

HAUSA KOKO: CONSUMER KNOWLEDGE AND PREPARATION METHODS

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ABSTRACT

This research aimed to determine the consumers' knowledge about the nutritional contribution of Hausa koko, compare the traditional preparation methods, and quantify the ingredients used in its preparation. Structured questionnaire was administered to KNUST populace through social media platform to determine consumers' knowledge, whilst measurement of ingredients and methods of preparation of Hausa koko were done using weighing scale and through interview with processors respectively. Majority (88.1%) of the respondents were young people (18-30 years), and had limited knowledge about the ingredients, nutritional composition and health benefits of Hausa koko. Hausa koko production is dominated by females (91%) from Northern Ghana with about 70% having at least basic education. About 94% of the processors use millet as principal ingredient with varied amounts of spices. The average amount of millet, ginger, red pepper, cloves, black pepper and African pepper were found to be 96.28, 2.55, 0.36, 0.38, 0.24 and 0.02% correspondingly. The process of Hausa koko production involved soaking, milling, slurry making, fermentation, boiling and mixing with boiled slurry, and this method is used by 76% of the vendors. The other processors (24%) follow a similar process but differs only at the milling stage where portion of the millet is mixed with the spices, and the other portion is milled separately. Trade secrets (quantity and choice of spices, and amount of water) are responsible for the inconsistencies in sensory properties. Nutritional education on Hausa koko, and standardization of its preparation methods will help increase its consumption, for improved nutrition due to its high nutritional content.

Keywords: Hausa koko, consumer knowledge, ingredients, preparation methods

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INTRODUCTION

The higher prevalence of non-communicable diseases (NCDs) in the world and particularly in low middle-income countries like Ghana, has been attributed to nutrition transition and unhealthy dietary lifestyles (Amuna & Zotor, 2008; Bosu, 2015). This transition focuses on frequent intake of highly processed foods that are rich in sugar, salt and fats, which have little or no contribution to micronutrient status of the consumer (Batal *et al.*, 2018; Popkin, 2015). This nutritional paradigm shift is influenced by the inadequate nutritional knowledge of the indigenous diets, advertisement and diminutive understanding of the role of traditional foods in ensuring the sustainability of nutritious and safe foods (Mozaffarian, 2013; Kuhnlein *et al.*, 2013; Milosavljević *et al.*, 2015). Traditional foods are nutritious, and have the potential to contribute to human nutrition and management of NCDs and malnutrition if given the attention it desires (Kuhnlein & Receveur, 2007).

Hausa *koko* is a traditional food in some African countries, and very popular among Ghanaians and Nigerians. It is usually prepared from cereals particularly millet in combination with other spices such as ginger, black pepper, chilies and cloves (Danson *et al.*, 2019). Some communities also choose to add or use maize or sorghum in its preparation due to high cost of millet (Haleegoah *et al.*, 2020). These food ingredients have been found to contain high energy, fiber, B vitamins, minerals (potassium, magnesium, iron, zinc, copper and manganese) and some phytochemicals including vanillic, proto-catechuic, p-hydroxybenzoic, coumaric, ferulic among others, which are good for promoting good health, physical activity and disease management (Sabuz *et al.*, 2023; Nambiar *et al.*, 2011; Benhur *et al.*, 2017; Akyereko *et al.*, 2021). In Ghana, *Hausa koko* production and consumption originated from the northern part of Ghana where pearl millet is mostly grown and used (Danson *et al.*, 2019). However, it is currently consumed across the country.

Hausa *koko* is a delicious and affordable meal patronized by people from all walks of life. It is one of the commonest breakfast meals in Ghana, and until recently, has been served as supper for those who prefer lighter food. It is normally consumed with accompaniments such as sugar, bread, fried cowpea/ *koose* (fried cowpea-*Vigna unguiculata* paste) or *maasa* (fried millet, sorghum, or corn paste) (Haleegoah *et al.*, 2016), roasted groundnuts and recently with evaporated milk. This indigenous food has the potential to contribute to the management of NCDs and malnutrition considering the ingredient composition and level of consumption among the Ghanaian populace.

