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AWARENESS, PERCEPTION AND CONSTRAINTS TO CONSUMPTION OF PRO-VITAMIN A CASSAVA FOODS AMONG WOMEN OF REPRODUCTIVE AGE IN IKIRE, NIGERIA

[*1]Ariyo O., [1]Oladejo E.O. and [2]Atojoko M.A.

[1]Department of Human Nutrition & Dietetics, University of Ibadan, Ibadan, Nigeria
[2]Department of Science Laboratory Technology, Kogi State Polytechnic, Lokoja, Nigeria

[*]Corresponding author's email: o.ariyo@ui.edu.ng

ABSTRACT

Pro-vitamin A cassava was introduced to Nigeria since 2011; however, the consumption remains low. Increased consumption of pro-vitamin A cassava foods can complement other vitamin A deficiency control initiatives. The study was designed to assess the awareness, perception and constraints to consumption of pro-vitamin A cassava foods among women of reproductive age in rural and urban areas of Ikire, Nigeria. The cross-sectional study involved 200 women aged 15-49 years (100 each), selected using a three-stage sampling procedure. Data were collected using an interviewer-administered questionnaire including awareness, perception, and constraints to biofortified cassava products consumption. Data were analyzed using frequencies, percentages and Chi square test at $p < 0.05$. Age of respondents was 31.50±9.30 years and 27.00±9.80 years among rural and urban respondents, respectively. More respondents from rural (22%) than urban areas (2%) had no formal education. More respondents from urban than rural had ever heard (55%; 53%), seen (49%; 43%), tasted (40%; 29%), were aware of the benefits (36%; 9%), and had ever consumed (20%; 16%) biofortified cassava foods, respectively. Acceptability of colour (29%; 24%), taste (27%; 20%), aroma/flavour (26%; 20%), and texture (26%; 18%) was higher in rural than urban areas, respectively. Only 12% and 2% of urban and rural respondents considered pro-vitamin A cassava foods affordable. Rural/urban variation exists in awareness and perception of pro-vitamin A cassava foods, however, knowledge of their benefits and perceived affordability remain major constraints in both areas. A multi-faceted approach to promote nutrition education and policy support for increased affordability are recommended.

Key words: women of reproductive age, biofortification, consumption of pro-vitamin A cassava foods

INTRODUCTION

Biofortification is a cost-effective intervention strategy to address micronutrient malnutrition and involves breeding staple food crops to include an improved micronutrient content (Bouis *et al.,* 2019). This effort allows poor consumers to adopt nutrient-dense varieties of the same or similar crops. Biofortification capitalizes on the regular daily intake of a consistent and large amount of food, opportunity for one-time investment couple with high sustainability and low recurrent costs to reach undernourished populations in relatively remote rural areas (Mwaniki, 2009; Meenakshi *et al*., 2010; Bouis *et al*., 2011). In Nigeria, where micronutrient malnutrition has remained a public health problem following poor quality diet, biofortification complements other micronutrient malnutrition control strategies such as food fortification, supplementation, dietary diversification, and behavioural change communication. With wide cultivation of cassava across all the agro-ecological zones of Nigeria and an average consumption of about 700.00 *g* person^{-1} day^{-1} (Maziya-Dixon *et al.,* 2004; Okwuonu *et al.,* 2021), biofortification of cassava is a promising strategy to address vitamin A deficiency in Nigeria. Provitamin A biofortified cassava was introduced to Nigeria in 2011, and this was complemented with aggressive promotion of the cultivation, product development and standardization of diverse yellow cassava-based recipes and snacks, sensitization using multiple channels and periodic nutritious food fair (Ilona *et al.,* 2017). Also, studies have reported increasing uptake and willingness to cultivate provitamin A cassava among farmers across the country, particularly women farmers (Oparinde *et al.,* 2014; Effiong *et al.,* 2015; Yusuf *et al.,* 2020). In addition, efficacy studies conducted in Nigeria showed improvement in the vitamin A intake and the overall vitamin A status of children following consumption of provitamin A biofortified cassava (Onyeneke *et al.,* 2020; Afolami *et al.,* 2021a; Afolami *et al.,* 2021b). Nevertheless, the recent Nigeria's National Food Consumption and Micronutrient Survey showed

