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Nutrition knowledge, cooking practices, and consumption of indigenous leafy vegetables among households in Sagnarigu Municipality, Ghana

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ABSTRACT

This study assessed nutrition knowledge, cooking practices, and consumption of indigenous leafy vegetables (IGLVs) among households in the Sagnarigu Municipality, Ghana. A structured questionnaire was employed to collect data on socio-demographics, nutrition knowledge scores, cooking practices, and consumption of IGLVs in the Sagnarigu Municipality. The study was cross-sectional, with a multi-stage sampling to select 399 respondents responsible for preparing family meals. More than half of the respondents had a low nutrition knowledge of IGLVs. Respondents with basic education were 67% (OR = 0.410, 95% CI: 0.170–0.986, p = 0.047) less likely to have high nutrition knowledge of IGLVs than those with tertiary education. Most respondents (65.7%) chopped their IGLVs before washing, and almost all (90.2%) discarded stock after cooking. Concerning the consumption of IGLVs, almost all respondents' households consumed kenaf and jute leaves representing 90.2% and 99.5% respectively. A few of the respondents indicated that availability, low cost and high nutrient content were significant drivers in the consumption of IGLVs (27.1%, 13.3% and 8.8%, respectively). Therefore, interventions by both the government and non-governmental organisations to increase nutrition knowledge and consumption of IGLVs should include strategies to promote the production, utilisation, and commercialisation of IGLVs, especially in the Northern Region.

Keywords: *Indigenous green leafy vegetables; Micronutrient deficiencies; Nutrition knowledge; Cooking practices*

INTRODUCTION

Food diversification, including the consumption of indigenous crops, could play a crucial role in reducing the perennial micronutrient deficiencies in low- and middle-income countries. As Kimiye *et al*. (2007) suggested, hunger and malnutrition form part of low- and middle-income countries' critical obstacles to development. Thus, promoting the consumption of indigenous green leafy vegetables (IGLVs) may contribute to efforts to improve the nutritional status of most resource-poor Ghanaians. IGLVs are those leafy parts of plants harvested either from the wild or through cultivation and consumed as vegetables (Jansen Van Rensburg *et al*., 2007; Uusiku, Oelofse, Duodu, Bester, & Faber, 2010). They may be indigenous or introduced from elsewhere and adopted over a long period by consumers.

Previous studies have widely proven the potential synergetic effects of IGLVs as nutraceuticals-micronutrient dense and

medicinal (Ene Obong, 2014; Kwenin, Wolli, & Dzomeku, 2011; Mibei, Ojijo, Karanja, & Kinyua, 2012; Oboh, Oyeleye, & Ademiluyi, 2019). Kasimba and co-workers (2019) proposed that IGLVs can help eradicate vitamin A deficiencies among the most vulnerable, especially children, pregnant women, and the poor. Calcium, magnesium, phosphorus, zinc, iron, vitamin A, vitamin C, and β-carotene are among the nutrients reported to be rich in IGLVs (Abu-Ja-Jah, 2020; Kasimba *et al*., 2019). It has also been reported that IGLVs contain non-nutrient bioactive phytochemicals associated with preventing cardiovascular and other degenerative diseases (Kwenin *et al*., 2011). In addition, Kansiime *et al*. (2018) reported that IGLVs have short growth cycles and utilise lesser soil nutrients and water better than most staple and conventional crops. As a result, they are one of the cheapest and most readily available vegetables consumed in many African homes (Kwenin *et al*., 2011).

Some available IGLVs found in Northern Ghana are Amaranth leaves (locally called *"aleefu"*), moringa leaves, okro leaves *("mana mahili")*, baobab leaves ("*kuuka"*), kenaf leaves *("bra")*, cowpea leaves, pumpkin leaves and jute leaves ("*ayoyo"*) (Abu-Ja-Jah, 2020; Amagloh & Nyarko, 2012; Atuna *et al*., 2022). However, although these IGLVs are available, they are often poorly utilised partly due to diminishing or lack of knowledge (Dlamini & Viljoen, 2020; Dweba & Mearns, 2011). The reasons suggested by the researchers are the influx of foreign ones, stigma, and reduced indigenous knowledge transfer from an older generation to a younger generation (Dlamini & Viljoen, 2020; Dweba & Mearns, 2011).