Consumer knowledge and perception is an indispensable component of food consumption and patronage, since most consumers make informed food choices based on their knowledge about the nutritional composition, health benefits, safety, traditional moiety, and sensorial appeal of the food (Akyereko *et al.*, 2022). It is an established fact that nutritional quality, safety and sensorial properties of foods are influenced by the ingredients and processing methods used in the food preparation (Martíne & Carballo, 2021; Aguilera, 2019). Despite the high patronage for Hausa *koko* among the Ghanaian populace, the various methods of preparation coupled with different ingredients combination and quantities used in its preparation have created consumer concerns regarding some inconsistencies in its organoleptic properties (taste, aroma, spiciness, sourness and thickness) (Osseo-Asare, 2005). In addition, these meals are usually prepared by people with low formal education, who might lack the technical knowledge in providing safe food for public consumption, and might be reluctant to change or adapt to improving situations and innovation (Haleegoah *et al.*, 2020).

It is therefore necessary to know the different methods and ingredients used in Hausa *koko* preparation, in order to harmonize the production processes for commercial producers. Also, understanding the consumers' knowledge and preparation methods would help to assess the contribution of the food to health, and provide framework to put the food in a good perspective for sustainable food development or production. For this reason, the present study sought to determine the consumer knowledge on the nutritional contribution of Hausa *koko* to their health, compare the traditional preparation methods, and quantify the ingredients used in its preparation.

MATERIALS AND METHODS

Study area

The study was conducted in the campus of Kwame Nkrumah University of Science and Technology (KNUST), Ayigya, Ayeduase and Aboabo, all being communities within the Kumasi Metropolis in the Ashanti region of Ghana. KNUST campus is situated in the city of Kumasi (latitude 6.673° N, longitude -1.565° W) and ~270km North-West of Ghana's capital city, Accra. It shares borders with other suburbs such as Kotei, Ayeduase and Bomso. Ayigya is a suburb of the Oforikrom Sub-metro and is situated close to Oforikrom, Aboabo, Ayeduase but shares boundaries with KNUST. It is located on latitude 6.675° N, and longitude -1.577° W. Ayeduase (lies on latitude 6.692° N, longitude -1.559° W) is under the Oforikrom Municipal Assembly, and is situated close to Kotei, Ayigya and Boadi. Aboabo, a suburb in Kumasi under the Asokore-Mampong Municipal Assembly, is a community which consists mainly of Muslims and northerners, from which Hausa *koko* originated. It is located on latitude 6.701° N, longitude -1.596° W. These communities were purposively selected for the study based on

their high involvement in the production and consumption of Hausa *koko*.

Development and administration of questionnaire

Consumer's knowledge on nutritional composition and benefits of Hausa *koko*

A cross-sectional study was conducted using a structured questionnaire through social media platforms (WhatsApp and Facebook) to determine the consumers' knowledge on the contribution of Hausa *koko* to their health. A cross-sectional study was adopted because the study involved different group of people whose data were taken at a specific point in time, and the data was meant for planning a cohort study. The consumer knowledge was assessed among KNUST populace only. The questions were grouped under respondents' demographics, consumption level, knowledge of health benefits and nutritional composition, and quality and safety concerns of Hausa *koko*. Prior to the conduct of the survey, the questionnaire items were pretested using 30 respondents to check its validity or accuracy for the study. Exactly 202 respondents were obtained as established by Geopoll (an online sample size calculator) as the required sample size considering the population of 75000, population proportion (15%), margin of error (5%) and confidence level of 95%.

Quantification of ingredients and traditional methods for preparing Hausa *koko*

Information on the quantities of Hausa *koko* ingredients and its preparation methods were accessed with the aid of a self-developed well-structured questionnaire, which was pretested using 5 respondents via interview. A total of 33 Hausa *koko* processors were recruited from the four communities or study areas using the snow ball method. Consent was obtained from participants before the interview. Demographic information of processors, the major and minor ingredients used as well as the methods of preparation

Consumer Knowledge and Preparation Methods of Hausa Koko

of Hausa *koko* formed the key components of the questionnaire. Quantities of ingredients used by the processors for preparing Hausa *koko* were measured using a weighing balance (Mettler Toledo 104T, UK). Process flow for the preparation of the porridge was also recorded for each processor.