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that only 3.20% of Nigerians consumed provitamin A cassava or any products made from it (FGN/IITA, 2022). This low level of penetration of provitamin A cassava foods into the food system after 12 years of intensive promotion reflects the need to re-strategize efforts at promoting improved vitamin A status using biofortification in Nigeria. Existing pro-vitamin A cassava foods in Nigerian markets include garri, cassava bread, cassava fufu flour, high-quality cassava flour, cassava starch, cassava cake, and cassava chips (Oteh *et al.,* 2020). It is therefore expedient to identify constraints to the uptake of biofortified cassava products and ascertain the level of awareness and use among women of reproductive age in rural and urban areas. The focus on women is largely because of their central roles in household food consumption and the ripple effect of women's nutritional status on overall well-being, nutrition outcomes and economic productivity of the entire household (Zembe-Mkabile *et al.,* 2018).

There is a need to get producers and consumers to accept biofortified crops by properly educating them to know that biofortification is not against food biodiversity but complement it (Onuegbu *et al.*, 2017). This study will help to provide information on the rural-urban dimension of awareness and consumption of pro-vitamin A cassava foods staples which will help to generate context-relevant information for development, delivery and marketing of this bio-fortified foods and other biofortified foods in the study location, as well as in the state and country. The study was therefore designed to determine the awareness, perception and consumption of pro-vitamin A cassava foods among women of reproductive age in rural and urban areas of Ikire, Nigeria.

METHODOLOGY

Study Design, Location, and Population

The study was descriptive comparative in design. The study was conducted in Ikire, the headquarters of Irewole Local Government Area of Osun State. Ikire lies within longitude 4° 11' 6.00" E and latitude 77° 21' 36.00" N, between Ibadan and Ile-Ife. Farming, trading, and timber work are the predominant occupations of the town. Ikire and its surrounding villages were considered appropriate for the study because of close proximity to surrounding cities including Ibadan, Ile-Ife, Ilesa and Osogbo, and serving as the food basket for these cities. Moreover, farmers' clusters in Osun state have been sensitized on the cultivation of biofortified and some biofortified cassava stem multiplier are in the state. The minimum sample size for the study was calculated using the Fischer's sample size formula with standard normal deviate corresponding to 95% confidence level (set at 1.96), level of error tolerance 5% and knowledge of yellow cassava set at 85% (Bechoff *et al.,* 2018). Therefore, the study population consisted of 200 women of reproductive age in Ikire, Osun state.

Sampling Technique

A three-stage sampling procedure was used to select respondents for the study. In the first stage, seven of the 11 wards in Ikire and its environs were selected using a simple random sampling technique. At the second stage, the seven wards were purposively stratified into five urban and two rural wards. The third stage involved simple random sampling of women of reproductive age across the settlements under the selected wards. For the rural population, respondents were recruited across five settlements comprising Ayetoro, Majeroku, Odeyinka, Oosa, and Waasinmi. Urban population was recruited from nine settlements comprising Ako, Moringbere, Oke-ada, Oke-alfa, Oke-awo, Oluofinrin, Onibembe, Opeyemi and Unity. A woman was considered eligible if age was within 15-49 years, had lived in the community for at least five years, was capable of verbal communication and consented to participate in the study.

Data Collection

Data were collected using a semi-structured, interviewer-administered questionnaire including the socio-demographic characteristics, awareness, perception, and consumption of biofortified cassava products and constraints to consumption. Awareness was assessed using a five-item questionnaire after Fetuga *et al*. (2013) including ever heard, ever seen, ever tasted, awareness of benefits and ever consumed biofortified cassava products. The various forms of consuming cassava products in Nigeria were harvested from the literature and recipe books to develop a biofortified cassava products-based food frequency questionnaire. The consumption of biofortified cassava products was thereafter assessed using a 15-item Food Frequency Questionnaire with nine response options (never or once monthly, 1-3 times monthly, once weekly, 2-4 times weekly, 5-6 weekly, once daily, 2-3 times daily, 4-5 times daily, and ≥ 6 times daily) and re-categorized into yes and no. Respondents' perception on biofortified cassava foods was assessed using a five-point Likert scale on various components including appearance/colour, taste, flavour, texture, availability, accessibility, affordability, and safety.

Data Analysis

Data were analyzed using Microsoft excel and Statistical Package for Social Sciences (SPSS 20.0). Respondents' awareness and consumption of pro-vitamin A cassava foods were summarized using yes or no responses, and perception was using three points Likert scale, disagree, neutral and agree. Descriptive analysis using frequencies, percentages and Chi square test at $p < 0.05$ were adopted.

