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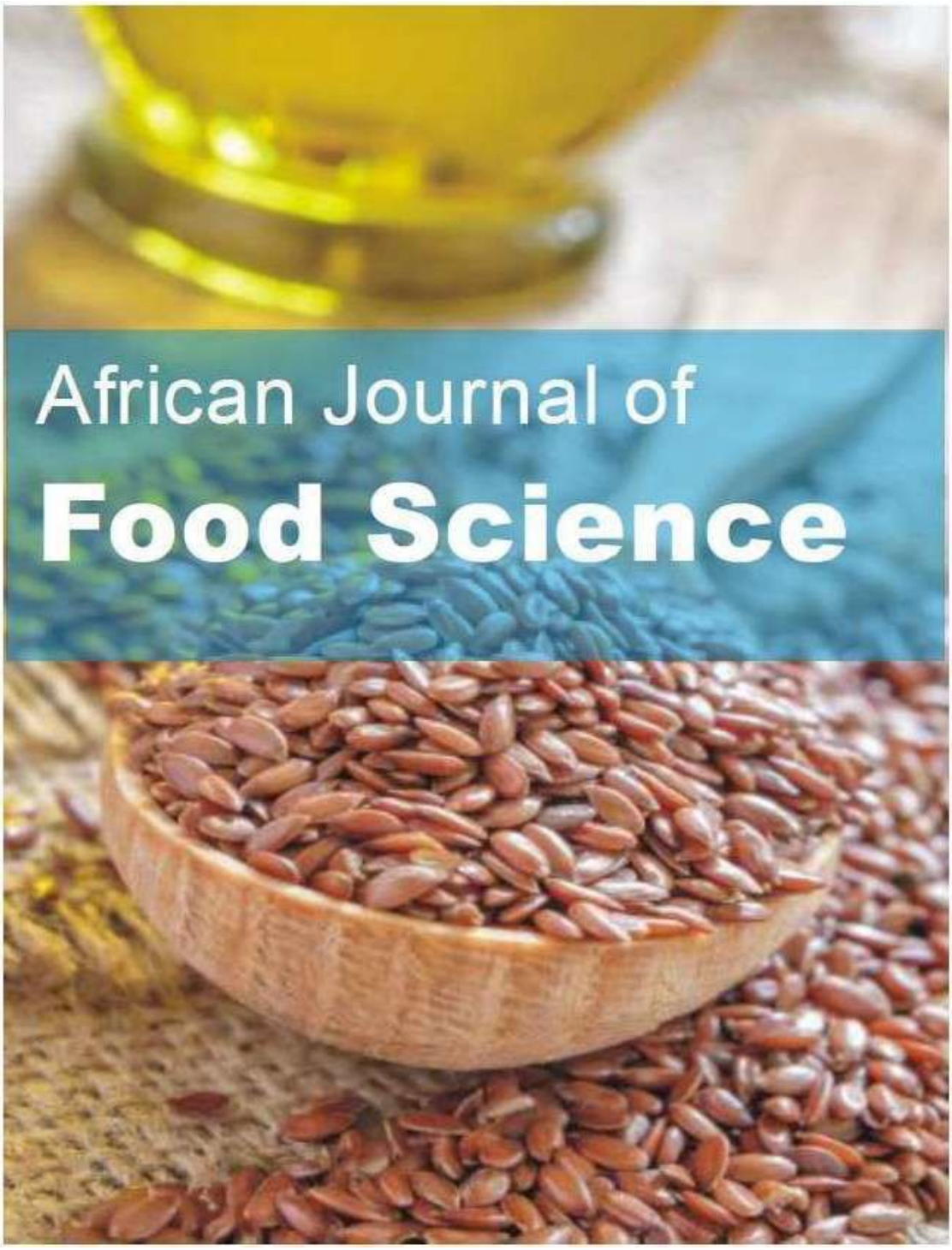

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African Journal of Food Science

Full Length Research Paper

Use of cooking salt in school meal preparation and quality control practices among food vendors engaged in the national home-grown school feeding programme in Southwest Nigeria

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The study was aimed at investigating practice relating to use of cooking salt in school meal preparation and quality control practices among Food Vendors (FVs) engaged in National Home-Grown School Feeding Programme (NHGSFP) in public primary schools located in Oyo and Ogun States, Southwest Nigeria. An exploratory qualitative study was conducted among 40 selected FVs engaged in NHGSFP in the two States. Data were collected using a pretested Key Informant Interview guide. Interviews were subjected to thematic content analysis. Findings reveal that several FVs usually used packaged cooking salt, while some preferred unpackaged cooking salt sold in open plastic containers. The use of salt combined with other forms of food seasonings including bouillon cubes was a common practice among FVs. Practices they often employed to determine quantity of salt included 'gradual adding of salt to taste', use of bare-hands to add salt and 'use of visual measure to gauge the added salt'. Some FVs usually salvaged meals containing excessive salt, especially rice by adding water and sieving it afterwards. An appropriate nutrition education intervention, which encourages use of packaged dietary salt by FVs as well as graduated measuring spoon to quantify the amount of salt added to school meals is suggested.

Key words: Food vendors; school meals; national home-grown school feeding programme; use of cooking salt control, use of condiments; Southwest Nigeria.

INTRODUCTION

Food preparation requires basic skills to ensure food quality and utmost safety (Benn and Carlsson, 2014). Along this line, food vendors are required to undergo training for skills acquisition that will enhance their

competence in the food preparation (Choudhury et al., 2011). In some instances, local food vendors may not undergo formal training before practicing, which can affect the quality of food prepared in terms of the standard and even health benefits of consumers (Raji et al., 2021). Good nutrition practices contribute to one of the cardinal principles that established the National Home-Grown School Feeding Programme (NHGSFP), which aims to meet the needs of pupils; through the provision of healthy and safe food (Ayoola, 2014; African Union, 2021). In addition, the quality meals in terms of the nutrient and salt content should be of concern. Studies have shown that food handlers' behaviour has an important influence on contamination and can reduce the quality of the final products (Da Cunha et al., 2012, 2013; Ansari-Lari et al., 2010).

In most instances, the quality of prepared foods is considered from the narrow perspective of microbial contamination, with little insight into the sodium content, excess of which is highly detrimental to health (Hunter et al., 2022). Clinical and epidemiological studies have established strong evidence of the link between excessive salt consumption and several chronic diseases (Aminde et al., 2021; Brown, 2022) including hypertension among children (He et al., 2008; Daini and Ajayi, 2018). The World Health Organization (WHO) recommends an intake of less than 5 g/day (WHO, 2012) to prevent hypertension. It is possible that many food vendors, especially those in charge of school meals may not be knowledgeable about this WHO's standard and much less practice it. In Nigeria, many food vendors learn the trade from their parents or by apprenticeship whereby traditional practices of cooking is employed (Akinbule et al, 2019; Ibrahim et al, 2021). While some of these practices are wholesome, some, especially with regards to use of salt in excess as well as use of salt in combination with various food seasonings such as monosodium glutamate, and other additives cited by Ikuomola and Airhihenbuwa (2021) is detrimental to health. There is dearth of literature information on what guides the food vendors' use of cooking salt in preparing school meals.

Outdoor food consumption, including school meals is one of the major sources of sodium intake (Jessen et al., 2022). Therefore, it is imperative to engage school food vendors in the quest to control high sodium intake among the populace, especially children as engaging in consumption in excess at early age could result in hypertension in later years (He et al., 2008; Daini and Ajayi, 2018). There are many ways to stem the use of excessive cooking salt by food vendors. In the case of school meal, providing training to school vendors and quality check by dedicating someone to inspect meals (by tasting) before being served to pupils would help to check the food vendors' excessive use of cooking salt (WHO, 2016).

Furthermore, the level of interaction between health professionals and food vendors is not well documented as regards the standardization of salt content of served school meals in line with the recommended daily intake by WHO. This has revealed some gaps in the available potentials to simultaneously promote good health and avoid dissatisfaction among consumers. There is, thus, the need to explore the practices and behaviours that could assist in formulating interventions with the potentials to reduce salt use and consumption (Geaney et al., 2011). Therefore, this study was aimed at investigating qualitatively the use of cooking salt in school meal preparation and quality control among food vendors engaged in the National Home-Grown School feeding programme in Southwest Nigeria.

METHODS

Study setting

The study was carried out in 2021 in two selected states, Oyo and Ogun States in South West Nigeria (Figure 1). Both neighbouring states are mainly inhabited by the Yoruba ethnic group. Inhabitants in both states are majorly agrarians. Other occupations residents of the states engage in craftmanship, trading and working in public service (Adegoke and Jegede, 2016).