Past studies on IGLVs in Ghana have centred on their nutrient and non-nutrient values (Kwenin *et al*., 2011; Mibei *et al*., 2012), reincorporation into Ghanaian dishes (Darkwa & Darkwa, 2013), their conservation, utilisation, and potential for commercialisation (Amisah, Jaiswal, Khalatyan, Kiango, & Mikava, 2002). Also, their marketability and consumer preference (Quaye, Gyasi, Larweh, Johnson, & Obeng-Aseidu, 2009), availability, cost, and popularity (Asase & Kumordzie, 2019) have been investigated. However, studies on consumer nutrition knowledge, practices, and consumption of IGLVs are rare, although they affect how much nutrients are provided to the body (Asakura, Todoriki, & Sasaki, 2017; Noronha *et al*., 2020). Therefore, the objective of this study was to investigate the nutrition knowledge, cooking practices, and consumption of IGLVs among households in the Sagnarigu Municipality, Ghana.

MATERIALS AND METHODS

Study design and consent to participate

The study employed an analytical cross-sectional survey design among households in Sagnarigu Municipality with approval from the Sagnarigu Municipal Assembly and Sagnarigu Health Directorate. Informed consent was sought from the study respondents, whose identities were coded to ensure confidentiality.

Sample size and sampling procedure

The study sample consisted of 399 members of the households responsible for preparing family meals, calculated using Cochran's formula for sample size estimation (Cochran, 1963). The study followed a multi-stage sampling procedure. The first stage comprised the selection of communities using cluster sampling, where communities were grouped into four (4) major sub-districts, and one community each was selected using the lottery method. The communities selected were Sagnarigu, Gurugu, Vittin, and Yilonayili.

The second stage involved the selection of respondents. The probability proportionate to size sampling was used to share samples to be picked from each community selected in the first stage based on their population sizes. Finally, the spin-the-bottle method (WHO, 2008), was used to select households where respondents were visited and interviewed.

Data collection

A structured pre-tested and pre-coded questionnaire designed based on a pilot survey was used for the data collection. The questionnaire was divided into sections. The first part comprised the socio-demographic and economic characteristics. The economic characteristic variable was measured using the household wealth indexing method as a proxy (GSS, GHS, & International, 2015). Fourteen household possessions such as television, bicycle, and radio were employed in the measurement for the household wealth index as used in other studies (Saeed & Wemakor, 2019).

The second section of the questionnaire comprised nutrition knowledge on IGLVs adapted from existing literature based on 16 statement questions on nutritional value, cost-effectiveness, and processing (Abu-Ja-Jah, 2020; Kwenin *et al*., 2011; Oboh *et al*., 2019). This section also comprised questions on the cooking practices used to prepare IGLVs. The cooking practices assessed included questions on whether respondents washed and chopped or not before cooking their IGLVs. Also, questions on the estimated cooking time of IGLVs and whether they discard the stock of IGLVs after cooking were asked as part of the cooking practices.

The last section was on the consumption of selected IGLVs. Also, the factors that affect household consumption of IGLVs were under this section. IGLVs considered for the study were cocoyam leaves, amaranth leaves, moringa leaves, okro leaves, baobab leaves, kenaf leaves, cowpea leaves, pumpkin leaves, and jute leaves. The factors that affected households' consumption of IGLVs were culture, availability, high nutrient content, and low cost.

Statistical analysis

Data were entered into and analysed using IBM SPSS statistical software version 25 (SPSS Inc., Chicago, IL, USA).

Concerning the socio-economic status of study respondents, possession of each household item attracted a score of one (1); otherwise, zero (0). Principal Component Analysis (PCA) was then used to generate wealth scores for each household. Finally, all scores were ranked into tertiles dividing scores into three (3) equal groups – poorest, medium, and richest.