Ethical Considerations

Ethical approval for the study was obtained from the University of Ibadan/University College Hospital Research Ethics Committee (Approval No. UI/EC/18/0537). Permission to conduct the study was obtained from the heads of settlement and informed consent was obtained from all respondents.

RESULTS

Sociodemographic Characteristics of the Respondents

The sociodemographic characteristics of the respondents is as shown in Table 1. Mean age was 31.52 years among rural respondents and 27 years among urban respondents. Respondents aged 30-39, 20-29, and 40-49 years constituted 33.00, 32.00, and 24% in rural areas and 22.00, 30.00, and 17% in urban areas, respectively. Respondents were almost entirely Yoruba (98%) in urban areas and constituted the majority (70%) in rural areas. About 84% of the rural respondents were married compared to 53% in urban areas. Household size was similar in both urban (5.35 ± 1.81) and rural areas (5.87 ± 2.59), though large household (> 9.00) were more predominant in rural (12%) than urban areas (5%). Educational status varies between the sectors, respondents without formal education was 22% in rural areas and only 2% in urban areas while respondents with only basic education constituted 36% in rural areas and 19% in urban areas. Occupation wise, 37% of urban respondents and 12% of rural respondents had no primary job. Farmers constituted 28% of in rural areas and only 1% in urban areas.

Awareness of Pro-Vitamin A Cassava Foods

Respondents' awareness of pro-vitamin A cassava foods is presented in Figures 1 and 2. About 55.00 and 53% of the respondents in urban and rural areas, respectively had ever heard of pro-vitamin A cassava foods. More respondents in urban (49%) than rural areas (43%) had ever seen the pro-vitamin A cassava foods, and more respondents in the urban (40%) than rural areas (29%) had ever tasted the pro-vitamin A casava foods. However, few of the respondents were aware of the benefits of the pro-vitamin A with higher awareness in urban (36%) than rural areas (9%). The only significant difference was found for awareness of benefits. Of the respondents that were aware of the benefits, information on pro-vitamin A foods emanated from various sources including family and friends (67.90%; 69.10%), extension workers (17%; 1.80%), farmers group (7.50%; 1.80%), social media (1.90%; 9.10%), meetings/seminars (1.90%; 7.30%), religious leaders (1.90%; 7.30%) and point of cassava stem purchase (1.90%; 3.60%) in rural and urban areas, respectively (Figure 2). Of all the respondents to the questionnaire, only 20% from urban areas and 16% from rural areas had ever consumed pro-vitamin A cassava foods.

Table 1: Sociodemographic characteristics of the respondents (SD - standard deviation)

Variables		Total		Rural		Urban	
		Number	(%)	Number	(%)	Number	(%)
Age (years)	15-19	42.00	21.00	11.00	11.00	31.00	31.00
	20-29	62.00	31.00	32.00	32.00	30.00	30.00
	30-39	55.00	27.50	33.00	33.00	22.00	22.00
	40-49	41.00	20.50	24.00	24.00	17.00	17.00
	Mean ± SD	29.28 ± 9.82		31.52 ± 9.32		27.03 ± 9.83	
Ethnicity	Yoruba	170.00	85.00	72.00	72.00	98.00	98.00
	Igbo	5.00	2.50	4.00	2.00	1.00	1.00
	Others	25.00	12.50	24.00	24.00	1.00	1.00
	Marital status						
	Single/separated /widowed	63.00	31.50	16.00	16.00	47.00	47.0
	Married	137.00	68.50	84.00	84.00	53.00	53.0
Household size	1-4	64.00	32.00	31.00	31.00	33.00	33.00
	5-9	119.00	59.50	57.00	57.00	62.00	62.00
	> 9	17.00	8.50	12.00	12.00	5.00	5.00
	Mean ± SD	5.61 ± 2.24		5.87 ± 2.59		5.35 ± 1.81	
Level of education	No formal education	24.00	12.00	22.00	22.00	2.00	2.00
	Basic education (9 years)	55.00	27.50	36.00	36.00	19.00	19.00
	Senior secondary	93.00	46.50	34.00	34.00	59.00	59.00
	Tertiary	28.00	14.00	8.00	8.00	20.00	20.00
Primary occupation	None	49.00	24.50	12.00	12.00	37.00	37.00
	Wage earners	25.00	12.50	9.00	9.00	16.00	16.00
	Artisans	97.00	48.50	51.00	51.00	46.00	46.00
	Farmers	29.00	14.50	28.00	28.00	1.00	1.00

