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Dietary patterns associated with body mass index in selected adult populations in Accra, Ghana

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Abstract

Background: Dietary pattern analysis is more appropriate for explaining diet-disease relationships instead of single nutrients in the treatment and prevention of diet and diseases.

Objective: The study aimed to identify dietary patterns and explore their association with body mass index among adults in selected areas in Accra.

Methods: This was a retrospective study comprising four (4) cross-sectional studies among healthy adults in the Greater Accra region of Ghana. Appropriately designed/pre-tested questionnaires submitted by 208 respondents were analysed for food patterns using principal component analysis to estimate pattern scores for each food item. Statistical significance was set at $p < 0.05$.

Results: Eight dietary patterns explaining 54.8% of the variation in the dietary intake of the study participants were identified. These were the traditional pattern, combined pattern, major protein pattern, modified pattern, white and red meat pattern, sweets and pastries pattern, rare dietary pattern and vegetables with moisture pattern. The mean BMI of the population was 23.1 ± 3.9 kg/m^2, with the prevalence of underweight, normal weight, overweight and obese observed to be 5.8%, 68.3%, 19.7%, and 6.2%, respectively. The traditional dietary pattern and the sweets and pastries patterns were significantly associated with BMI ($p < 0.05$ and $p < 0.001$, respectively).

Conclusion: Eight (8) dietary patterns were identified. The traditional sweets and pastries patterns were found to be related to weight gain.

Keywords: Dietary pattern, BMI, Adults, food frequency questionnaire

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INTRODUCTION

The traditional approach in nutritional epidemiology previously focused on using single nutrients to prevent and treat diseases such as scurvy, beriberi, pellagra, and nutritional anaemias [1]. To determine the association between diet and health, the focus is currently on the assessment of dietary patterns instead of single nutrients in disease treatment and prevention [2]. This is supported by the fact that nutrients are not eaten in isolation but rather as a diet, which is made up of a combination of foods that contain multiple nutrients [2]. Additionally, nutrients in foods may exert a synergistic or antagonistic effect in addition to bioactive compounds such as drugs. Hence, there is a need for a comprehensive understanding of how the pattern of consumption of nutrients and other bioactive compounds in foods influences health outcomes [3]. "Dietary pattern (DP) is defined as the quantity, variety, or combination of different foods and beverages in a diet and the frequency with which they are habitually consumed" [4]. It is a reflection of an individual's habitual exposure to a variety of foods [5]. Economic development and rapid urbanisation have resulted in changes in dietary patterns characterised by a shift in disease burden from undernutrition to overnutrition in both developed and developing countries [6]. Identifying and characterising

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dietary patterns will encourage healthy dietary practices and help create public health strategies [7].

Global reports have shown that dietary patterns with higher consumption of nutrient-dense foods such as fruits, cereals, vegetables, low-fat meat, and dairy products are associated with good health outcomes in adults, including a decline in the rate of weight gain over time and improved survival of malnutrition and quality of life [8,9]. On the other hand, nutrient-deficient and energy-dense dietary patterns with higher consumption of high-fat dairy products, desserts and sweets have been associated with increased rates of malnutrition in adults. The Centre for Disease Control [10] described BMI as one of the several modifiable indicators for the increased risk of non-communicable diseases (NCDs). The food frequency data was used as the theoretical basis for this study to explain latent factors underpinning patterns that correlate with other biological and clinical variables. The factor analysis offered the chance to decipher the underlying components of the diet that demonstrated a relationship with BMI. Values for BMI were used to determine the obesity and overweight status of the respondents. Whereas the individual nutrient of the diet influences the biochemical reactions within the body, it is the combined effect of these nutrients in the diet that ensures the adequacy and maximum utilisation of these nutrients [2]. Considering that diet is the main source of nutrients and energy for the body, it is generally considered that dietary patterns determine overall health outcomes rather than individual diet.