Oyo State has its headquarters in Ibadan and lies between latitude 7°51′9.25″N and longitude 3°55′52.5″E with 33 Local Government Areas (LGAs). It covers an area of 28,454 km^2 with a projected population of 7,377,170 at the time of this study in 2021 (NPC and ICF, 2019). Ogun State on the other hand lies between latitude 6°54′35.3988″N and longitude 3°15′30.1068″E, it has its headquarters in Abeokuta with 20 LGAs. Ogun State has a land mass of 16,980.55 km^2 with a projected population of 6,153,869 as at 2021 (NPC and ICF, 2019).

Data from the last Nigerian Demography and Health Survey reported 68.0 and 72.4% primary school attendance rates for Oyo State and Ogun States respectively (NPC and ICF, 2019). Accordingly, the projected numbers of pupils in public primary schools in Oyo and Ogun States for the year 2021 were put at 506,348 and 460,064 respectively (Gambo and Adelokun, 2020).

The NHGSFP scheme, which mainly targets pupils in classes one to three took off in both Oyo and Ogun States in January 2017 across 2,408 and 1,510 public primary schools in Oyo and Ogun states respectively (Civil Society Action Coalition on Education for All, 2018; Action Health Incorporated; 2020). It was reported that through the NHGSFP 2,779 and 2,578 direct jobs were created for women to work as food vendors in Ogun and Oyo State, respectively. (Civil Society Action Coalition on Education for All, 2018; Action Health Incorporated, 2020).

Study design, population and sampling process

An exploratory qualitative study involving key informant interviews

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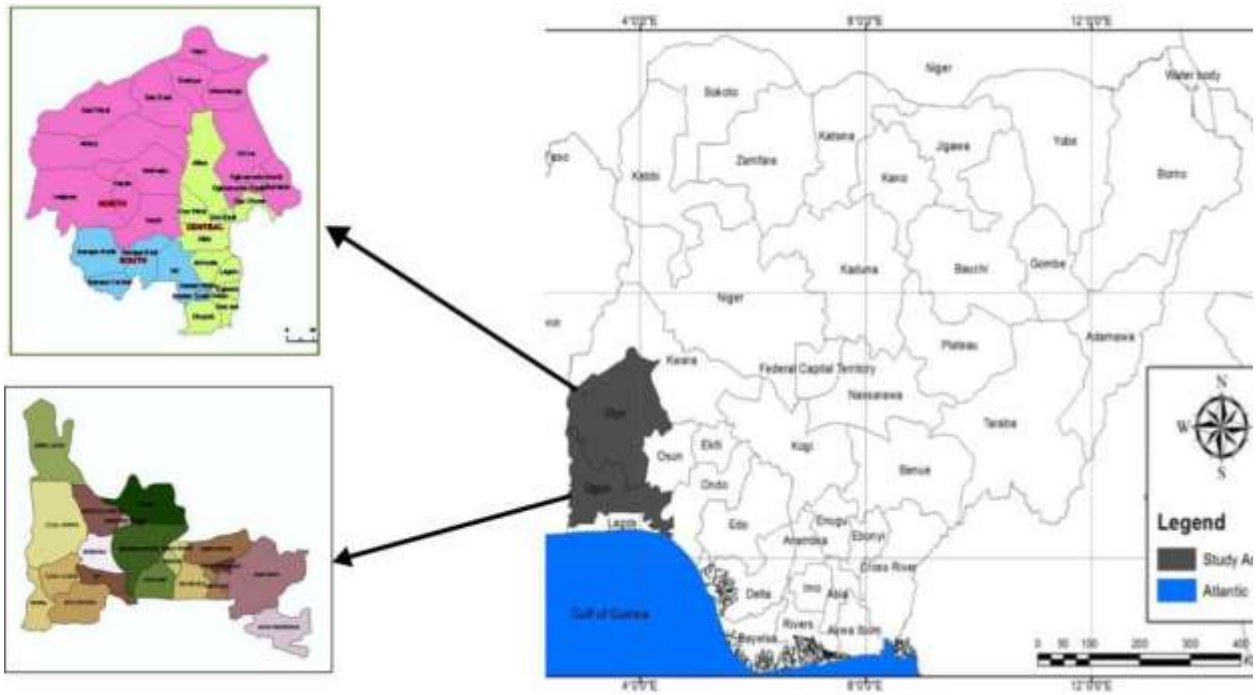

Figure 1. Map of the study area
Source: Nigerian Muse, 2010; Olayinka, 2016

(KIIs) was conducted among food vendors engaged in NHGSFP in Oyo and Ogun States. The interviews were conducted among 40 food vendors (with 20 food vendors in each of states) who were selected from various public primary schools engaged in the NHGSFP in Oyo and Ogun States. Efforts were made to achieve geographical dispersal of interviewees across the various local government areas for holistic views and presentation. The number of food vendors interviewed was decided based on saturation, which is commonly used to determine sample sizes in qualitative research (Hennink et al., 2019).

Data collection instrument, method and process

The food vendors were interviewed using a validated researcher-designed KII guide. The data collection instrument and procedures were pretested for adequacy and consistency prior to the main study. Quality control practices involving use of cooking salt in preparation of school meals was operationally defined in terms of the quality of the cooking salt being used by the food vendors, processes involved in using the salt, which include tasting the salt content of the meal and what the food vendors would do if the school meal prepared is found to be salty. These indicators of quality control are very germane; as lack of effective food quality control practices and proper school meal preparation practices can culminate in food-related non-communicable diseases.

The main sections of the KII guide included the type of cooking salt used in preparing school meals, the use of other forms of food seasonings apart from salt, how the quantity of cooking salt used is determined, methods used to eliminate excess salt when too much cooking salt is accidentally added in the meals during preparation, and checking of the salt content of the school meal before pupils are served. The instrument was initially designed in English language and later forward-back translated into the Yoruba language version.

Twenty research assistants comprising males and females were recruited and trained for data collection in each of the States. The research assistants were all graduates with previous experiences in qualitative research and were proficient in both Yoruba and English languages. They were taken through a 6-h intensive training in each of the study sites with a focus on the study objective, data collection instrument and method. In addition, practical sessions on interviewing skills, note-taking and transcription of recordings were held. Each KII, which entailed asking open-ended questions, was conducted one-on-one in a place and time of interviewee's choice by a pair of research assistants. While one research assistant served as moderator, another was responsible for note-taking, observing and documenting the interview processes and non-verbal cues of the interviewee.

Before the commencement of the interviews, the objectives and nature of the study were explained to the interviewees. The interviewees were assured of anonymity and confidentiality of the data, and their permission was obtained to use audio-tape recorder during the interviews. The interviews were conducted either in quiet environment within the school premises where participants supply school meals after school closing hours or in other convenient places within their communities, where their privacy was guaranteed. The interviewers were open-minded, polite and emphasized the voluntary nature of the interviews. Notably, the interviewers had no prior personal relationship with the interviewees. Each interview lasted an average of 50 min. The interviews were held to the point of saturation, using open-ended questions to elicit more responses.

Prior to the data collection, the instrument was pre-tested in both States among three food vendors drawn from outside the LGAs/communities selected for the main study. Apart from pre-testing the instrument, constant debriefing on the field and monitoring of the data collection process by the field supervisors and project team members were part of the strategies employed to ensure quality data collection.

Figure 2. Sample of unpackaged and packaged salt. Source Authors

Data analysis

The data analysis started with the verbatim transcription of the KII recordings, which was done daily at the end of the field work by the interviewers to avoid losing or omitting important details. Additionally, the interviews that were conducted in Yoruba were subjected to forward-back translation to English to ascertain quality transcripts. All the English versions of the transcribed notes were audited and validated by two field supervisors and a data analyst. The validated transcribed notes were entered into the computer using NVIVO version 12 Pro. Inductive-dominant coding approach was employed to facilitate the coding process (Armat et al., 2018). Primary and secondary codes were generated based on the content of the data. The codes were linked appropriately to the corresponding quotations. The generated codes and the quotations were reviewed and critiqued carefully by the data analyst and by two other experienced qualitative experts. Having memos linked to appropriate codes and quotations as well as keeping of reflexive diaries were part of the strategies used to enhance the trustworthiness and quality assurance of the coded data.

Thematic content analysis was performed. Generated themes were guided by the (a) content of the study instrument (b) sample quotes from transcripts and (c) peer review and reflections (contributions from members of the research team). Following the step-by-step approach of thematic analysis identified by Nowell et al. (2017), the verbatim transcript of each interviewee was carefully read and examined theme by theme and thereafter compared with that of other interviewees to identify relevant texts, similar words and phrases as well as divergent opinions. For each theme, common and peculiar trends as well as similar and divergent opinions were noted. Themes were developed and revised iteratively. Finally, a summary of findings was written in narratives and supported by appropriate verbatim quotes.