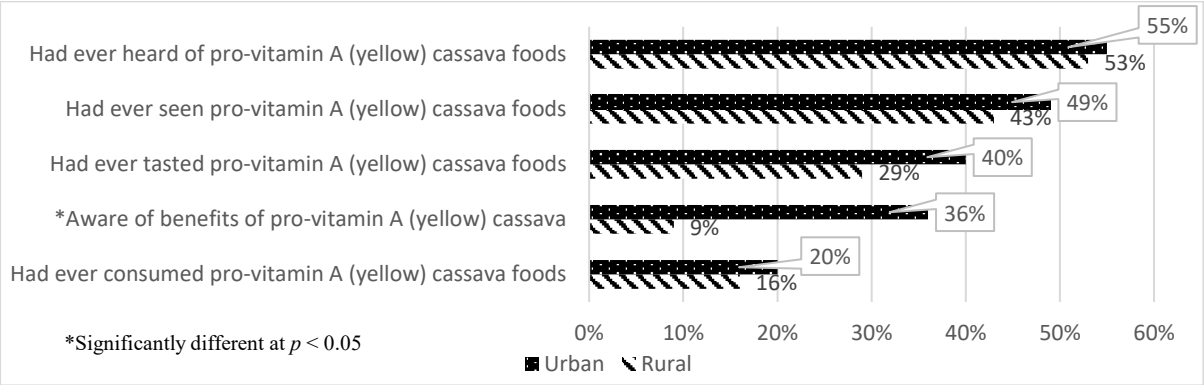

Figure 1: Respondents' awareness of pro-vitamin A cassava foods

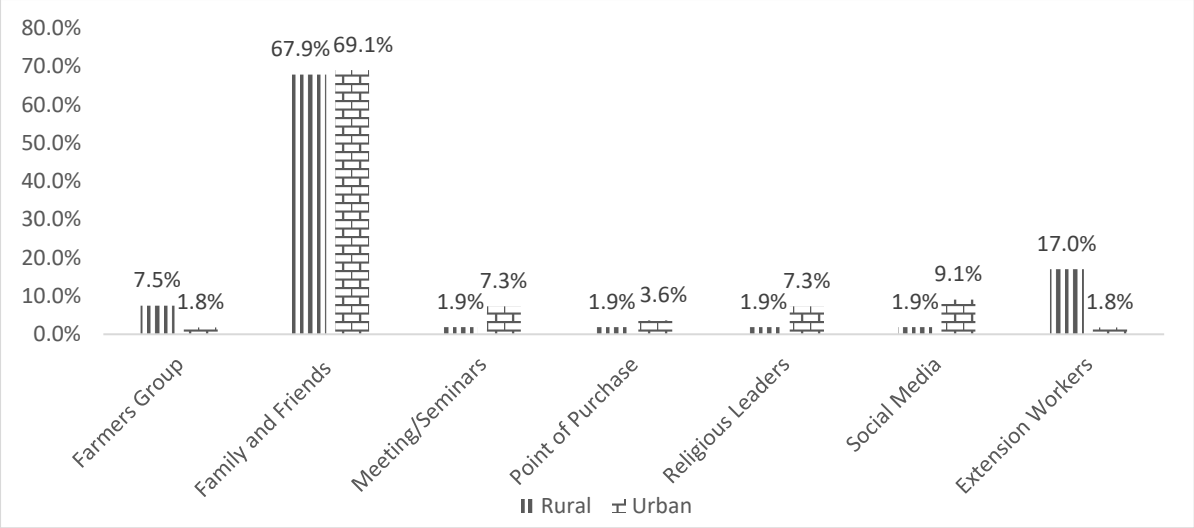

Figure 2: Source of information on pro-vitamin A cassava foods

Respondents' Consumption and Perception of Pro-Vitamin A Cassava Foods

The various forms in which pro-vitamin A cassava foods were consumed among the respondents are shown in Figure 3. The major forms of consumption of pro-vitamin A cassava foods among respondents from urban areas included garri-eba (17%), soaked garri (14%), fufu (14%), and lafun (4%) while in rural areas, it was consumed in the form of soaked garri (12%), garri-eba (11%), fufu (7%), lafun (3%), and abacha (1%). There was difference in the perception of pro-vitamin A cassava foods among the respondents from rural and urban areas (Table 2). Largely, majority of the respondents in both rural and urban areas were indifferent to the characteristics and other attributes of vitamin A cassava foods. Nevertheless, more respondents in rural than urban areas found the appearance and colour (29%; 24%), taste (27%; 20%), aroma/flavour (26%; 20%), and texture (26%; 18%) of pro-vitamin A cassava foods acceptable, respectively. However, more respondents from urban than rural areas found the products readily available (44%; 42%), and readily affordable (12%; 2%), respectively. Fewer respondents in rural (2%) than urban areas (13%) considered pro-vitamin A cassava foods posed threat to health.