A significant association between Western dietary patterns and an increased risk of BMI and associated risk factors among adults in the Middle East and North Africa has been reported [9,11,12]. Increased adherence to the Mediterranean dietary pattern was associated with a decreased BMI and risk of coronary heart disease. Despite the link between dietary patterns and the BMI of adults [8,9,11], studies have not extensively examined such relationships among the Ghanaian population [13-15]. This study aimed to assess the dietary patterns and their association with BMI in an adult population in Greater Accra, Ghana.

MATERIALS AND METHODS

Study design and sites

This study was retrospective; it involved dietary data abstracted from a pool of data obtained from four (4) previous cross-sectional studies conducted in the Greater Accra region of Ghana. Two hundred and eighty-four questionnaires obtained from healthy adults were sampled from a pool of questionnaires on dietary studies from the databank of the Department of Dietetics, University of Ghana. A total of 76 questionnaires had incomplete demographic, dietary (food frequency), and anthropometric (weight and height) data and were excluded, resulting in a sample size of 208 for the present analysis. The data on the food frequency questionnaire covered different kinds of foods that were consumed over a month. The population included adults aged 18 to 60 years who were staff at the Korle Bu Teaching Hospital, the University of Ghana Health Services at Legon and the University of Ghana Korle-Bu campus. Participants in the previous studies were selected randomly by ballot.

Information on age and sex, marital status, educational background, religion, and tribe were extracted and pooled from the questionnaires. Data on height in meters (m) and weight in kilogram (Kg) was extracted to estimate the body mass index (BMI) (kg/m^2) (weight (kg)/height $(m)^2$). The BMI was classified based on the Centre for Disease Control BMI classification for adults; BMI less than 18.5 kg/m^2 was underweight, normal weight was 18.5 $kg/m^2 < 25$ kg/m^2, overweight 25 $kg/m^2 < 30$ kg/m^2 and obese ≥ 30 kg/m^2 [16,17]. Dietary intake was assessed using a quantitative food frequency questionnaire. Data on the frequency (daily, weekly, monthly, and never) of consumption of cereals and grains, root and tubers, fruits, vegetables, legumes, nuts, animal and animal products, processed food items, and fat and oil were extracted and pooled for analysis to identify the dietary patterns.

Data analysis

Data analysis was performed using SPSS version 25 (IBM Corp. Armonk NY). Descriptive statistics were summarised using frequencies for categorical variables and means and standard deviations for continuous variables. An independent sample T-test was used to test the differences in means between sex for weight, height, and BMI. The Chi-square test was used to compare the proportions of males and females among BMI categories. Dietary patterns were assessed using the Principal Component Analysis, which was calculated on the whole sample and not by age groups or gender. The criteria for the data to suit factor Principal Component Analysis (PCA) are the reliability, adequacy and sphericity of the data. The reliability, adequacy and sphericity tests for the data were done to determine the suitability of the data for the PCA, a form of the factor analysis procedure. For the reliability test, Cronbach's alpha was used, which gave a reliability value of 0.858. For the adequacy test, the Kaiser-Meyer-Olkin (KMO) measure was employed, which gave a value of 0.795, implying the adequacy of the data. For Sphericity, Bartlett's test gave a value of 5118.11 with $p < 0.001$, which implied that there was no evidence of correlation matrix identity. Fifty-one (51) food items from the food frequency questionnaire were used for the PCA analysis. The orthogonal rotation method, specifically varimax, was used to maximise variable loadings on the extracted factor components. To identify the number of principal components (PC) to retain, three commonly applied criteria were used: eigenvalue > 1, the interpretability of the components and Monte Carlos PCA for parallel analysis. The number of factors was determined by Kaiser's stopping rule; thus, eigenvalues > 1.0 yielded thirteen factors [18]. All these analysis steps are required to ensure a comprehensive identification of the most appropriate number of components for the factor analysis. This is required in order to relate the dietary pattern scores to the BMI. However, Monte Carlos PCA for parallel analysis was used to determine the statistical significance of the eigenvalues and the number of factor components to retain. The eigenvalues of the data were systematically compared with the eigenvalues from the parallel analysis. If the eigenvalue from the SPSS analysis eigenvalue was greater than the eigenvalue from the parallel analysis, then that factor component was retained. Therefore, only 8-factor components were retained. Scree plots were also used to confirm the adequacy of the eight components retained.