Ethical considerations

Ethical approvals for the study were obtained from the Oyo State Ministry of Health Ethics Review Committee (AD 13/479/1645^{B}) and Ogun State Ministry of Health Ethics Review Committee (HPRS/381/332). The research was conducted in accordance with the World Medical Association Declaration of Helsinki (World Medical Assembly, 2000) as well as the provisions of the National Code of Health Research Ethics in Nigeria (National Health Research Ethics Committee of Nigeria, 2007). The study participants were given adequate information on the study, and those who agreed to participate in the study signed a written consent form. Confidentiality was maintained and accesses to data were restricted to only research team members. The data set was de-identified to ensure privacy.

RESULTS

Type of cooking salt used in preparing school meals

More than two-third of the food vendors involved in the KIIs in both States affirmed that they usually made use of well-packaged sachet salt for cooking school meals (Figure 2). The Majority of food vendors specifically mentioned that they usually used a particular brand of sachet salt (‘Salt A’- name of brand withheld). Some other brands of sachet or packaged salts (Salt B and C) were also mentioned (names of brands withheld). The reason many of the food vendors gave for not using unpackaged salt for preparing school meals was that it is exposed to flies and contaminants. One of the participants emphatically opined that apart from unpackaged salt being cheaper than sachet salt, some of them ‘looked rocky’ (congealed) and made soup to taste salty after a while after cooking (Figure 2). Another participant also mentioned that she refrained from using unpackaged salt because she learned that unpackaged salt makes people to develop goiter. The food vendors commonly referred to sachet salt as ‘the good cooking salt’ and the ‘unpackaged salt’ as the ‘ordinary cooking salt being sold in uncovered bowls in the market’.

…. salt that is packaged inside nylon is what I buy and pour into a covered plastic container (KII participant 19

Odogbolu Ogun State).
….there is some salts that look rocky, they are sold in congos (a local measure to sell food stuff), I do not use it. I use the one in Sachet (KII 9 Kudeti Ibadan Oyo State).
The unpackaged salt is cheaper but i do not use it. The reason I don't use it is that they said when the soup is almost finished, it always tastes salty when eating; which is why I don't use it (KII 9 Kudeti Ibadan Oyo State).
I don't use unpackaged salt because it is government food I cook and will not be proper to buy salt that that are sold in open bowls in the market; that houseflies already perched on (KII 15 Lalupon Ibadan Oyo State).
I usually buy the salt in sachet but if we don't see we go for the ordinary one measured in "congo" (KII 11 Iseyin Oyo State).
I use the salt that is in a sachet because they said the other type of salt gives people goitre. I don't know book so I don't know the name of it (KII participant 10 Ipokia Ogun State).

A few of the food vendors admitted that they preferred to use unpackaged salt usually measured with measuring bowl (congo). The reason given by one of these interviewees for the use of unpackaged salt was that '…sachet salt is too salty' (KII participant 16 Abeokuta North Ogun State).

Use of other forms of food seasonings

Most of the food vendors interviewed admitted that they usually use other forms of food seasonings in addition to cooking salt in preparing school meals. The commonly mentioned seasonings used in addition to salt in preparing the school meals included bouillon or stock cubes (the brand names are withheld), spices mentioned included curry powder, dried thyme, ginger, garlic, and grounded crayfish. However, some of the food vendors disclosed that in place of seasonings like 'bouillon cubes' they use fermented locust beans ("*iru"*) or fermented sesame seed or melon seed ("*ogiri"*) and onions in preparing their school meals in adherence to the pre-employment training they had.

For instance, on the days we cook jollof-rice, we use tomato paste, spices curry and thyme, butter, onions, reasonable amount of bouillon cubes, salt, and palm-oil. Because we also eat from the food we prepare for the children, we can't give them "poison" (unwholesome meals capable of causing bodily harms) (KII 15 Lalupon Ibadan Oyo State).
We use bouillon cubes of different types and locust bean (Iru). We use bouillon cubes brands we perceived are not harmful (KII 18 Omi-Adio Ibadan Oyo State).
When I cook, I add a little salt just in moderation to the food and stir, and then I taste it and add bouillon cubes. If it is still not tasty enough, then I add a little more salt to the food. I also use different brands of bouillon especially when cooking jollof rice, I use that one that comes in double cubes something called chicken something…(KII 1 Iseyin Oyo State).
Other food seasoning for cooking like bouillon cubes are used minimally, sometimes when I want to cook vegetable, I use locust beans, for "ifoko/ikokore" (water yam porridge) I use ogiri and add fish(KII participant 19 Odogbolu Ogun State).
For me, I do not use bouillon cubes to cook; I will just add onion in the meat am boiling that is all (KII participant 7 Odogbolu Ogun State).

Practices relating to how the quantity of cooking salt used was determined

Many participants mentioned that they had a measuring spoon, commonly a teaspoon that they usually used to measure salt for school meal preparation. The participants usually kept the spoons they used for measuring salt in the containers being earmarked for keeping salt. Few of the participants in each of Oyo and Ogun States explained they gradually added salt to taste when preparing school meals. Some food vendors admitted that they did not have any specific measurement or measuring spoon for determining the quantity of the salt they used. Several food vendors disclosed that they just relied on their experience and initiative in determining the amount of salt they added to the school meals they prepared.

Few participants mentioned they used their hands to measure the salt they added to the school meals prepared. Moreso, two participants unequivocally attested that they usually used their eyes to gauge the amount of salt that they used their hands to scoop into the meals. There was an instance where one particular participant disclosed that she relied on mere aroma of school meals she cooks to ascertain the adequacy of salt during food preparation.

I use the spoon to measure it, and I already know the right measurement to use so that the salt won't be too much (KII participant 12 Ado-Odo Ota Ogun State).
I pour it in a spoon. I use the spoon to measure and put it in the food and whenever it is not enough, I add more to it. I don't use my hand to measure (KII participant 2 Sagamu Ogun State).
I don't pour or even use my eyes to determine the amount to add, there is a spoon inside my salt that is what I use and the amount depend on the quantity of food too (KII 12 Lalupon Oyo State) .
We will first add small salt and check the taste if it's enough we stop it and of it's not enough we add little to it not that we add salt at once (KII participant 9 Ipokia Ogun State).
…even my mother is a caterer and we do not taste food,

it is from the aroma we know if the food has enough salt and seasoning (KII 9 Kudeti Ibadan Oyo State).

Practices usually engaged to reduce salt in food if too much cooking salt was accidentally added while preparing school meals

Most of the food vendors interviewed mentioned they had never experienced a situation where too much cooking salt was accidentally added to the school meals they prepared. They emphasized that they usually added moderate salt to the meals they prepared. A number of the participants admitted that if they accidentally added too much salt into the school meals, especially rice or beans, they would add more water to the salty food and pour the food in a sieve or strainer to reduce the salt content of the food. Some participants disclosed that what they do to salvage stew if they had accidentally added too much salt is to add some fresh uncooked ingredients (grinded tomato and pepper) without salt to the stew with the excess salt. Some KII participants mentioned there were instances they simply threw the food away, especially if jollof rice and cooked another for the pupils.

I won't bring it to school, I will inform the coordinator and I will make sure I cook another and bring it to school before school meal time (12noon). But it has never happened to me before (KII participant 12 Ado-Odo Ota Ogun State).
If it is stew, I will add more ingredients (grinded tomato and pepper) and if it is rice, I will add water and turn it into sieve (KII participant 7 Odogbolu Ogun State).
No one walks without shaking his or her head, No one is all knowing, no one is above mistake. If I mistakenly put too much salt, I will pour water in it and sieve to reduce the salt (KII participant 15 Sagamu Ogun State).
If it is rice, say jollof rice, I will cook more rice separately without salt and I will add to the cooked salty one and mixed thoroughly (KII 4 Beere Ibadan Oyo State).
There is nothing we will do, because we cannot throw it away. So, when such occur, when we get to the school, we will explain to the person who is the head of the school that this thing occurred… I don't know about another person but for me that is it (KII 17 Iseyin Oyo State).

Practices used to check the quality of school meal as relates to amount of cooking salt

Many of the participants in both States attested there were teachers designated to tasting the school meals brought by vendors before serving the pupils. These were usually the school health officers or health teachers. In addition, few participants mentioned that the head teachers did this occasionally. Several participants acknowledged that school personnel usually tasted the school meals for the saltiness and other quality of meals such as freshness, odours, and colour. Some of the food vendors mentioned that feedback on the tasting was usually given to them. The food vendors affirmed that checking of the school meals by school personnel helped them to control the salt contents of meals and ensured quality of the meals.

The health teacher and sometimes the sanitary inspectors check the cooking salt content of the school meal I prepare before serving the pupils (KII 6 Mokola Ibadan Oyo State).
From the school, they inspect the stew and the food, whether the salt is okay or not. And they do this inspection every day (KII 1 Iseyin Oyo State).
I am rest assured and I can boldly say the quality of my food is good because in that food, I will eat out of it, my children will eat out of it and also the school health teachers will eat out of it. If there is any "comma", they will tell me but I've never had any issue of such (KII 5 Oke-Ado Ibadan Oyo State)
Contrarily, two interviewees reported that no one checked the salt content of the school meals they supplied before serving the pupils.
No one checks the salt content for us o! (KII 20 Ido Ibadan Oyo State).