Statistical analysis

Microsoft Excel 2013 was used for descriptive statistical analysis (mean, frequency, minimum and maximum values) of the data. Consumer perception on health benefits of Hausa *koko* was presented as percentages. Quantities of the ingredients were presented as minimum, maximum and average.

RESULTS AND DISCUSSION

Consumer knowledge about the nutritional and health benefits of Hausa *koko*

About 58% of the respondents were females whilst 42% were males (Table 1), and the disparity in gender composition may be due to high interest or concern of females in meeting the food needs of their families and themselves (Wang *et al.*, 2014; Holmboe-Ottesen *et al.*, 1988). The age of the respondents ranged from 18-50 years with majority (80%) falling within 18 to 30 years, a finding similar to Haleegoah *et al.* (2016). Having a considerable amount of the respondents in the age brackets of 18-30 is a true reflection of the target population and suggestive of market opportunity for Hausa *koko* vending targeting young people in our tertiary institutions. A greater number of the respondents (89%) were at the tertiary level of their education and were single (90%). The study area (within the environs of a university) and mode of data collection (online platforms) might account for the majority been single and below 30 years of age, since in such

communities most of the inhabitants are young people receiving tertiary education. It is expected that the high educational level of the respondent would reflect in their knowledge base regarding the nutritional composition and health benefits of Hausa *koko*, since a strong correlation between knowledge and food consumption has been revealed (Akyereko *et al.*, 2022).

Table 1. Demographic information of respondents (n= 202)

Characteristics	Respondents (%)
Gender	
Female	57.90
Male	42.10
Age range	
Under 18	0.90
18-30	88.10
31-40	7.40
41-50	2.40
Above 50	0.90
Educational level	
Secondary	7.90
Vocational	2.90
Tertiary	89.10
Marital status	
Single	92.00
Married	6.40
Divorced	0.40
Co-habiting	0.90

Majority of the respondents (92%) consume Hausa *koko*, and usually do so as breakfast (73.76%) (Table 2). About 10% of respondents who consumed Hausa *koko* in the evening, mentioned that it induces or promotes sleep. According to Panwar *et al.* (2016), *millet* contains adequate amount of tryptophan, which exerts positive effect on circadian

pattern and sleep (Bravo *et al.*, 2013). Danson *et al.* (2019) has also demonstrated that the amount of tryptophan in Hausa *koko* can induce drowsiness. This might explain the ability of Hausa *koko* to promote sleep.

Table 2. Consumer knowledge on nutritional composition and health benefits of Hausa koko

Parameter	Respondents (%)
Consumption of Hausa koko	
Yes	92.00
No	8.00
Time of Consumption	
Early morning	73.76
Late morning	16.34
Evening	9.90
Knowledge of nutritional composition	
Yes	46.53
No	53.47
Knowledge of health benefits of Hausa koko	
Yes	30.00
No	70.00

N = 202 respondents

A greater percentage of the respondents had limited knowledge about the nutritional content and the health benefits of *Hausa koko* (Table 2). This finding is in conformity with that of Diako *et al.* (2010), who established that people know much about the cultural attributes of foods than their nutrient and health benefits. Similar studies by Laryea *et al.* (2016) and Wang *et al.* (2014) also revealed that parents decide what children

consume due to family systems and they may sometimes grow up consuming such foods with little or no knowledge about the nutritional content of the food, and this might be the reason for the limited knowledge of respondents on the nutritional content and health benefits of Hausa *koko* since majority of the respondents were young people who are being provided for by their parents.

Respondents (46.5%) who had knowledge of the nutrient composition of Hausa *koko* stated that Hausa *koko* contains minerals, fiber and antioxidants, because it is a millet-based food. On the health benefits of Hausa *koko*, the respondents (30%) stated that cloves and ginger promotes and protects gastrointestinal integrity; millets provide energy; the high fibre can serve as prebiotic, protect against colon cancer, cardiovascular diseases and weight gain; contains phosphorus that aids energy utilization and muscle contractions. The findings from the present research align with Hassan *et al.* (2021) and Yousaf *et al.* (2021), which established that millet-based foods contain antioxidants and nutrients such as magnesium, calcium and fiber, which play significant roles in human health and development.