Significant contributing food items to the factor were those with an absolute factor loading of 0.40 or higher. A positive factor loading indicates that the original dietary variable was positively associated with the principal component in question, whereas a negative factor loading indicates the opposite. The food items had communality values considerably above 0.5, indicating that the number of components retained was appropriate. As a result, the data set was declared suitable for PCA. Dietary patterns produced from PCA were suitably labelled based on food items that substantially accounted for variation in the component. Based on the factors derived, specific factor scores were estimated for each food item. These factor scores for the food items were then correlated with the BMI and other demographic variables. The factor scores had a skewed distribution, so the Kruskal-Wallis test was used to test the association between dietary patterns and BMI with a level of statistical significance set at $p \leq 0.05$.

RESULTS

The demographic and physical characteristics of the participants are shown in Table 1. A greater proportion of participants, 123 (59%), were females. The median age of the sample was 59 years. The majority, 142 (68.3%) of the participants had normal BMI. More males (77.2%) had normal weights compared to females (55.3%). More females were overweight (28.2%) and obese (10.6%) compared to males (13.8% and 3.3% respectively). Thus, females were significantly more overweight and obese than males, p = 0.001. Fifty-one (51) food items used in the factor analysis yielded eight principal components. These were labelled as traditional patterns, combined patterns, major protein patterns, modified patterns, white and red meat patterns, sweets and pastries patterns, rare dietary patterns and vegetables with high moisture patterns. Table 3 shows the identified dietary patterns and their food

Table 1. Demographic characteristics of study participants

Parameter	Male (123) n (%)	Female (85) n (%)	Total (208) n (%)	P-Value
Median age (min, max)	25 (18,56)	25 (19, 58)	25 (18, 58)	
Educational level				
None	3 (2.4)	5 (5.9)	8 (3.8)	
Primary	13 (10.6)	14 (16.5)	27 (13.0)	
Junior High	20 (16.3)	13 (15.3)	33 (15.9)	0.464
Senior High	10 (8.1)	5 (5.9)	15 (7.2)	
Tertiary	77 (62.6)	48 (56.5)	125 (60.1)	
Marital Status				
Single	74 (60.2)	50 (58.8)	124 (59.6)	
Divorce	4 (3.3)	3 (3.5)	7 (3.4)	0.836
Married	44 (35.8)	30 (35.6)	74 (35.6)	

Table 2. Comparison of anthropometric variables between males and female

Variable	Male	Female	Total (208)	P-value
Weight (Kg)	65.3 ± 9.9	62.6 ± 12.4	64.2 ± 11.0	0.86
Height (m)	1.7 ± 0.1	1.6 ± 0.1	1.7 ± 0.1	<0.001
BMI (kg/m^2)	22.4 ± 3.0	24.1 ± 4.8	23.1 ± 3.9	0.001
BMI classification	n(%)	n(%)	n(%)	
Underweight	7 (5.7)	5 (5.9)	12 (5.8)	
Normal Weight	95 (77.2)	47 (55.3)	142 (68.3)	
Over Weight	17 (13.8)	24 (28.2)	41 (19.7)	0.004
Obese	4 (3.3)	9 (10.6)	13 (6.2)	

BMI (body mass index) = weight (kg)/height(m)^2, BMI (body mass index) classifications are based on (Center for Disease Control, 2021; World Health Organization,2021)