DISCUSSION

The finding that many food vendors used packaged or sealed cooking salts that were more hygienic and of good nutritional value for preparing school meals is beneficial. Dietary salt that is packaged dry in high-density polyethylene bags and polyethylene laminated bags are recommended for optimal nutritional value (Tsegaye et al., 2016; Ramugondo et al., 2021). The iodine content of the salt remained stable for longer time, and its distribution remained uniform for many months when the salt is packed and kept dry, preferably in a cool place and away from sunlight (Zimmermann et al., 2008). Gebremariam et al. (2013) in their study found that using packed salt was significantly associated with the availability of adequately iodised salt.

Some food vendors preferred the use of unpackaged salts that were usually being displayed openly and measured with bowls in the markets, which is a similar finding of Tsegaye et al. (2016), which is of public health concern. This could be addressed by using one or more combination of behavioural change communication strategies; including training programme and public advocacy as suggested by WHO (2016) for ensuring safe and moderate salt usage. Indeed, unpackaged salts sold in the markets could be salt that is not iodised or industrial salt or salt with deteriorated or reduced iodine

content due to long-term exposure to sunlight, moisture, heat or contaminants as noted in a previous study (Kumma et al., 2018). When iodised salt is not packaged and stored in closed plastic bags, sealed waterproof materials, or closed containers, iodine loss occurs, leading to reduction in the iodine content of salt before it is consumed (Sebotsa et al., 2009). In some instances, industrial salts have been peddled as cooking salt using the open unpackaged way of selling or using the recommended package for cooking salt. The National Agency for Food and Drug Administration and Control (NAFDAC) in Nigeria directed that industrial salt should only be packaged in 50kg but it has been seen to be sold in small sizes as 5kg, 10kg and 20kg recommended for cooking salt (Eagle, 2017). It is advisable that NAFDAC and other regulatory agencies in Nigeria including Standard Organization of Nigeria (SON) ensure strict compliance and monitoring of the quality and standards of cooking salts sold in the Nigerian market.

The use of salt in combination with other forms of food seasonings and spices including salt containing ‘bouillon cubes, ‘curry powder’ and ‘dried thyme’ by vendors could make meals change taste. This practice should be discouraged among food vendors as too many condiments in foods may increase the sodium intake, which may increase the risk of cardiovascular diseases including hypertension (Brown, 2022). Herbs or natural condiments such as locust beans (*iru*) and spicy vegetables including spring onions, carrots as well as meat stock can be used to reduce the need for salt. Food vendors need to learn what combination of flavours tastes well. A randomized controlled study conducted by Dougkas et al. (2019) observed that use of blends of natural herbs and spices instead of salt is a promising approach to reduce salt content in foods and increases legume consumption. Training food vendors on the use of natural spices and spicy vegetables can motivate and empower them to recognize the importance of natural spices and spicy vegetables and adopt them as healthier and safer salt reduction options than seasonings like ‘bouillon cubes, ‘curry powder’ and ‘dried thyme.

The use of spoons for measuring or scooping cooking salts as well as gradual addition of salt to taste was a major practices food vendors used to determine the quantity of cooking salt for the school meals. In addition, some food vendors typically relied on unreliable practices such as using hands to scoop salt to meals, using visual measurement to gauge or measure amount of salt, and using aroma to determine the amount of salt. These afore-mentioned practices are inappropriate for preparing school meal that guarantees adequate salt and prevent meals containing salt above the recommended level of intake of less than 5 g/day (WHO, 2012). Surprisingly none of the food vendors mentioned the practice of weighing salt used for preparing the school meals. The food vendors should be taught about weighing of salt in accordance to the amount recommended in standard recipe as part of ways to control excessive use of cooking salt in food preparation.

The findings revealed some of the ways food vendors salvaged school meals that had too much salt added accidentally. While this could reduce the salt content, it has implications for the quality of the food that would be served.

For instance, the practice of adding water to cooked meals assumed to contain excessive salt and the subsequent draining of the water in a bid to reduce the salt content may lead to some essential nutrients being discarded with the water causing nutrient depletion in the meal. Similarly, the practice of adding some fresh unsalted ingredients (grinded tomatoes and pepper) to already cooked stew with the intent of reducing the salt content could lead to the meals being too peppery, over cooked with nutrient depletion. In addition, foods with hot or too much pepper could pose some potential threats to young children; they could lead to or exacerbate some digestive problems including nausea, vomiting and burning diarrhoea as well as aggravate peptic ulcers (Schultz, 2013; Ada, 2017).

The daily inspection of school meal for salt content by school personnel was a major factor that helped to check food vendors’ use of cooking salts in meals served to the pupils. This is an appropriate practice in line with school nutrition services and should be reinforced in other to discourage the excessive or inappropriate use of cooking salt. It is surprising that some schools did not have this control mechanism in place. Concerted efforts relating to school nutrition services, including food inspections as well as other salt quality assurance and control strategies, need to be put in place in all schools involved in the NHGSFP.

Conclusion

While many food vendors used packaged or sealed cooking salts that are more hygienic and of good nutritional value for preparing school meals, the use of unpackaged or unsealed cooking salts for preparing school meals by few is a cause for concern considering the health implication. Using cooking salts in combination with other forms of condiments is a common practice among the food vendors engaged in NHGSFP, which needs to be addressed through appropriate training. The food vendors rarely practiced the weighing of cooking salt in accordance with recommendation in standard recipe. The use of various unreliable practices such as using hands for scooping and adding salt to meals, using visual for gauging or measuring amount of salt, and using aroma and taste to determine the amount of salt should be discouraged and guidelines should be developed by NHGSFP. Despite the potential benefits of daily inspection or checking of the salt content of school meals by school personnel as part of measures to promoting

reduced salt intake among children; there were reports of some schools not practicing food inspection. The finding suggests that the practice of tasting school meal by designated personnel prior to serving could be an important predictor of quality meal being served to pupils. The findings of this study also underscore the need for capacity building interventions that can help to promote appropriate use of cooking salt in accordance with recommended nutritional standards; which stands to reduce the risks of non-communicable diseases especially hypertension among pupils benefitting in the NHGSFP.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Dietary habit, nutritional status and related factors among adolescents in Tamale Metropolis, Ghana

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Healthy eating during adolescence is a fundamental prerequisite for optimal physical growth, psychosocial and cognitive development and prevention of diet-related chronic diseases. This study assessed the dietary habit, nutritional status and associated factors among adolescents in Tamale metropolis, Ghana. An analytical cross-sectional survey of 402 adolescents was used in this study. Semi structured questionnaire was used to solicit information on the adolescents' socio-demographic characteristics and dietary practices. Descriptive statistics and regression analysis were used to summarize the data and to assess factors associated with the adolescent's dietary habits and nutritional status. Meal skipping (87.8%), particularly breakfast was observed as the main unhealthy eating habit among adolescents in the Tamale metropolis. The prevalence of underweight, overweight and obesity as observed among adolescents were 26.1, 5.2, and 0.7%, respectively. Adolescents whose caregivers/parents are of low socio-economic status were 27% less likely to practice unhealthy dietary habits compared to those whose parents/caregivers are of high socio-economic status (OR=0.73; 95%CI: 0.54-0.99; P=0.04). The risk of adolescents being underweight as against normal in males was 2.46 times higher (RRR=2.46; 95% CI: 1.50-4.04; P=0.001) compared to the risk of being underweight in females whereas the risk of being overweight or obese as against normal was 57% lower (RRR=0.43; 95% CI: 0.14-1.36; P=<0.001) in males compared to the risk of being overweight or obese in females. More than quarter of the adolescents were underweight and factors such as unhealthy dietary habits, average socio-economic status, and adolescents whose mothers were unemployed were predictors of underweight.

Key words: Adolescents, dietary habit, nutritional status, overweight, underweight, obesity.

INTRODUCTION

Adolescence is a transitory period of rapid growth and maturation in human development that requires quality

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nutrients to support their growth spurt. Furthermore, adolescence is an intense anabolic period when the requirements for all nutrients increase. During this period, an individual achieves 20% of final adult height, 50% of adult weight and 45% increase in bone mass (Kedir et al., 2016).

The World Health Organization (WHO) identified adolescence as a period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19 years where physiological, psycho-social and cognitive development occurs. Many lifestyle factors including poor eating habits acquired during adolescence can lead to serious diseases later in life. Healthy eating behavior during adolescence is a fundamental prerequisite for physical growth, psychosocial development and cognitive performance, as well as prevention of diet-related chronic diseases in adulthood. According to the 2018 Global Nutrition Report, data from 195 countries show both male and female adolescents' obesity rates are increasing by 6.5 and 4.7%, respectively annually. Also, 15% of adolescents in Africa are overweight and obese and are at increased risk of getting diabetes and other diet related non- communicable diseases later in life (Akseer et al., 2017).