Hausa *koko* is a highly patronized food in Ghana but consumers are concerned with the safety and quality during preparation and serving. Respondents reported that there is low adherence to food safety practices. Haleegoah *et al.* (2020) attributed these safety and quality challenges to the low educational levels of vendors, making them ignorant of providing safe food for public consumption, as well as their unwillingness to change. The respondents recommended that vendors of Hausa *koko* should wear hand gloves while dishing food, use raw materials of good quality, cook with clean utensils and serve foods in clean environments. This also presents opportunity for educators and well-meaning Ghanaians or stakeholders to provide some form of training on food quality and safety management to the vendors. The consumers want consistency in the taste of Hausa *koko* and this might necessitate the

development of an instant value-added Hausa koko powder, which would provide nutritious, safe and consistent taste for consumers.

Ingredients and their quantities, and preparation methods of Hausa koko

The demographic data of the processors showed that females, within the economically active age bracket of 18-50, dominated the Hausa koko trade (Table 3). This is in agreement with Lues *et al.* (2006) and Yahaya *et al.* (2018) who discovered that street food vending is a common source of income for women in developing countries, and these women are frequently business owners and employers. More than 80% of the processors hailed from the northern part of Ghana (Northern and Upper East regions) with only 15% from the Ashanti region. This confirms the assertion that Hausa koko is a traditional food native to inhabitants of Northern Ghana (Danson *et al.*, 2019). Interestingly, 70% of

the Hausa koko processors had attained some form of education, at least basic education whilst only 30% lacked formal education (Table 3), and this may have positive bearing in terms of hygiene practices in the way they prepare the food. Also, the number of educated people in the business is promising as provision of training program on food quality and safety practices to such people or processors would be effective and easily assimilated. This result is contrary to other studies that reported lower educational level of street food vendors and their reluctance to adapt to sustainable and safe processing techniques for the provision of safe foods for public consumption (Samapundo *et al.*, 2015; Haleegoah *et al.*, 2020; Nkosi & Tabit, 2021). In effect, it will be very necessary for training institutions or concerned stakeholders to provide Hausa koko processors with education on food hygiene and safety practices for a sustained business and consumer protection.

Table 3. Demographic information of Hausa koko processors

Characteristics		Percentage(%)
Gender	Female	100
Age	18-30	27
	31-40	27
	41-50	46
Level of education	None	30
	Basic	52
	Secondary	15
	Tertiary	3
Community	In and around KNUST	64
	Ayigya	21
	Aboabo	15
Hometown Region	Northern	76
	Upper East	9
	Ashanti	15
Marital status	Single	85
	Married	15

Note: In and around KNUST refers to processors in KNUST campus, and immediate environs of Bomso and Ayeduase

The ingredients (Fig. 1) and the proportions (Table 4) of each used for the preparation of Hausa *koko* were revealed by the processors. Pearl millet was identified as the major ingredient used by most of the processors (94%) for Hausa *koko* preparation, though some processors (6%) use sorghum (Fig. 1), and this outcome reflects the findings of Lei and Jakobsen (2004). The average quantity of millet used for Hausa *koko* preparation among the vendors was 96.28%, with maximum and minimum proportions being 98.6% and 85.4% respectively. Haleegoah *et al.* (2016) reported that some processors use sorghum instead of pearl millet as their major ingredient. Both

major ingredients are cereal grains which are rich in nutrients such as carbohydrates, proteins, minerals (iron, zinc, calcium, copper, magnesium and potassium) and dietary fibre for human growth and development (Sabuz *et al.*, 2023; Tripathi *et al.*, 2021; Abah *et al.*, 2020; Amadou *et al.*, 2013). None of the respondents reported using corn dough as part of their ingredients due to the availability of millet (principal ingredient) and product quality, which contradicts the results of Haleegoah *et al.* (2016) who identified the use of corn dough as supplement in Hausa *koko* preparation among some vendors due to high cost of millet during the lean season.