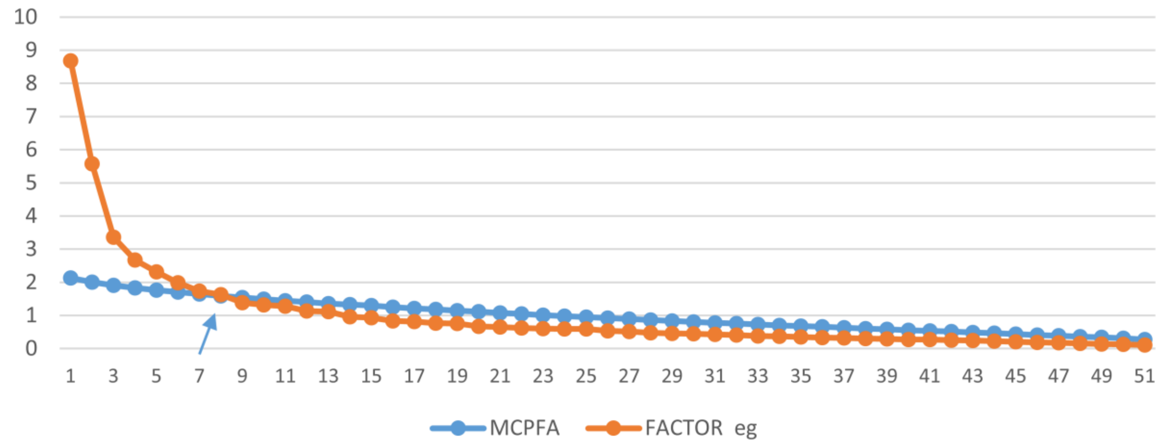

Figure 1. Scree plot of eigenvalues of data versus eigenvalues of Monte Carlos PCA for parallel analysis

Table 3. Identified dietary patterns and their food components

Dietary pattern	Food items
Traditional pattern (TDP)	cassava, sweet potato, yam, coconut oil, mango, sorghum, pawpaw, orange, garden eggs, plantain, okra and agushie
Combined pattern (CDP)	vegetables (carrot, cabbage, cucumber, and green leafy vegetables), fruits (apple, banana) and milk
Major protein pattern (MPDP)	game meat, crab, snail, shrimp, tigernut
Modified pattern (MDP)	gari, bread, millet, oats
White and red meat pattern (WRMDP)	poultry, meat, and fish
Sweets and pastries pattern (SPDP)	candies, chocolate, pastries
Rare dietary pattern (RDP)	Bambara beans, grape, soya, cheese
Vegetables with high moisture (VHMDP)	onion and tomatoes

Table 3a. Factor loadings by of dietary patterns

Food items	TDP	CDP	MPDP	MDP	WRMDP	SPDP	RDP	VHMDP
Cassava	0.699							
Sweet Potato	0.68							
Yam	0.65							
Coconut Oil	0.635							
Mango	0.586							
Watermelon	0.542	0.458						
Sorghum	0.528							
Pawpaw	0.522							
Pineapple	0.508	0.407						
Orange	0.505							
Garden Eggs	0.483							
Plantain	0.482							
Agushie	0.45							
Okro	0.437							
Coconut								
Carrot		0.756						
Cabbage		0.694						
Apple		0.663						
Cucumber		0.637						
Green Leafy Vegetables		0.629						
Milk		0.447						
Banana		0.422						

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 3b. Factor loadings by dietary patterns continuation

Food items	TDP	CDP	MPDP	MDP	WRMDP	SPDP	RDP	VHMDP
Rice								
Game meat			0.848					
Crab			0.816					
Snails			0.802					
Shrimps			0.793					
Tiger nuts			0.57					
Corn			-0.428					
Beans								
Indomie								
Butter								
Gari				0.594				
Bread				0.567				
Millet				0.558				
Oats				0.471				
Wheat								
Groundnut								
Wean mix								

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 15 iterations

Table 3c. Factor loadings by dietary patterns continuation

Food items	TDP	CDP	MPDP	MDP	WRMDP	SPDP	RDP	VHMDP
Poultry					0.777			
Meat					0.759			
Fish					0.602			
Candies						0.828		
Chocolate						0.764		
Pastries						0.743		
Bambara beans							0.843	
Grape							0.65	
Soya beans							0.619	
Cheese							0.54	
Tomatoes								0.794
Onion								0.697

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 15 iterations.