Ghana is one of the few sub-Saharan African countries at a later stage of the nutrition transition where diet changes are already affecting the health of majority of the population (Abrahams et al., 2011). These dietary intake changes among Ghanaian population were first noticed in the 1990s (Goody and Goody, 1995).

The dietary intake among adolescents in developing countries including Ghana is of concern as most traditional diets (predominantly cereal and tuber based, fresh fruits and vegetables, and foods low in fat) are gradually being replaced with more Westernized diets which lack diversity and are high in calorie-rich processed foods (Ochola and Masibo, 2014). Adolescents spend most of their time in school coupled with the autonomy to make food choices while in school making them vulnerable to sub-optimal dietary habits.

Dietary habit analysis has emerged as a useful epidemiological approach to assessing the overall diet and its relation with disease conditions. Adolescent dietary habits have been useful in understanding the occurrence of chronic diseases. Dietary habits also have an added advantage of being easily understood and used by the general population (Abizari and Ali, 2019).

In Northern Ghana, the dietary habit of adolescents is influenced by so many factors including poverty, educational environment, cultural practices, etc. Adolescents from resource-constrained households have limited access to healthy foods and health care services, which put them at higher risk of sub-optimal nutrition and dietary intake (Nikoi and Anthamatten, 2012). Adolescents who normally spend most of their time with their peers in school are usually left with no option than to eat what is available to them. A study conducted by Abiba et al. (2012) revealed that, about 73% of adolescents do not get to eat eggs and meat occasionally while 56% of them also consume both light and heavy diet as snacks.

Adolescence is a stage of human development that requires major food nutrients including protein, calcium, iron and other vitamins. These nutrients are of greater demand during adolescence than any other time in the life cycle. It is therefore believed that bone mass achieved during adolescence and young adulthood may decrease the risk of fractures and osteoporosis later in life. Consequently, failure to consume adequate diet can disrupt normal growth and development (WHO, 2003). According to the Ghana Demographic Health Survey (2014), 14% of adolescents in Ghana are underweight. Also, a study in the Northern Region revealed that, 6.3 and 6.0% of adolescents were underweight and overweight/obese, respectively (Abizari and Ali, 2019).

Nsiah-Asamoah (2017) found that adolescents who usually engaged in unhealthy dietary habits failed to meet their daily nutritional needs. A study conducted among Ghanaian Junior High School adolescents found that 62.8% usually skipped breakfast (Buxton, 2014). Similarly, a study carried out in the Northern Region also revealed that 30% skipped breakfast, 73% did not consume egg and 37% snack twice a day (Abiba et al., 2012).

Northern region is the second poorest region (50.4%) (GSS, 2014a) and has the highest burden of malnutrition (GDHS, 2014) in the country despite the fact that most non-governmental organizations in Ghana are based in Northern Ghana and have implemented several interventions to improve the nutritional situation of the population. This could be due to the fact that the interventions and initiatives implemented so far especially targeting adolescents are not evidence driven. Hence, the study was designed to assess dietary habits, nutritional status and associated factors among adolescents in the region to provide data that could be used in prioritizing, designing and initiating evidence- based intervention programs, aimed at improving adolescents' nutrition.

MATERIALS AND METHODS

Study area

The study was carried out in Tamale metropolis of Northern region, which is ecologically situated in the Guinea Savannah zone. The area is characterized by drought-resistant trees such as baobab, dawadawa, shea, mango and neem. It lies between longitudes 1°E and 3°W and latitudes 9°S and 11°N of the equator. Tamale metropolis shares boundaries with Savelugu/Nantong to the North, Tolon and Kumbungu to the North West, East Gonja to the South and Yendi District to the East. The major occupation of the people is farming. Rice and maize are the main cereal crops cultivated in the area. Few farmers also cultivate yam, cassava, pepper and some other crops. Most farmers keep small ruminants as well as poultry at their backyard to supplement their crops. The area has a population of about 223,252 (GSS, 2014b), with adolescents being 46,820 representing 21% of the entire population in the metropolis. Economic activities that provide jobs for the people are very few in

the study area, hence poverty is chronic. As urbanization is expanding in the region, sedentary life style, consumption of fast foods and Western diet are becoming common.

Study design

The study design used in this study is an analytical cross-sectional study design, which involves five communities and four schools. A total of 402 adolescents (10-19 years old) were covered. A semi structured questionnaire was used to generate data to answer the research question.

Sample size determination

The minimum required sample for this study was estimated using the formula for estimating single proportion as follows: 95% confidence interval, 5% margin of error and 50% prevalence as there was no known prevalence of dietary habits in adolescents in the study area.

Formula: $\mathrm{n} = \frac{Z^2 P(1-P)}{D^2}$ (Cochran, 1977)

Sampling procedure

There are 115 communities within the metropolis. A sampling frame (Data base of all the 115 communities) was formed. Excel software was used to generate random numbers for each community in the sampling frame. The communities with the random numbers from 1 to 5 were then selected (lamashegu, changli, sabonjida, aboabo and sakasaka). The metropolis also has 112 junior high schools. A sampling frame was also formed for the 112 schools and Excel was used to generate random numbers for the schools, SDA Junior High, Zogbeli Junior High, E.P Junior High and Lamashegu Junior High were selected.

Adolescents from 10 to 19 years who live within the Tamale metropolis were included in the study. Households within the communities were visited. Houses with adolescents aged 10 to 19 years were selected. Also, any adolescent who was found around these areas were also interviewed. In all, 202 adolescents were interviewed in the selected communities. Within the schools, adolescents from 10 to 19 years from each class were also selected and interviewed. For each chosen school, the list of students who fall within the inclusion criteria was obtained (that is, sample frame), and a total of 50 students were carefully chosen from each school using systematic sampling. Thus, in the four schools 200 adolescents were selected and interviewed.

Data collection methods

A semi structured questionnaire was developed for the data collection. The questionnaire consisted of both close ended and open-ended questions. Section A was structured to gather information about the respondents' socio-demographic and economic characteristics. Section B was made up of respondents' dietary habits. Section C contained respondents' dietary intake whilst Section D comprised the respondents' anthropometric data. The questionnaires were drafted in English language and translated into the local dialects for individuals who could not read or understand English. For those who could read and write (particularly the school pupils) the questionnaires were given to them to complete. However, for those who were not conformable completing the questionnaire on their own because they could not read and write the researchers administered the questionnaire to them. All the interviews were conducted using English and some selected local languages, which included Dagbani and Twi. The anthropometric data that were measured included weight, height and age. The weight of the adolescents was taken using SECA 876 electronic scale (Manufactured by SECA, United States of America). The scale was placed on a flat horizontal surface and set to zero. Participants were advised to remove any object on them that could affect the readings of their weights before mounting the scale. All adolescents were made to stand on the scale with their heads upright and hands by their sides. Readings were taken to the nearest 0.1 kg. Heights of the adolescents were also measured using the SECA 206 mechanical tape (microtoise) (Manufactured by SECA, United States of America). The microtoise was fixed to a flat vertical wall and adolescents were made to stand (without shoes) on a horizontal platform with his/her heels together.

Data analyses

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) software, version 20, Microsoft office Excel, and WHO Anthroplus.

Descriptive statistics were used to describe the socio-demographic and household characteristics of the adolescents and their parents. Means, standard deviations and ranges were calculated for continuous variables, whereas frequencies and proportions were calculated for categorical variables. Household wealth status was assessed from possession of 17 durable items including electricity, radio, color TV, black TV, satellite dish, mattress, sewing machine, refrigerator, DVD/VCD, computer, electric fan, mobile phone, bicycle, motorcycle, washing machine, animal-drawn cart, and car (GDHS 2014). Based on these, the wealth index was determined using principal component analysis (PCA) and categorized into three (3) groups (low socio-economic status (SES), middle socio-economic status and high socio-economic status). A socioeconomic score of 0-8 was considered low SES, 9-15 was considered middle SES and 16-32 was considered high SES. To score dietary diversity, the 14 food groups were regrouped into 10 food groups; starchy staples, dark green leafy vegetables, other vitamin A rich fruits and vegetables, other fruits, other vegetables, meat, poultry and fish, eggs, legumes, nuts and seeds, milk and milk products (FAO, 2021). Adolescents who consumed less than five (5) food groups were classified as consuming a 'less diversified diet' while adolescents who consumed five (5) food groups and above were classified as consuming a 'diversified diet' (FAO, 2021). Overall dietary habits were determined using meal consumption pattern and meal skipping habits. Under meal consumption pattern, a score of 0 was assigned to adolescents who consumed breakfast, lunch and supper 0-1 day/week, 1 was assigned to those who consumed breakfast, lunch and supper 2-3 days/week, 2 was assigned to those who consumed breakfast, lunch and supper 4-5 days/week and 3 was assigned to those who consumed breakfast, lunch and supper 6-7 days/week. The maximum score was 9. Under meal skipping, scores of 3, 2, 1 and 0 were given to adolescents who never skipped meals, sometimes skipped meals, quite often skipped meals and very often skipped meals, respectively. Also, adolescents who mostly skip breakfast were given a score of -1 and those who skipped any other meal (lunch and supper) were given a score of 0. Under meal skipping habits the maximum score was 3. In all the total score was 12. Adolescents who had a score of less than 5 were classified under 'unhealthy dietary habits' and a score of 5-12 were classified under 'healthy dietary habits (George et al., 2014; Reedy et al., 2014; Harmon et al., 2015; USDA, 2020).