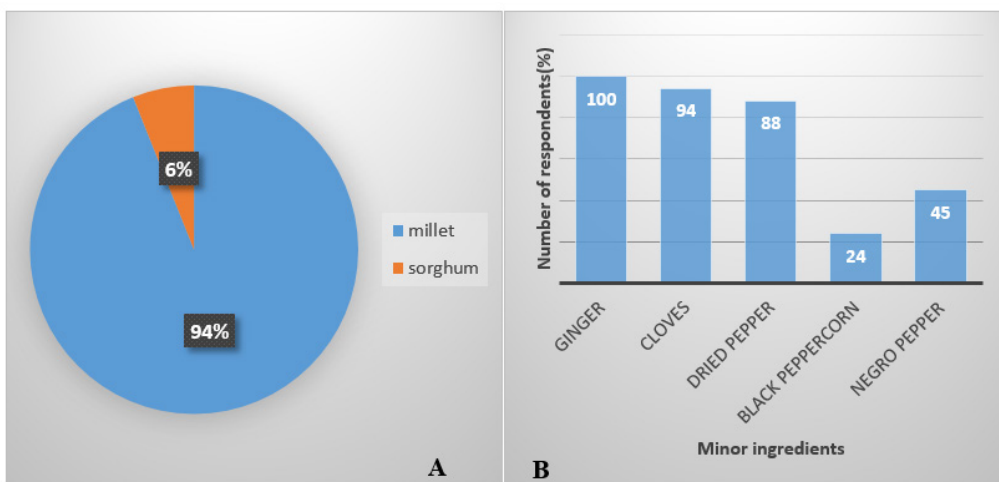


Fig 1. Major (A) and minor (B) ingredients used by vendors in the preparation of Hausa koko

Spices are the minor ingredients used with millet for the preparation of the porridge (Lei & Jakobsen, 2004; Haleegoah *et al.*, 2016). All the respondents (100%), in the preparation of the porridge, used ginger (Fig. 1), with the minimum and average quantities being 0.20% and 2.55% respectively (Table 4). Only one processor used 10% of ginger during meal preparation; for the majority, the range was 0.2-3%. Out of the 33 respondents, 94% of them used cloves, 88% use dried pepper/chili, 24% used black pepper (peppercorn) and 45% used Negro/African pepper for

the preparation of the porridge (Fig. 1). The average amount of dried pepper used accounted for 0.36% of the total ingredient weight (dry basis) with a maximum of 1.46%. The quantities for cloves were similar to that of dried red pepper/chili (Table 4). The processors reported that they use these spices to enrich the porridge's taste and improve health. The indigenous use of these spices in managing and treating health conditions or as part of indigenous drug formulations/preparations might have accounted for this knowledge even among processors with

lower educational levels. These spices are functional ingredients usually consumed in smaller quantities that confer a lot of health benefits. Ginger (*Zingiber officinale Roscoe*) is a rich source of phytochemicals and is used traditionally for managing pain, nausea, cold and vomiting (Li *et al.*, 2019). It is protective against tumours, fever, platelet aggregation, hyperglycaemia, and has antioxidant and carminative effect (Shahrajabian *et al.*, 2019). Cloves (*Syzygium aromaticum*); a traditional spice, rich in phytochemicals, has analgesic, antispasmodic and anti-depressant properties. It has higher antioxidant and antimicrobial activity than numerous fruits, vegetables and other spices (Cortés-Rojas *et al.*, 2014; Trifan *et al.*, 2021; El-Saber *et al.*, 2020). Red pepper/chili (*capsicum*) is one of the most commonly used spices globally. It contains a good amount of provitamin A/carotenoids, vitamins C, E, and phenolic compounds. Pepper has antioxidant, antimicrobial, immune modulatory, anti-obesogenic and anorexic effects (Elmas & Gezer, 2022; Hernández-Pérez *et al.*, 2020). Black pepper (*Piper Nigrum L.*) has antioxidant, gastro-protective, anti-lipedemic and antimicrobial components, owing to its major active component, *piperine* (Jiang, 2019). It has been employed in the