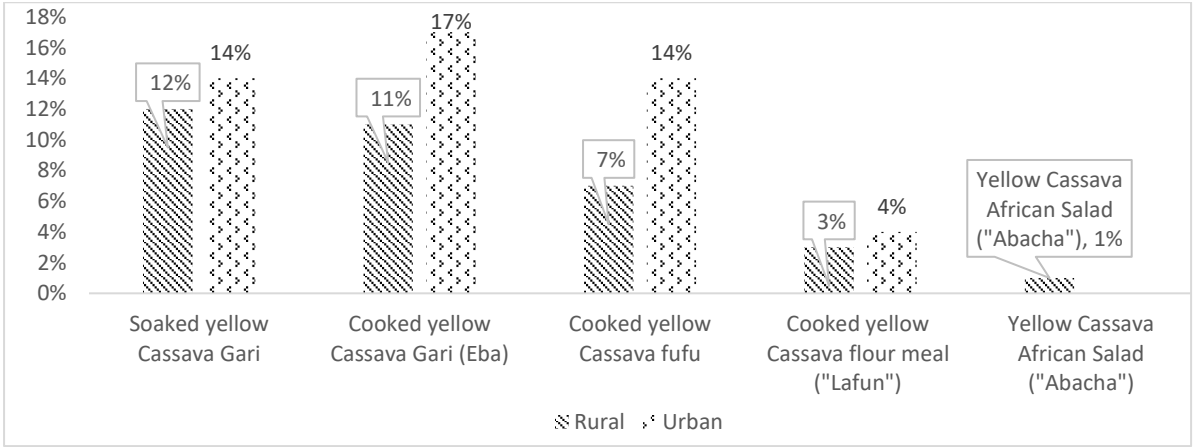

Table 2: Respondents' perception and constraints to pro-vitamin A cassava foods consumption

	Rural			Urban		
	Disagree (%)	Neutral (%)	Agree (%)	Disagree (%)	Neutral (%)	Agree (%)
*Acceptable appearance/colour	2.00	69.00	29.00	16.00	60.00	24.00
*Acceptable taste	2.00	71.00	27.00	16.00	64.00	20.00
*Acceptable aroma/flavour	2.00	72.00	26.00	17.00	63.00	20.00
*Acceptable texture	3.00	71.00	26.00	21.00	61.00	18.00
Readily available	4.00	54.00	42.00	8.00	48.00	44.00
Readily accessible	3.00	56.00	41.00	9.00	50.00	41.00
*Readily affordable	1.00	97.00	2.00	12.00	76.00	12.00
*Constitute health threat	44.00	54.00	2.00	22.00	65.00	13.00