For knowledge scores, every "Yes" response indicated a correctly answered question that attracted a score of one (1), and zero (0) for a "No" response. First, the frequencies of the respective "Yes" and "No" responses were determined. Then, with a maximum score of 16 and a minimum score of 1, scores were then categorised into high and low knowledge using a calculated median score of 13. Thus, respondents whose total scores were below the median score were categorised as having low nutrition knowledge. In contrast, those with scores equal to or above the median score were classified as having a high nutrition knowledge of IGLVs.

Pearson's Chi-square (χ^2) and Fisher's exact tests were used to examine the associations between socio-demographic and economic characteristics and nutrition knowledge of IGLVs. After, the multivariate binary logistic regression analysis was conducted for possible predictors of nutrition knowledge of IGLVs. Similarly, a significant level of 5% was set for all statistical tests.

RESULTS AND DISCUSSION

Socio-demographic and economic characteristics of respondents

Out of the data collected from 399 study respondents from the four communities used for the analysis, the majority (52.1%) were between 20 to 30 years (Table 1). The mean (±SD) age of respondents was 29.2 ± 7.9 years. Other variables are presented in Table 1.

Table 1: Socio-demographic and economic characteristics of study respondents

Characteristic	Frequency
Age group (years)	
<20	42
20 – 30	208
31 – 40	109
>40	40
Gender	
Male	13
Female	386
Education	
No formal education	173
Basic education	97
Secondary education	81
Tertiary education	48
Marital status	
Unmarried	81
Married	318
Religion	
Islam	344
Christianity	53
Traditionalist	2
Occupation	
Trading	245
Farming	32
Private sector worker	20
Public sector worker	35
Unemployed	67
Socio-economic status	
Poorest	234
Medium	129
Richest	36

Nutrition knowledge of IGLVS

Generally, the nutrition knowledge of IGLVs among respondents was low. More than half (55.9%) of respondents had low nutrition knowledge. This information adds to the assertions made by other studies that have reported the decline in knowledge of IGLVs in Africa (Dlamini & Viljoen, 2020; Dweba & Mearns, 2011). The influence of knowledge of food on intake cannot be underestimated (Asakura *et al*., 2017; Noronha *et al*., 2020). When there is a reduced knowledge of the importance of a food product, especially IGLVs, which are rich in micronutrients, and less expensive and readily available, intake becomes low. Possibly, contributing to micronutrient deficiencies bedevilling the poor regions of Ghana. The inadequate nutrition knowledge identified in this study is due to the observed low literacy rates since most had not obtained formal education.

Education ($\chi 2$=24.047, p<0.001**)** and socio-economic status ($\chi 2$=40.921, p<0.001) of respondents had significant associations with nutrition knowledge of IGLVS. The likelihood of having high nutrition knowledge of IGLVs was 66.6% (OR = 0.334, 95% CI: 0.141–0.794, p = 0.013) lower among respondents with a basic education compared with those with tertiary education (Table 2). This shows a need for nutrition education for respondents with lower education levels as they form a majority in the municipality. Therefore, activities that will increase the awareness of the importance of IGLVs to curb micronutrient deficiencies among this category of people are needed.

Also, respondents within the poorest socio-economic status were 59% (OR = 0.410, 95% CI: 0.170–0.986, p = 0.047) less likely to have a higher nutrition knowledge of IGLVs than those in the richest category (Table 2). Since socio-economic status affects purchasing power (Majumder, 2022), there is a likelihood that the rich can purchase these IGLVs, and in doing so, would like to know more about their nutrient contents, unlike the poor.

Table 2: Multivariable binary logistic regression analysis of predictors of nutrition knowledge of IGLVs

Characteristic	OR (95% CI)	*p*-value
Education		
Tertiary education*	1	
Secondary education	0.682 (0.301 – 1.543)	0.358
Basic education	0.334 (0.141 – 0.794)	**0.013**
No formal education	0.646 (0.284 – 1.479)	0.301
Socio-economic status		
Richest*	1	
Medium	1.430 (0.620 – 3.300)	0.401
Poorest	0.410 (0.170 – 0.986)	**0.047**

*: Reference groups. OR: Odds ratio. CI: 95% Confidence interval. Embolden *p*-value indicates statistical significance at a 95% confidence level.