treatment of respiratory conditions such as asthma and cold; digestive disorders such as chronic indigestion and diarrhea (Abukawsar *et al.*, 2018). Negro/African pepper/grains of *Selim* (*Xylopi aethiopic a*) is a spice widely used in African cuisines. Its rich bioactive compounds (alkaloids, saponins, sterols, tannins, glycosides) are responsible for its anti-inflammatory, antidepressant, sedative and hypoglycemic properties (Mohammed *et al.*, 2016; Osafo *et al.*, 2018; Biney *et al.*, 2016; Biney *et al.*, 2014). The African pepper has therefore found application in the traditional management of inflammation (asthma, bronchitis, arthritis) and pain (Biney *et al.*, 2016). Consequently, the use of these spices in this commonly vended street food can serve as a healthier food option, other than its nutrient-dense major ingredients. The proportions of ingredients used in the preparation of Hausa koko would have considerable effect on the nutritional value, energy content, organoleptic properties and the health benefits it will offer the consumers since quantities of ingredients used in food preparation have been showed to affect the product qualities and its contribution to health (Haslam *et al.*, 2020).

Table 4. Proportion of ingredients used for Hausa koko preparation

Ingredient	Proportions (%)		
	Minimum	Maximum	Mean ± SD
Pearl Millet	85.40	98.60	96.28 ± 3.96
Ginger	0.20	10.12	2.55 ± 2.80
Dried Pepper/chili	0.19	1.46	0.36 ± 0.39
Cloves	0.19	1.39	0.38 ± 0.37
Black Peppercorn	0	1.59	0.24 ± 0.49
Negro Pepper	0	0.23	0.02 ± 0.07

All the processors stated that the amount of the spices usually added depend on the quantity of millet used, and consumers' preferences. Addition of lower quantities of

ginger and pepper (Table 4) to Hausa koko is a strategy to reduce its spiciness since it is being consumed by people of all ages, including infants on complementary feeding

and children. The major and minor ingredients used in Hausa *koko* preparation as revealed by the respondents are in accordance with those reported by (Lei & Jacobsen, 2004). Trade secrets of processors arose from the differences in the quantity of spices used and addition of other spices.

Two main traditional methods were identified. For both processing methods, the preparation starts 3 days ahead of the day the porridge will be served. The flow chart for the preparation of Hausa *koko* used by 76% of the processors was captured (Fig. 2).

Methods of Hausa *Koko* Preparation

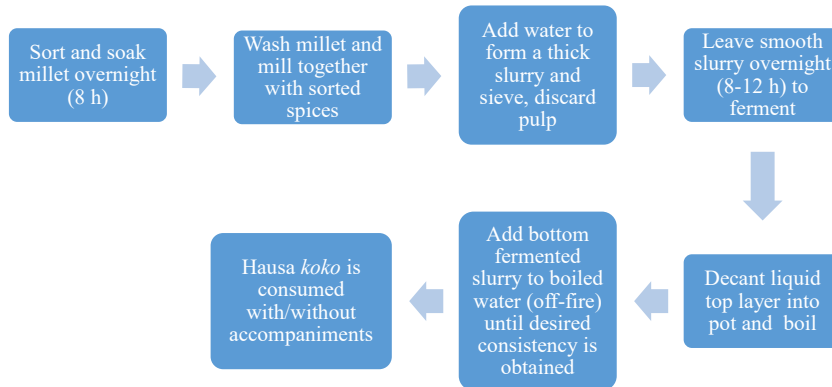


Fig 2. Flow Chart for Hausa *koko* preparation

The millet or sorghum is first sorted to remove damaged grains, foreign materials such as stones and other unwanted materials, before washing with water for three times to remove dirt. The millet is then soaked and left overnight (about 8 h) to soften, and the water is drained off. According to Hotz and Gibson (2001), soaking of millets reduces the content of phytic acid, which impairs the absorption of essential minerals like iron, zinc, and calcium; and enhances the digestibility of the millets. In addition, nutrients that would have been lost through prolonged cooking time are maintained, owing to soaking (Zamindar *et al.*, 2016; Kumari *et al.*, 2015). Nonetheless, steeping has also been found to reduce the mineral content due to the leaching of the minerals into the steeped water, which is mostly discarded (Traoré *et al.*, 2004).