Chi-square test was done to establish the association between the dependent (nutritional status and dietary habits) and independent variables (socio-demographic factors, wealth index and dietary habits of respondents). Thereafter, all variables with P values of <0.05 were included in the logistic regression model as well as the multinomial logistic regression models. The benchmark

Table 1. Socio demographic characteristics of adolescents and their parents.

Demographic variable	No.	%
Sex		
Male	137	34.1
Female	265	65.9
Total	402	100
Age		
10-14	75	18.7
15-19	327	81.3
Total	402	100
Ethnicity		
Dagomba	301	74.9
Gonja	42	10.4
Mamprusi	41	10.2
Others	18	4.5
Total	402	100
Religion		
Islam	359	89.3
Christianity	43	10.7
Total	402	100
Marital status		
Married	7	1.7
Single	395	98.3
Total	402	100
Father's occupation		
Unemployed	61	15.2
Trader/Farmer	275	68.4
Civil Servant	27	6.7
Others	39	9.7
Total	402	100
Mother's occupation		
Unemployed	57	14.2
Trader/farmer	321	79.8
Civil servant	9	2.2
Others	15	3.7
Total	402	100
Father's level of education		
None	230	57.2
Primary	41	10.2
JHS/SHS	89	22.1
Tertiary	42	10.4
Total	402	100
Mother's level of education		
None	265	65.9
Primary	43	10.7
JHS/SHS	74	18.4
Tertiary	20	5.0
Total	402	100

P value of <0.05 was selected because of its closeness to zero (0); thus it would reveal the most desired effect and improve the estimated models.

Binary and multinomial logistic regression models were estimated based on the factors established in the Chi-square to determine possible risk factors or predictors of underweight, overweight/ obesity and dietary habits of adolescents.

Level of statistical significance was set at P-value < 0.05

Ethical consideration

Ethical clearance was obtained from Kwame Nkrumah University of Science and Technology, Komfo Anokye Teaching Hospital. Consent was obtained from the participants before questionnaires were administered and all participants were assured of confidentiality.

Reliability and validity

Test-retest reliability was conducted by giving the questionnaires to same respondents and repeated for the purposes of ensuring that same or much similar results could be obtained using same questionnaires. Again, established face validity was achieved by giving the questionnaires to colleagues who better appreciate the topic to go through it and ensure that, the questions really capture the topic under investigation.

RESULTS

Background characteristics of adolescents

A total of 402 adolescents were recruited for the study. Out of the 402, 201 were in school adolescents while 201 were out of school adolescents. Their mean age was 15.7 ± 1.4 years. Out of the 402 adolescents, 34.1% were males and 65.9% were females. 18.7% had their ages ranging from 10-14, while 81.3% aged 15-19 years.

Majority of the adolescents interviewed were of the Dagomba ethnic group (74.9%). Greater portions (89.3%) of the respondents sampled for this survey were practicing the Islamic religion with almost all of them being single (98.3%). Out of the participants interviewed, 20.6% and 11.5% of their fathers and mothers, respectively, had completed higher than junior high school education. About 65.9 and 57.2% of mothers and fathers, respectively had no formal education. The most common occupation for mothers was trading (70.1%) while 34.8 and 33.6% of the fathers were farmers and traders, respectively (Table 1).

Dietary habits of adolescents

In investigating adolescents' dietary practices, self-reported usual habits related to meal consumption frequency, meal skipping, snacking and out of home eating were assessed.

Meal consumption habits/meal frequency

Approximately, 53% of the adolescents in Tamale

Table 2. Meal frequency.

Number of meals consumed per day	No.	%
Once a day	55	13.7
Twice a day	108	26.9
Thrice a day	211	52.5
Four/more times a day	28	7.0
Meals consumed per week (days/week) breakfast		
0-1	86	21.4
2-3	133	33.1
4-5	58	14.4
6-7	125	31.1
Total	402	100
Lunch (days/week)		
0-1	40	10.0
2-3	87	21.6
4-5	120	29.8
6-7	155	38.6
Total	402	100
Supper (days/week)		
0-1	39	9.7
2-3	66	16.4
4-5	65	16.2
6-7	232	57.7
Total	402	100

Source: Author

reported that they usually eat 3 meals a day (Table 2). The remaining reported consuming 2 meals (26.9%) or more than 3 meals (7.0%) a day. The proportion of adolescents who consumed breakfast, lunch and dinner during a typical week, was 31.1, 38.6 and 57.7%, respectively (Table 2).

Meal skipping

About 12% of the adolescents indicated that they often skipped meals whilst 12.2% never skipped meals. It was found that the most frequently skipped meal was breakfast (66.3%) while supper was the least meal frequently skipped (10.8%). The main reasons for meal skipping included food unavailability (43.5%), lack of appetite (27.3%), lack of time (21.3%), dislike for food (20.2%), saving money (19.0%) and losing weight (8.3%) (Table 3).

Snacking habits

Majority (58.7%) of the adolescents in the study were found to have a habit of snacking. The main reasons for snacking comprised an appetite for snacks (58.5%), hunger (14.2%), dislike for available food (10.8%), promotion of good health (9.0%) and to lose weight (7.5%). Snacks that were most frequently consumed in a typical week as reported by the adolescents were carbonated soft drink (24.9%), vegetables (18.7%), cookies/biscuits (15.2%) and toffees (10.9%) (Table 4).

Purchased meals (out of home eating)

Lunch was consumed by majority (77.1%) of adolescents outside the home, with the least purchased meal being supper (6.0%). 42.6% of the adolescents ate outside their home every day, 34.8% ate outside their home once a week, 10.9% ate outside their home every weekend, 9.0% ate outside their home during weekdays and 2.7% never ate outside. Adolescents also mentioned rice, rice and beans (wakye), kenkey, wasawasa, fried yam, indomie, fufu, banku, Tuozafi (TZ), rice balls and cowpea as foods normally consumed out of home. The majority (45.7%) purchased rice whilst only 0.2% purchase fried rice (fried rice) (Table 5).

Dietary diversity category

On the whole, 21.9% of the adolescents who participated in the present study had poor or unhealthy dietary habits

Table 3. Meal skipping frequency.

Meal skipping	No.	%
Very often	47	11.7
Quite often	68	16.9
Sometimes	238	59.2
Never	49	12.2
Total	402	100
Most likely skipped meals		
Breakfast	234	66.3
Lunch	81	22.9
Supper	38	10.8
Total	353	100
Meal skipping reasons		
Lack of appetite	69	27.3
Dislike for food available	51	20.2
To lose weight	21	8.3
Saving money	48	19.0
I don't have time	54	21.3
No food available	110	43.5

Source: Author

Table 4. Snacking habits.

Variable	No.	%
Snacking		
Yes	236	58.7
No	166	41.3
Reasons for snacking		
Hunger	30	14.2
An appetite for snacks	124	58.5
Promotion of good health	19	9.0
Dislike for food available	23	10.8
To lose weight	16	7.5

Source: Author

compared to 78.1% who had healthy dietary habits. Adolescent mean dietary diversity score in this study was 7.8±2.4. Majority (92.5%) of the adolescents in the metropolis consumed a diversified diet and 7.5% of the adolescents consumed a less diversified diet (Table 6).

Factors associated with dietary habits among adolescents

Results from the study showed that 21.6% of persons from average socio-economic status compared to 44.8% from high socioeconomic status and 13.4% of low socioeconomic status had good dietary habits. Also 29.1% of males compared to 50.7% of females had good dietary habits. Socio-economic status (p=0.02), gender (p=0.04) and purchased meals (p=0.01) (out of home eating) were significant factors associated with the dietary habits of adolescents in Tamale metropolis (Table 7).

Predictors of dietary habits among adolescents

Low socio-economic status was a significant predictor of dietary habits. Adolescents with caregivers/parents of low socio-economic status were 27% less likely to practice unhealthy dietary habits compared to those with parents/caregivers of high socio-economic status (OR=0.73; 95%CI: 0.54-0.99; P=0.04) (Table 8).

Table 5. Meals consumed outside.