Cooking practices among respondents

More than half (65.7%) chopped their IGLVs before washing, and almost all the respondents (90.2%) discarded stock after cooking (Figure 1). This result corroborates the finding of Kimiye *et al*. (2007) in Nairobi, Kenya, who reported that 43.1% chopped their leafy vegetables before washing, and 79.1% discarded stock after cooking IGLVs.

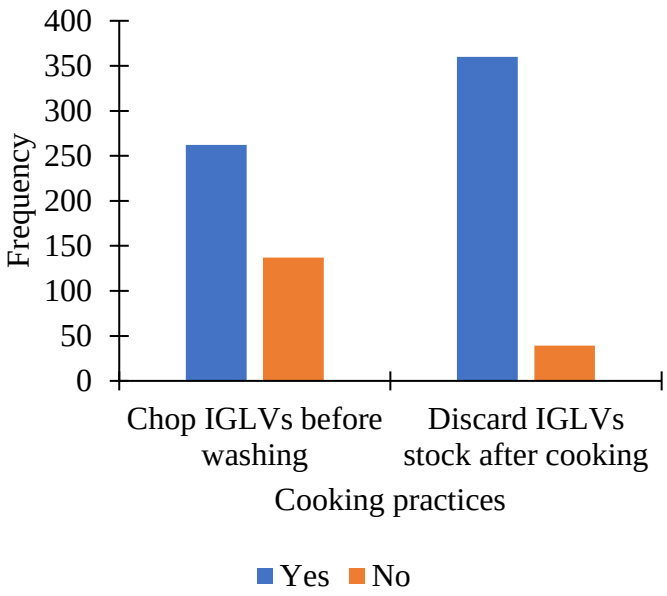

Figure 1: Cooking practices of IGLVs among study respondents

These cooking practices seem to be common across African households and are of great concern as water-soluble vitamins (B vitamins and C) are lost mainly during food preparation (Hailemariam & Wudineh, 2020; Kimiye *et al*., 2007). For instance, when chopping before washing, these nutrients easily leach into the washing water as the surface area of the IGLVs is increased. Notwithstanding, these practices reduce the bitterness of some leaves and improve their sensory properties. Therefore, other ways should be developed to minimise the bitterness of some of these leaves, like blanching and using an automated bitter leaf processing machine (Uguru-Okorie, Adebimpe, Oni, & Omoyemi, 2022).

There is no study on the ideal cooking time of IGLVs due to species variation and cultural background. An estimated duration, ranging from 5 to 60 mins was reported by the respondents. However, other researchers have suggested that long cooking periods may lead to the loss of essential nutrients (Hailemariam & Wudineh, 2020; Jansen Van Rensburg *et al*., 2004).

Consumption of IGLVs

From the study, almost all the households interviewed consumed kenaf (99.7%) and jute (99.5%) IGLVs. On the other hand,

pumpkin leaves were the least consumed among households in the study area, representing 33.8% (*n*=399). The results are shown in Figure 2.