Table 4. Association between dietary patterns and BMI

Dietary Pattern	Correlation coefficient (r)	P-value
Traditional pattern	.220**	0.001
Combined pattern	-0.112	0.109
Major protein pattern	-0.089	0.199
Modified pattern	0.07	0.313
White and red meat pattern	-0.067	0.337
Sweets and Pastries pattern	.172*	0.013
Rare dietary pattern	0.116	0.096
Vegetables with high moisture	0.043	0.539

Spearman correlation was used to assess association between the factor scores for each food pattern and the BMI

components. The Monte Carlo's parallel analysis reduced the factor components from 13 to 8, which accounted for 54.8% of the variability in the dietary intake among participants. Tables 3a, 3b and 3c show the loadings of the food items on the extracted components. Food items with absolute values ≥ ± 0.4 significantly contributed to the components. Table 4 shows the correlation between dietary patterns factor scores and BMI. The traditional pattern and sweets and pastries pattern showed a significant correlation with BMI (p = 0.001 and 0.013, respectively). Further analyses to determine the association between the dietary patterns and BMI categories using the Kruskal-Wallis test revealed a significant association between the traditional dietary pattern (p = 0.032) and the Sweets and Pastries pattern (p < 0.001) with BMI categories. Obesity

Table 5. Association between dietary pattern and BMI categories

Dietary patterns	Weight category	N (208)	Mean Rank	P-value
Traditional pattern				
	Underweight	12	95.25	
	Normal Weight	142	100.85	
	Overweight	41	104.90	*0.032**
	Obese	13	151.69	
Combined pattern				
	Underweight	12	105.50	
	Normal Weight	142	109.15	
	Overweight	41	93.54	0.353
	Obese	13	87.38	
Major protein pattern				
	Underweight	12	95.08	
	Normal Weight	142	109.02	
	Overweight	41	85.10	0.076
	Obese	13	125.00	
Modified pattern				
	Underweight	12	114.17	
	Normal Weight	142	101.15	
	Overweight	41	116.17	0.459
	Obese	13	95.31	
White and red meat pattern				
	Underweight	12	102.08	
	Normal Weight	142	107.18	
	Overweight	41	93.00	0.552
	Obese	13	113.69	
Sweets and Pastries pattern				
	Underweight	12	96.50	
	Normal Weight	142	94.39	
	Overweight	41	139.83	*<0.001**
	Obese	13	110.92	
Rare Dietary pattern				
	Underweight	12	113.42	
	Normal Weight	142	102.64	
	Overweight	41	100.10	0.386
	Obese	13	130.46	
Vegetables with high moisture				
	Underweight	12	111.33	
	Normal Weight	142	102.02	
	Overweight	41	102.73	0.404
	Obese	13	130.85	

Kruskal-Wallis test was used for the analysis, N=total. This test was used to do the comparisons because the factor score values were ordinal and skewed.

was significantly higher with the Traditional dietary pattern, while overweight was significantly higher with the sweets and pastries pattern. Table 5 shows the association between dietary patterns and BMI categories.