Purchased meals	No	%
Breakfast	68	16.9
Lunch	310	77.1
Supper	24	6.0
How often meals are purchased (OHM)		
Everyday	171	42.6
Once a week	140	34.8
Weekends	44	10.9
Weekdays	36	9.0
Not at all	11	2.7
Purchased foods		
Rice	184	45.7
Rice and beans(wakye)	67	16.6
Fried yam	62	15.4
Indomie	12	3.0
Rice balls	2	0.5
Banku	11	2.7
Fufu	5	1.2
Wasawasa	17	4.2
Cowpea	2	0.5
Porridge	7	1.7
Kenkey	24	5.9
Beans	3	0.7
T.z	5	1.2
Fried rice	1	0.2
Tubani	2	0.5

Source: Author

Nutritional status of adolescents

Approximately, 26.1% of the adolescents in Tamale metropolis were underweight, 67.9% normal, 5.2% overweight and 0.7% obese (Table 9).

Factors associated with nutritional status of adolescents

Results from this study showed that the sex of adolescent (p=0.01), household socio-economic status (p=0.01) and dietary habits (p=0.04) were statistically and significantly associated with the nutritional status of the adolescents. It was observed that 37.2% of the adolescents (males) were underweight compared to 20% of the females; whereas, 6.5% of the adolescent females were overweight/obese compared to 2.9% of males. Also, 25.4% of the adolescents from the middle socio-economic households were underweight compared to 23.1 and 17.2% of the adolescents from the middle and low socio-economic households, respectively; while 10.0% of the adolescents from low socio-economic households were overweight/obese compared to 6.2 and 7.5% of those in middle and high socio-economic households, respectively. Lastly, 26.8% of the adolescents who had healthy dietary habits were underweight compared to 23.9% of those who practiced unhealthy dietary habits; 15.95 of the adolescents who practiced unhealthy dietary habits were overweight compared to 3.1% of those who practiced healthy dietary habits (Table 10).

Determinants of underweight and overweight/obesity

The risk of adolescents being underweight as against normal in males was 2.46 times higher (RRR=2.46; 95% CI: 1.50-4.04; P=0.001) compared to the risk of being underweight in females; whereas, the risk of being overweight or obese as against normal was 57% lower (RRR=0.43; 95% CI: 0.14-1.36; P=<0.001) in males compared to the risk of being overweight or obese in females. Moreover, the risk of being overweight/obese as against normal in adolescents whose mothers were traders was 86% lower (RRR=0.14; 95% CI: 0.02-0.87;

Table 6. Dietary habit classification among adolescents.

Dietary Habits	No.	%
Unhealthy dietary habits	88	21.9
Healthy dietary habits	314	78.1
Total	402	100
DDS Category		
Less diversified diet (<5)	30	7.5
Diversified diet (≥5)	372	92.5

Source: Author

P=0.03) compared to the risk of being overweight or obese in adolescents whose mothers were employed as civil or public servants (Table 11).

DISCUSSION

Usual meal frequency and purchased meals (out of home eating)

More than 50% of adolescents reported eating 3 times a day during a typical day. According to FAO (2004a), school children and adolescents' daily meals should be composed of 3 meals and some snacks. This result is consistent with that of the findings of Kotecha et al. (2013) who found, in their study on determining the dietary pattern of school going adolescents in urban Baroda, that majority (55%) of adolescents consumed three meals daily. However, Hoffmann et al. (2012)'s study on the dietary behaviors of adolescents, from urban and rural areas in the district of Szamotuly, Poland revealed that 39.7% adolescents ate 3 times daily.

In spite of breakfast being an important meal, it was interesting to note that adolescents always eat both lunch (38.6%) and supper (57.7%) more than breakfast (31.1%). Similar finding was made by Agnieszka et al. (2016) who showed that adolescents eat lunch and dinner more often than breakfast. Also, Pendergast et al. (2016) found that more adolescents skipped breakfast (62.8%) than lunch (40.2%) or supper (35.1%).

Purchased meals (out of home eating) were part of the measures of the dietary habits of the adolescents. Majority of the adolescents indicated they eat from home, mostly lunch. During the afternoons, adolescents are mostly found in school or left behind at home by their parents. As a result, adolescents mostly eat foods outside their home. The type and quantity of food eaten by an individual has an effect on his/her well-being and hence eating properly at meal times at this stage of life is very vital in achieving optimum growth (Stang and Story, 2005). Eating out of home frequently has been associated with lower intake of fruits and vegetables (Seguin et al., 2016). Similar to this finding, a study conducted by Feeley et al. (2012), on the changes in dietary habits and eating practices of adolescents living in urban South Africa revealed that, out of the 655 participants almost all participants eat more than one fast-food item per week (95 and 92.2% for males and females, respectively).

Meal skipping and snacking habits

The results also revealed that majority of the adolescents skipped breakfast and the least skipped meal was supper, which is consistent with the findings of Akman et al. (2010). Breakfast skipping and meals in general is a typical habit of adolescents. According to other researchers, this habit increases as the adolescents get older (Monzani et al., 2019). Similarly, a study conducted by Aganah (2014) on the dietary practices and nutritional status of adolescent girls in Ko Senior High Boarding School in the Upper West Region of Ghana revealed that 50.6% of adolescent girls skipped breakfast. Also, a study conducted by Badrasawi et al. (2021), on reasons for skipping breakfast among adolescents in Palestinia also showed that breakfast was often skipped by adolescents. In addition, Onyiriuka et al. (2013) revealed that meal skipping particularly breakfast, eating of fast foods, soft drinks and low consumption of fruits and vegetables were the key eating habits showed among adolescent girls in Nigerian urban secondary school.

Several studies consistently relate consumption of breakfast to improvements in academics. For example, Adolphus et al. (2013) found that increased frequency of habitual breakfast was consistently positively associated with academic performance and task behavior in the classroom. Breakfast consumption is associated with positive outcomes for diet quality, micronutrient intake, weight status and lifestyle factors (Adolphus et al., 2013). An individual who skips breakfast misses some very important dietary needs that are not usually compensated for in other meals. In fact, adolescents who skip breakfast have significantly lower vitamin and mineral intake compared to those that regularly eat breakfast (Matsumoto et al., 2020).

In this study, snacking was also reported by majority of the adolescents as part of their eating habits. This finding of the present study is similar to a study done by Przyslawski et al. (2011), which was conducted on female adolescents from the Great Poland Region. The study found that nearly half of the adolescents (46%) reported that they snacked between main meals.

When asked about their snack intake during a typical week, majority of the adolescents indicated that they consumed carbonated soft drinks, followed by pastries and toffees. These food items are high-caloric, energy-dense foods containing high quantities of sugar and fats which increase the risk of becoming overweight and obese or risk of chronic disease like diabetes, later on in life. Only a few adolescents consumed fruits and

Table 7. Factors associated with the dietary practices among adolescents.

Variable	Dietary habits		
	Unhealthy dietary habits	Healthy dietary habits	P value
Age			
10-14	17 (22.7)	58 (77.3)	0.55
15-19	64 (19.6)	263 (80.4)	
Sex			
Male	20 (14.6)	117 (85.4)	0.04
Female	61 (23.0)	204 (77.0)	
Ethnicity			
Dagomba	57 (18.9)	244 (81.1)	0.13
Gonja	14 (33.3)	28 (66.7)	
Mamprusi	8 (19.5)	33 (80.5)	
Others	2 (11.1)	16 (88.9)	
Religion			
Islam	75 (20.9)	284 (79.1)	0.28
Christianity	6 (13.9)	37 (86.1)	
Marital status			
Married	0 (0.0)	7 (100)	0.18
Single	81 (20.5)	314 (79.5)	
Fathers education			
None	49 (21.3)	181 (78.7)	0.30
Primary	12 (29.3)	29 (70.7)	
JHS/SHS	12 (13.5)	77 (86.5)	
Tertiary	8 (19.0)	34 (81.0)	
Mothers education			
None	50 (18.9)	21 (581.1)	0.22
Primary	11 (25.6)	32 (74.4)	
JHS/SHS	18 (24.3)	56 (75.7)	
Tertiary	2 (10.0)	18 (90.0)	
Socio-economic status			
Low SES	31 (27.0)	85 (73)	0.02
Middle SES	27 (23.7)	87 (76.3)	
High SES	35 (20.2)	138 (79.8)	
Purchased meals (OHM)			
Breakfast	23 (33.8)	45 (66.2)	0.01
Lunch	53 (17.1)	257 (82.9)	
Supper	5 (20.8)	19 (79.2)	

Source: Author

vegetables (Monzani et al., 2019). The findings of this study suggested that, parents may not be providing fruits and vegetables often at home. Evidence available showed that, among adolescents, taste is a main reason for not liking fruits and vegetables, especially vegetables (Zeinstra et al., 2007). Among the reasons mentioned by the adolescents for snacking, appetite for snack was the major reason for snacking. It has also been reported that

Table 8. Predictors of dietary habits among adolescents.

