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## Physical activity patterns and dietary habits of undergraduate students

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### Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Data Interpretation
- E Manuscript Preparation
- F Literature Search
- G Funds Collection

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### abstract

**Background:** Data about physical activity report card for Ghanaian children and youth are available but reports on physical activity patterns and dietary habits of undergraduates are scarce.

**Material and methods:** This cross-sectional study sampled 278 participants (161 males, 117 females, mean age = 20.73 ± 1.72 years). Blood pressure, heart rate, physical activity patterns and dietary habits were measured.

**Results:** Most (83.1%) of the sample predominantly engaged in household activities. Time spent on treadmill/cycling activities is significantly higher in females than males ( $P = 0.018$ ). Day/week for high intensity sports was higher in males ( $P = 0.005$ ), while household work was significantly higher in females ( $P = 0.032$ ). Few people observed breakfast. There was poor consumption of soft drinks, vegetables, fresh fruits, dairy products, fast-foods, fried foods, and cake/biscuit twice/three times a week; 70.3% seldom consumed energy drinks; 49.8% ate the main meal daily. Males significantly had higher systolic blood pressure (SBP) ( $P = 0.014$ ) and consumed fried foods habitually more often than females ( $P = 0.026$ ).

**Conclusions:** Participants mainly involved in low physical activities and consumed less than recommended amounts of fruits and vegetables per week. Proactive and regular health-enhancing physical activity interventions would stimulate participation and healthy dietary habits of university students.

**Key words:** exercise, nutrition, health behaviour, obesity, gender, public health.

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## INTRODUCTION

Individuals who live a sedentary lifestyle are susceptible to many chronic diseases like diabetes, cardiovascular disease (CVD) and some cancers [1]. Increased sedentary behaviours and unhealthy dietary habits coupled with the use of technology for learning, recreation, and at workplace account for the global prevalence of obesity and its related non-communicable diseases (NCDs) [2]. Several NCDs risk factors, such as too little fruit/vegetable consumption, unhealthy dietary habits, physical inactivity, tobacco use and alcohol consumption, elevated blood pressure, blood glucose, and lipid levels, overweight and obesity are preventable or could be completely eliminated [3, 4].

Obese children and adolescents are at risk of cardiovascular problems, like ischaemic heart disease and stroke, insulin resistance, non-alcoholic fatty liver disease, polycystic ovarian syndrome, some cancers, skeletal problems, varying inflammatory conditions, and upsurge adulthood premature mortality, risk for disability and morbidity, hypertensive disorders, and haemorrhage [4, 5]. The waist-hip ratio (WHR), blood pressure (BP), the body mass index (BMI) and the heart rate (HR) are among reported tools for examining, screening and predicting the prevalence of obesity, overweight, non-communicable diseases and other disease risks [6-10].

Regular physical activity (PA)/exercise and healthy dietary habits play important roles in preventing non-communicable diseases (NCD) [4, 11]; they decrease the risk of non-communicable diseases, delay the onset of diabetes [12], increase mental well-being [13], lower blood pressure in adults, improve blood glucose control by increasing insulin sensitivity [19], assist in weight reduction in visceral fat [15], reduce the risk of many chronic diseases among men and women [16] and help maintain a healthy body weight [17].

Although physical activity and healthy dietary habits are beneficial to human health, the transition from secondary school to university is often accompanied by decreased physical activity, unhealthy dietary habits and increased sedentary behaviours - causative agents for the development of obesity [18, 19]. Physical activity report card for Ghanaian children and youth (12-17 years old) has been documented [2, 20]. But information on the physical activity patterns and dietary habits of undergraduate Ghanaians (18 years old and above) who are the next generation of workforce is scarce. Therefore, this study investigated physical activity patterns and dietary habits of undergraduate Ghanaians while regard to gender.

## MATERIAL AND METHODS

### DESIGN AND PARTICIPANTS

A quantitative cross-sectional survey was employed to investigate the physical activity patterns and dietary habits of undergraduate Ghanaian students while moderating for gender, age group and year of study. Two hundred and seventy-eight undergraduate university students were recruited with a stratified sampling technique from six colleges: Sciences (50; 17.9%); Health Sciences (45; 16.1%), Arts and Built Environment (40; 14.3%), Engineering (50; 17.9%), Agriculture & Natural Resource (43; 15.4%) and Humanities & Social Science (50; 17.9%). Out of the total participants, 57.7% (161) were males and 41.9% (117) were females. Sixty of the participants, representing 21.5%, were in year one, 87 (31.2%) were in year two, 48 (17.2%) in year three and 83 (29.7%) were in the fourth year of

the programme. Besides, 128 (46.04%) were within the age range of 18–20, 149 (53.60%) were within 21–25 and 1 (0.35%) was within 26–30. Participants were included if admitted in the university for at least one semester, with a minimum age of 18, from any of the six earlier mentioned colleges, and not on any prescribed drugs.