DISCUSSION

This study assessed the dietary patterns of an adult population in Accra, the capital city of Ghana and determined their association with BMI. The mean BMI of participants in this study was 23.1 ± 3.9 kg/m^{2,} with females having significantly higher BMI than males. Previous studies on BMI have reported similar findings [19,20]. The World Health Organization [19] reported that the mean BMI in Africans was 23.1 kg/m^2, with the mean BMI of males and females being 22.4 kg/m^2 and 24.1 kg/m^{2,} respectively, which is consistent with the findings of this study. Overweight and obesity were predominant among the female participants in this present study, similar to findings in a systematic review and meta-analysis of the overweight and obesity epidemic in Ghana [6]. Other studies have also reported a higher rate of overweight and obesity in females than males [21-24]. These differences could be attributed to women having more body fat deposition than men [25,26]. Eight dietary patterns were identified in the study. By contrast, the Research on Obesity and Diabetes among African Migrants (RODAM) carried out among urban and rural Ghanaians in the Ashanti Region, and Europe identified three dietary patterns (mixed pattern: rice, pasta, meat and fish pattern; and the roots, tubers and plantain pattern) [27-29]. Even though the dietary patterns identified in this study did not map directly onto the dietary patterns in the RODAM study, elements of overlap exist. For instance, the mixed pattern identified in the RODAM study had characteristics similar to five (5) of the dietary patterns in this present study, i.e., the traditional DP, Combined DP, white and red meat DP, vegetables with high moisture DP, and sweets and pastries DP. The rice, pasta, meat, and fish patterns in the RODAM study had characteristics similar to the combined DP, modified DP, and sweets and pastries DP in this present study. Additionally, the root tubers and plantain pattern had characteristics comparable to the traditional pattern in this study. The present study, however, identified one new dietary pattern, the rare dietary pattern, which was not identified in the RODAM study. The rare dietary pattern consisted of these food items: Bambara beans, grapes, cheese, and soya beans.

In a similar study to determine the association between the risk of type 2 diabetes and dietary patterns among urban Ghanaians (Kumasi), two dietary patterns (purchase dietary pattern and traditional dietary pattern) were identified [30]. The component food items in the purchase dietary pattern were found in 4 separate dietary patterns in our study, namely sweets and pastries pattern, white and red meat pattern, combined pattern, and vegetables with high moisture content pattern. The traditional pattern identified in the Kumasi study also had elements of the traditional pattern and the combined pattern in our study with high loadings on plantains, fruits, garden eggs and green leafy vegetables. However, the modified pattern, major protein pattern and rare dietary pattern identified in the present study were not accounted for [30] in previous studies. The dietary patterns identified in this adult population in Accra corroborate other studies in different parts of the world. There is an overlap of the food items in some studies [31,32] despite slight variations in the naming of the patterns, likely due to differences in geographical locations, which influence the food environment. In Hangzhou, East China [32], four dietary patterns (animal food, traditional Chinese, western fast food and high-salt patterns), whose elements can be found in the major protein, traditional, combined vegetables with high moisture, rare, sweets and pastries dietary patterns were identified. Contrarily, this study identified the modified pattern whose elements cannot be found in any of the patterns reported in the Hangzhou study [32]. Some findings from other studies were not consistent with the results of our study [9,33,34]. For instance, a study in the Quebec City metropolitan area [9] identified two dietary patterns among adults: the western pattern with high loadings of refined grains, French fries, condiments, processed meats, regular soft drinks, pizza, snacks, and the prudent pattern with high loadings on non-hydrogenated fat, vegetables, eggs, fish and seafood, wine, coffee, regular dairy products as well as whole grain products. Despite a few similarities in the food items, there were more variations than in our study.

Similarly, three dietary patterns (cereals-savoury foods, fruit-veg-sweets-snacks and animal-food patterns) with elements different from those reported in our study were observed in India [33]. Two other dietary patterns (mixed and processed patterns) were reported in a study among four African populations [34]. These inconsistencies may reflect the differences in geographical location and culture and, hence, are not totally unexpected. Geographical location affects the availability, accessibility, and affordability of food items, whereas culture may influence the recipes for the food products as well as the type of food consumed. In line with this, a strong association was identified between geographical location and culture with variance in food intake among University students in the UK [35].

The traditional and the sweets and pastries patterns in the present study were significantly associated with BMI. Frequent consumption of the traditional pattern was seen among obese individuals, whereas the frequent consumption of the sweet and pastries pattern was observed among overweight participants. A plausible explanation for these observations could be the energy-dense nature of the foods identified under the two patterns. The sweets and pastries pattern was energy-dense with foods high in saturated fat and low in fibre coupled with high added sugars, whereas the traditional pattern was composed of some energy-dense food components such as cassava, sweet potato, yam, and coconut oil. A number of studies have also reported a strong association between energy-dense, high-saturated fat, low-fibre dietary patterns and overweight and obesity in adults [34,36,37]. These dietary patterns often contain carbohydrate foods that are high in glycaemic index and cause rapid changes in blood glucose and insulin levels. Frequent consumption of these diets leads to excess calories, which, when coupled with low physical activity, leads to overweight or obesity.