Variable	Poor dietary habits				
	N	OR	95% CI for OR		p-value
			Lower	Upper	
Sex					
Male	137	1.75	1.01	3.04	0.05
Female	265	1	Reference	Reference	Reference
SES					
Low SES	115	0.73	0.54	0.99	0.04
Middle SES	171	0.88	0.45	1.74	0.72
High SES	116	1	Reference	Reference	Reference
Purchased meals (OHM)					
Breakfast	68	1.57	0.48	5.15	0.46
Lunch	310	0.66	0.22	1.98	0.46
Supper	24	1	Reference	Reference	

Source: Author

Table 9. Nutritional status of adolescents.

Nutritional status	No	%
<-2 SD (Thinness/low BMI for age)	105	26.1
-2 to 1 SD (Normal)	273	67.9
>1 SD (Overweight)	21	5.2
>2 SD (Obese)	3	0.7

Source: Author

most adolescents choose their diet on the basis of taste rather than nutrition (Lassi et al., 2017).

The study shows that the participants skipped breakfast more than any other meal, which is found to be unhealthy behavior with consequences. For example, studies have shown that skipping breakfast is associated to unhealthy behaviors, poorer diets, and lower physical activity and also with a higher metabolic risk, that is, higher body mass index (BMI), larger waist circumference, higher fasting insulin and increased cholesterol and LDL levels (Ruxton and Kirk, 1997; Song et al., 2005; Timlin et al., 2008; Van der Heijden et al., 2007).

Nutritional status of adolescents in Tamale metropolis

BMI for age Z-score (BAZ) gave an indication of the long-term impact of nutrition on the growth of children and adolescents. The results reveal that most adolescents had a normal BMI for age. This indicated that majority of the adolescents in Tamale metropolis are within -2 to 1 SD, according to WHO criteria (WHO, 1995; de Onis et al., 2007). Also, about a handful of the adolescents were underweight, while only a few were overweight and obese.

The prevalence of underweight in this study is similar to others found elsewhere. For instance, Yohannes et al. (2015) reported that the underweight prevalence of 26.1% among adolescent students in Northern Ethiopia. However, the magnitude of underweight in this study is lower than the 28% reported in India (Bhargava et al., 2020). The discrepancy might be due to the implementation of a battery of interventions such as the school health programme in Ghana.

Evidence available showed that between 1975 and 2016, globally obesity prevalence increased from 0.7 to 5.6% in girls and from 0.9 to 7.8% in boys (Di Cesare et al., 2019). The global proportions of obesity are similar to the one (5.9%) found in the present study, which confirmed the double burden of malnutrition currently experienced in low and middle in-come countries.

However, the prevalence found in the present study is relatively low compared to the one found (12.9%) in the study conducted in Ethiopia (12.9%) (Gebrie et al., 2018), but higher than that of Abiba et al. (2012) who found 4% prevalence of overweight among upper primary school children (adolescents) in Tamale metropolis, Ghana. Moreover, Otuneye et al. (2017) established that there is 2.8% prevalence rate of obesity among adolescents in

Table 10. Factors associated with nutritional status of adolescents.

Variable	Nutritional status			P-value
	Underweight [N (%)]	Normal weight [N (%)]	Overweight/Obese [N (%)]	
Age				
10-14	26 (34.7)	48 (64.0)	1 (1.3)	0.05
15-19	79 (24.2)	225 (68.8)	23 (7.0)	
Sex				
Male	51 (37.2)	82 (59.9)	4 (2.9)	0.01
Female	54 (20.4)	191 (72.1)	20 (6.5)	
Ethnicity				
Dagomba	81 (27.0)	204 (67.7)	16 (5.3)	0.81
Gonja	9 (21.4)	31 (73.8)	2 (4.8)	
Mamprusi	10 (24.4)	27 (65.9)	4 (9.7)	
Others	5 (27.8)	11 (61.1)	2 (11.1)	
Marital Status				
Married	1 (28.6)	6 (71.4)	0 (0.0)	0.57
Single	104 (26.3)	267 (67.6)	24 (6.1)	
Religion				
Islam	91 (25.3)	247 (68.8)	21 (5.9)	0.54
Christianity	14 (32.6)	26 (60.5)	3 (6.9)	
Father's occupation				
Unemployed	13 (21.3)	44 (72.1)	4 (6.6)	0.36
Trader/Farmer	57 (20.7)	107 (38.9)	111 (40.4)	
Civic/Public servant	27 (41.0)	30 (45.5)	9 (13.5)	
Mother's occupation				
Unemployed	19 (33.3)	33 (57.9)	5 (8.8)	0.16
Trader/ Farmer	74 (24.9)	208 (70.0)	15 (5.1)	
Civil/Public	8 (20.5)	28 (71.8)	3 (6.7)	
servant	3 (33.3)	4 (44.4)	2 (22.3)	
Fathers' education				
None	62 (27.0)	157 (68.3)	11 (4.7)	0.34
Primary	12 (29.3)	28 (68.3)	1 (2.4)	
JHS/SHS	16 (18.0)	64 (72.0)	9 (10)	
Tertiary	15 (35.7)	24 (57.1)	3 (7.2)	
Mother's education				
None	68 (25.7)	184 (69.4)	13 (4.9)	0.44
Primary	9 (20.9)	31 (72.1)	3 (7.0)	
JHS/SHS	20 (27.0)	49 (66.2)	5 (6.8)	
Tertiary	8 (40.0)	9 (45.0)	3 (15.0)	
Dietary diversity				
Low	8 (26.7)	22 (73.3)	0 (0.0)	0.60
High	97 (26.1)	251 (67.5)	24 (6.4)	
SES				
Low SES	20 (17.2)	83 (72.8)	13 (10.0)	0.01
Middle SES	29 (25.4)	78 (68.4)	7 (6.2)	
High SES	40 (23.1)	120 (69.4)	13 (7.5)	

Table 10. Contd.

Dietary Habit				
Unhealthy dietary habit	21 (23.9)	53 (60.2)	7 (15.9)	0.04
Healthy dietary habit	84 (26.8)	220 (70.1)	17 (3.1)	
Meals consumed outside				
Breakfast	13 (19.1)	50 (73.5)	5 (7.4)	
Lunch	83 (26.8)	210 (67.7)	17 (5.5)	0.40
Supper	9 (37.5)	13 (54.2)	2 (8.3)	

Source: Author

Table 11. Determinants of underweight and overweight/obesity among adolescents.

Variable	Underweight RRR (95% CI)	p-value		Overweight/Obesity RRR (95% CI)	p-value
Dietary habit					
Unhealthy dietary habit	1.37 (1.05, 2.50)	0.58	Normal (Base outcome)	0.60 (0.23, 1.56)	0.29
Healthy dietary habit	1	Reference		1	Reference
SES					
Low SES	1.59 (0.39, 6.41)			1.90 (0.50, 7.06)	0.35
Middle SES	1.03 (0.36, 3.00)			1.27 (0.48, 3.39)	0.63
High SES	1			1	
Sex					
Male	2.46 (1.50, 4.04)	0.01		0.43 (0.14, 1.36)	<0.0001
Female	1	Reference		1	Reference
Mother occupation					
Unemployed	2.76 (0.19, 5.30)	0.35		0.35 (0.05, 2.61)	0.31
Trader	3.57 (0.12, 0.26)	0.19		0.14 (0.02, 0.87)	0.03
Farmer	0.57 (0.01, 3.30)	0.49		0.21 (0.03, 1.77)	0.15
Civic/Public service	1	Reference		1	Reference

Source: Author

Abuja municipal area council of Nigeria.

Predictors of overweight/obesity among adolescents in Tamale metropolis

The present study found sex of adolescents and adolescents' mothers' occupation (trading vs. civil or public servants) as the main predictors of adolescents' nutritional status. The finding in the present study is consistent with the findings of a meta-analysis conducted by Gebrie et al. (2018) who showed that sex of adolescents was associated with overweight or obesity. Similarly, a study conducted by Worku et al. (2021), among adolescent in Ethiopia showed that adolescents whose mothers are employed by government were almost 6.5 times more likely to be overweight and obese.

Conclusion

Based on the findings of this study, it can be concluded that meal skipping particularly breakfast was the main unhealthy eating habit observed among adolescents in Tamale metropolis, with majority of adolescents within the Tamale metropolis practicing a healthy dietary habit.

Moreover, the 24-h recall conducted in the study showed that majority of the adolescents consumed a diversified diet with only less than a tenth consuming a less diversified diet.

Finally, this study again indicated that most socio-demographic characteristics did not predict significantly dietary habits except socio-economic status. Conversely, dietary habit, socio-economic status, and sex were statistically and significantly associated with the nutritional status of adolescents in Tamale metropolis.

However, only sex and maternal occupation (trading vs public/civil servant) was the only predictors of the adolescents' nutrition status.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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