* - significant at $p < 0.05$

DISCUSSION

In this study, awareness and perception of pro-vitamin A cassava foods is high, however, accessibility, affordability, knowledge of benefits of these foods, and consumptions remain low. The low level of consumption of pro-vitamin A cassava foods is a major setback for reducing the burden of vitamin A deficiency in Nigeria. It suggests the failure of the increased awareness and perception of pro-vitamin A cassava foods to translate to improved behavioural change to promote adoption ad use of the products. Earlier studies have shown contradicting reports on the awareness of yellow cassava with variation across ethnic and geographical affiliations. In South East and South South regions, studies have shown high level of awareness (69.20-100%) of pro-vitamin A cassava foods (Oteh *et al.,* 2020; Ekanem *et al.,* 2023) whereas awareness was low (35.00-47.50%) in South West Nigeria (Ojeleye, 2018; Ogunmola, 2020). The high level of awareness in the present study can be attributed to the environmental factors such as the closeness of the study to Ibadan where the major organization promoting the yellow cassava is located and the presence of a university which may enhance access to information. The major source of information of pro-vitamin A cassava foods in this study was family and friends. This is not expected as the extension workers, farmers groups and meetings and seminars are expected to be more reliable source of information on key agricultural innovations and practices. Evidence has shown increasing use of various sources to seek health and nutrition information and the reliability can vary with source (Dalhaug and Haakstad, 2019; Frey *et al.,* 2022). There is a need to strengthen social marketing and information dissemination around biofortified foods in Nigeria and reduce proneness to misinformation that can be counterproductive to the optimal use of biofortified foods. The use of social media among other channels is increasingly becoming important in sharing agricultural, health and nutrition information (Frey *et al.,* 2022). Therefore, this channel can be deployed in promoting uptake and use of pro-vitamin A cassava foods in the country. Bouis and Saltzman (2017) reported that information on the nutrition and health benefits of bio-fortified foods is important to increasing adoption and consumption and integrating bio-fortified food to daily diet. The fewness of the respondents that had ever consumed pro-vitamin A cassava foods agrees with the report of national food consumption (FGN/IITA, 2022). The low use of provitamin A cassava foods in this study can be attributed to poor knowledge of the benefits of these foods, low availability, and affordability. Uzokwe *et al.* (2021) reported a low knowledge of the benefits of biofortified foods among Nigeria thereby limiting the uptake of these products. Evidence have shown that improved affordability and improved knowledge of the benefits of pro-vitamin A cassava foods are essential to increase the uptake and consumption of these foods (Bechoff *et al.,* 2018; Oteh *et al.,* 2020). The poor physical access or availability of these products can be attributed to inadequate production. Nguema *et al.* (2010) reported limited presence of biofortified foods in most local markets of sub-Saharan Africa including Nigeria. It is unfortunate that 12 years after the introduction of biofortified cassava varieties, access to biofortified food products remain limited. Ilona (2014) reported that only 10% of the total estimated production of yellow cassava roots harvested in Nigeria was sold in local markets. This suggests that production is largely for households' own consumption and large-scale production of the pro-vitamin A cassava remain limited in the country thus impacting both availability and affordability of the products. This production gap limits efforts to deepen consumer demand and supply for these products as this could further impact affordability to poor households. According to Low *et al.* (2007), food must be acceptable, affordable, and available to consumers, and consumers must have the resources, knowledge and motivation to purchase and consume these foods. Findings from Nigeria shows that pro-vitamin A cassava foods are acceptable, however, availability and affordability remain poor, and knowledge of the benefits of these foods is limited. This may be responsible for low uptake and consumption of pro-vitamin A cassava foods in Nigeria. Affordability has been identified as a key factor for food choice in an earlier study in Nigeria (Oguntoye *et al*., 2022). Though product development and standardization were key components of the cassava biofortification promotion programme in Nigeria and several healthy snacks and recipes were developed, conventional foods largely garri and fufu remain the major forms in which Pro-Vitamin A cassava foods were consumed. Studies from other parts of the country have reported garri and fufu as the major forms of consumption of provitamin A cassava among Nigerians (Chavez *et al*., 2007; Etuk *et al.,* 2018; Ekanem *et al.,* 2023). This finding suggests that the developed recipes are not yet integrated into the meal pattern of the masses in both urban and rural areas. Also, it may be due to the study population which are entirely adult women, as the consumption of snacks may be more common among children and adolescents than adults. Nevertheless, promotion of the developed snacks and recipes are crucial in increasing the uptake and use of biofortified cassava products in Nigeria. In addition, majority of the respondents were indifferent to the taste, texture, aroma and colour of the foods. An earlier study in Kenya has shown similar report which suggests the acceptance of the physical attributes of yellow cassava products (Talsma *et al*., 2013). Nonetheless, there still exist some misconceptions about the health benefits of the pro-vitamin A cassava foods, and this call for intense sensitization and public nutrition education.

CONCLUSION

Though awareness and perception of pro-vitamin A cassava foods differ in rural and urban areas, the knowledge of their benefits and consumption remains low among the women of reproductive age in both areas of Ikire, Nigeria. Availability, accessibility, and affordability are key constraints to increase consumption of pro-vitamin A cassava foods, and these could impede the efforts to reduce vitamin A deficiency in Nigeria. The use of a multi-faceted approach to promote nutrition education on the benefits of vitamin A cassava foods, policy support to incentivize increased yellow cassava production and enhanced market availability, accessibility and affordability, and intensive promotion of yellow cassava-based snacks and recipes are recommended to improve uptake and consumption of pro-vitamin A cassava foods.

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