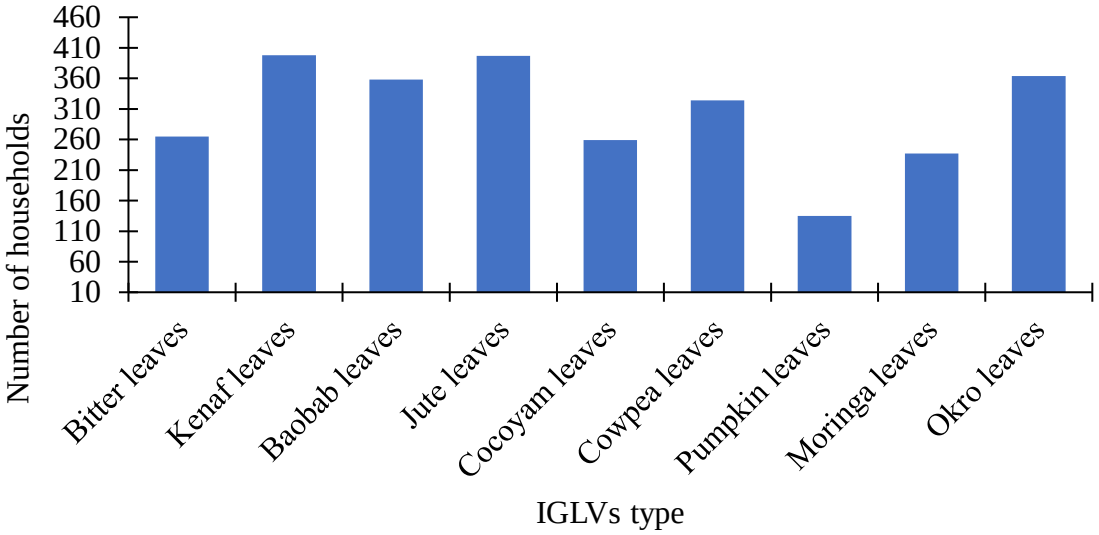

Figure 2: Types of IGLVs consumed among households in Sagnarigu Municipality

Culture, availability, high nutrient content, and low cost are the key factors influencing the consumption of IGLVs among households in the study area (Table 3). Regarding the consumption of IGLVs, 75.7% of the respondents agreed that culture played a role. About a quarter (27.1%) of them indicated that availability influenced IGLVs consumption in their households. The low cost and high nutrient content of IGLVs were also indicated by the respondents (13.3% and 8.8%, respectively) as contributory factors to their consumption.

Culture as the most selected factor in the consumption of IGLVs is not surprising as these foods form the traditional diets of most of the respondents. A similar finding was observed in a study elsewhere in Nairobi, Kenya, where the ethnic background of the respondents influenced the consumption of IGLVs (Kimiye *et al.*, 2007).

Additionally, the influence of availability and low cost on the consumption of IGLVs should be of great concern. Just about one-tenth agreed that it was relatively low cost to consume IGLVs. This may be due to the increasing scarcity of IGLVs because of the influx of foreign vegetables as reported in other studies (Chagomoka *et al.*, 2015; Jansen Van Rensburg *et al.*, 2007; Kimiye *et al.*, 2007). Therefore, when there is an increased production of IGLVs, the availability will suit the demand, decreasing the price of consuming IGLVs.

Unfortunately, high nutrient content, which is a crucial factor was not seen as a high driving force in the consumption of IGLVs. Perhaps the low nutrition knowledge resulting from the study accounted for it. However, it is possible that when there is an increased awareness of the nutritional benefits of IGLVs, consumption will be higher among households. Therefore, there is a need to intensify education on the nutritional benefits of these locally available vegetables.

Table 3: Factors that influence the consumption of IGLVs among households

Factors	Frequency
Culture	
Yes	302
No	97
Availability	
Yes	108
No	291
High nutrient content	
Yes	35
No	365
Low cost	
Yes	53
No	346

CONCLUSION

Nutrition knowledge, cooking practices, and consumption of IGLVs reported as high in essential micronutrients, were investigated among households in Sagnarigu Municipality, Ghana. A decline in nutrition knowledge on IGLVs. Further, inappropriate cooking practices: chopping IGLVs before washing, and discarding stock of IGLVs after cooking were identified among the respondents. Additionally, availability, low cost and the reported relatively high nutrient content were not significant drivers in the consumption of IGLVs among the respondents. Therefore, increased efforts are required to promote the consumption of IGLVs among households in the Sagnarigu Municipality and Northern Region. Such publicity could be done through mass media such as television, radio, posters, and pamphlets.

Competing interests

The authors declare that they have no competing interests.

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