The millet together with the spices (ginger, dried pepper and cloves) are milled into a

dough. Water is added to the millet-spice dough to make a thick slurry/solution. The slurry/solution is sieved through a clean cloth to remove the chaff. The smooth slurry/solution is then left overnight (8-12 h) to ferment. Fermentation is an ancient and commonly used method of processing cereals including sorghum and millets. Millets generally have poor digestibility and low bioavailability of minerals (Bhuvaneshwari *et al.*, 2020). Increasing fermentation time increases mineral bioavailability, protein digestibility (El Hag *et al.*, 2002), with a reduction in anti-nutritional components (phytic acid) (Mohamed *et al.*, 2007) and carbohydrates (Achi & Asamudo, 2019). Thus, fermentation is used to improve the nutritional quality of cereals by increasing mineral content and digestibility. The fermentation process might also render this food as a

probiotic food source for the protection of the gastrointestinal tract (Achi & Asamudo, 2019).

The final stage of the preparation involves cooking of the Hausa *koko*. During this process, water from the fermented slurry, also known as '*koko* sour water' is decanted from the fermented slurry. Potable water (depending on the quantity of the slurry) is added to the decanted sour water, heated to boiling point and removed from fire. The fermented millet slurry/solution is added, a little at a time while stirring, until it is cooked and has reached the desired consistency. Addition of the fermented millet-spices slurry to boiled water off fire is done to prevent over cooking of the porridge, this is because of the short cooking time of pearl millet. This process of cooking takes about 20 to 30 min depending on the quantity of millet. The processors also reported that, sometimes, the desired thickness is not achieved off fire. When this happens, they are compelled to cook the porridge on fire until the desired thickness is attained and they claimed the cooking on fire does not affect the taste. Processors who use sorghum as their major ingredient employed this method for their meal preparation.

The other method used by some processors (24%) is similar to what was described above and mostly used by the majority. The only difference is that, the spices are not milled with all the soaked millet. After sorting and soaking, a portion of the millet (about one quarter) is milled with the spices, and the remaining portion of the millet is milled separately. The different millet flours are made into slurry (with water), sieved and fermented separately for 8-12 h. The supernatant is decanted, mixed with potable water and boiled. From here, the process follows that described by the majority (Fig. 2). The processors who use this method reported that, though the quantities of spices are smaller, they are able to taste the spices better than the others who do not use this method. This might be a reason for

the inconsistencies in the sensorial property (spiciness) of the porridge, and therefore requires recipe standardization to get consistent taste.

CONCLUSION

Hausa *koko* is a cheap food source with high patronage, especially among the youth, but knowledge on its nutritional and health benefits are low. Most consumers are not aware of the ingredients used in the meal preparation as well as the nutritional implications it can have on health. The major ingredients used for the preparation are pearl millet with spices such as ginger, cloves and dried red chili/pepper. Two main traditional preparation methods were identified from the processors, and the amount of water and spices added depends on the quantity of millet. Trade secrets (quantity and choice of spices, and amount of water) are responsible for the variations in the sensory properties of the porridge. It is recommended that the recipe should be standardized in terms of ingredients quantification and preparation method, as this meal is a nutritious meal with a potential for curbing malnutrition if the appropriate accompaniment is added and this could promote millet utilization amidst food and nutrition security.

DATA AVAILABILITY

Data can be obtained from the corresponding author upon request.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ROLE OF THE FUNDING SOURCE

The study did not receive any external funding.

AUTHORSHIP CONTRIBUTION

Francisca Charlotte Korley, Esther Naa Lamptey and Abena Amoakoa Nkansah: conduct of research, field data collection and analysis, Georgina Benewaa Yeboah: conceptualization and drafting of manuscript, Yaw Gyau Akyereko: conceptualization and proofreading of manuscript, and Faustina Dufie Wireko-Manu: conceptualization, supervision and editing of manuscript.

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Consumer Knowledge and Preparation Methods of Hausa Koko

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Consumer Knowledge and Preparation Methods of Hausa Koko

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