The results of our study are consistent with previous studies reporting that various dietary patterns of adults influence BMI [8,9,11]. In connection with this, a systematic review of studies evaluating the association between dietary patterns and BMI [38] found that the fatty, sweets or energy-dense patterns were positively associated with BMI, while fruits and vegetables DP were inversely associated with BMI. In addition, a significant association was found between the Processed Dietary Pattern and overweight and obesity in a study that assessed dietary patterns in Tanzania, South Africa, and peri-urban and rural Uganda [34]. This dietary pattern contained elements of the sweets and pastries dietary patterns identified among Ghanaian adults. No such association between overweight and obesity in the mixed dietary pattern was reported in the other African countries. The mixed dietary pattern contained elements of the combined white and red meat patterns seen in this present study.

Overall, the results of our study reveal that sweets and pastries and traditional dietary patterns play a significant role in obesity and overweight dispositions. The RODAM study [28] found that adherence to the ‘mixed’ and ‘rice, pasta, meat, and fish’ dietary patterns were significantly associated with a higher BMI ($p < 0.001$) and lower risk of type 2 diabetes and 10-year atherosclerotic cardiovascular disease risk (ASCVD) in Ghanaian adults in Ghana and Europe. The mixed, rice pasta, meat and fish dietary patterns had some elements of the sweets and pastries DP associated with high BMI in our study population. However, frequent consumption of 'roots, tubers, and plantain' dietary patterns in the RODAM study, which were similar to the traditional DP in the present study, were significantly associated with a lower BMI (p = 0.003) and reduced risk of type 2 diabetes. Contrary to this, the traditional dietary pattern in our study was associated with overweight and obesity. Portion sizes, as well as recipes for the foods, could be contributing factors to this difference.

The findings in our study did not show a significant association between the major protein pattern and BMI. This is not consistent with other studies conducted in sub-Saharan Africa and India, which found an association between protein patterns and BMI (overweight/obesity) [33,39]. An association between the protein dietary pattern and BMI among urban Ghanaian women, but not Malawi or Tanzania, was recently reported [39]. In contrast with some other studies, the results of our study did not also show an association between the red and white meat pattern and BMI (obesity) [33,40]. Varied recipes used in various countries may be a contributing factor to the inconsistencies. The results of this study show that it may be crucial for adults to receive nutrition guidance and education concerning dietary options, taking into consideration all the patterns identified with more emphasis on the traditional pattern and sweets and pastries pattern. The food frequency questionnaire used in this study is based on recall, which may be subject to bias. Dietary intake assessment using the food frequency questionnaires (FFQ), on the other hand, has been found to be appropriate in indicating usual intake, which is essential in this study. The results of this study may not be applicable to other populations.

Conclusion

Dietary patterns characterised by the intake of starchy root tubers, local vegetables, sweets and pastries may exert a negative effect on weight gain. Further studies assessing the food environment, availability, accessibility and preparatory methods would be useful in establishing causal relationships.

DECLARATIONS

Ethical consideration

The study was approved by the Protocol Review Committee of the University of Ghana, College of Health Sciences (CHS-Et/M.5 - 4.5/2020-2021).

Consent to publish

All authors agreed on the content of the final paper.

Funding

None

Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author contributions

MA, TN, and JAQ participated in the conception and design of the study. BA and MA participated in the acquisition of data. Analysis and interpretation of data were done by BA, TN, MA, JAQ, AAM and RO. BA, RO, MA, TN, JAQ and AAM participated in the drafting of the manuscript.

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Availability of data

Data for this work is available upon reasonable request from the corresponding author.

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