Anthropometric measurements including height, weight, waist, hip circumference, and body mass index were carried out according to the protocol of the International Society for the Advancement of Kinanthropometry [21]. Height (m) and body weight (kg) were measured with the Health-O-Meter (HY-RGZ160 Weight & height measuring scale, China). The body mass index (BMI) was determined as the ratio of the body weight (kg) value divided by the square value of height (m). Waist circumference (WC) was measured midway between the inferior angle of the ribs and the suprailiac crest [22] using a non-elastic measuring tape [23].

## **PHYSIOLOGICAL PARAMETERS**

Blood pressure (systolic and diastolic) and the heart rate were measured in the sitting position after a five-minute rest. The average of three consecutive readings using automatic blood pressure equipment (Omron BP Monitor M10-IT) was recorded [24].

## **QUESTIONNAIRE**

The value of physical activity patterns (PAP) was assessed using the Arab teens lifestyle study (ATLS) questionnaire, a tool for assessing the lifestyle habits of adolescents, developed by Al-Hazzaa, Al-Sobaye and Musaiger [25]. However, to accommodate for Ghanaian diets, ATLS was slightly modified for dietary habits assessment and made in three parts: the first part included demographic information (Age, Gender, Study level (year) and College); the second part comprised questions on students' physical activity patterns (32 items) – the questionnaire seeks information on the frequency, duration and intensity of a variety of light, moderate, self-defence weight training/body building and household work physical activities/sports during a typical (usual) week; and the last part consisted of questions on dietary habits (10 items) that cover the consumption of fresh fruits, vegetables, dairy products, fried foods, drink/soft drinks and energy drinks.

## **ETHICAL ISSUES**

The study received approval of the Committee on Human Research, Publications and Ethics (CHRPE) of the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana (Ref. No.: CHRPE/AP/355/17). All the participants signed a consent to participate form after attaining personal understanding of the rationale of the study.

## **DATA ANALYSIS**

The data was analysed using Statistical Package for Social Science (SPSS version 23.0). To determine the differences in self-reported current physical activity patterns and dietary habits by gender, Mann-Whitney U test and chi-square ( $\chi^2$ ) were used. Paired t-test was used for comparison of the body mass index, blood pressure and the heart rate by gender. Significance was set at P value of 0.05.

## RESULTS

Results of the present study showed variations in the body mass index, blood pressure, the heart rate, physical activity patterns and dietary habits of the sampled population based on gender. Females' body mass index was insignificantly higher ( $P > 0.05$ ); systolic blood pressure was significantly higher in males ( $P < 0.05$ ); diastolic blood pressure was insignificantly higher in males ( $P > 0.05$ ), while the heart rate was insignificantly higher in females ( $P > 0.05$ ). There was an increase in the mean body mass index with an increase in age. Out of the 278 participants, 13 (4.7%) were underweight, 235 (84.5%) had normal weight, 23 (8.3%) were overweight and 7 (2.5%) were obese.

Table 1 shows the physical activity (PA) patterns of the participants presented in time spent (in minutes) or number of days/week of participation by gender. Time spent (in minutes) on PA participation every week ranged from 16 to 88 minutes. Time spent on swimming once per week had the highest 50th percentile whilst the least was on treadmill/cycling, weight training and other sports. Females spent significantly higher time on treadmill/cycling and household works once and three times / day / week, respectively, than males. Males engaged in high intensity sports once/week significantly more than females. Most of the participants (169; 60.6%) engaged in PA for health reasons whilst the least (31; 11.1%) participated for recreational purposes (Table 2).

As shown in Table 3, only 81 (29.0%) of the participants observed breakfast and 93 (33.3%) ate dairy products twice / three times per week whereas 139 (49.8%) consumed the main meal once daily. Drinks/soft drinks, cakes/biscuits, fast foods, and fried-foods were mostly consumed twice/three times per week. Although dietary habits varied between male and female participants as shown in Table 4, only the consumption of fried foods was significantly higher ( $P = 0.026$ ) in males when compared to their female peers.

Table 1. Distribution of physical activity patterns by time (minutes)/day(s)

Physical Activities	Percentile		
	25th	50th	75th
	Time (minutes) per session [Days/week]	Time (minutes) per session Days/week]	Time (minutes) per session Days/week]
Jogging/Running	15.0 [1.0]	30.0 [1.0]	45.0 [2.0]
Treadmill/Cycling	10.0 [1.0]	15.0 [1.0]	20.0 [1.0]
Swimming	30.0 [1.0]	60.0 [1.0]	127.5 [1.0]
Moderate Intensity Sports	15.0 [1.0]	30.0 [1.0]	30.0 [2.0]
High Intensity Sports	30.0 [1.0]	52.5 [1.0]	68.0 [1.0]
Self-Defence Sports	22.5 [1.0]	30.0 [1.0]	30.0 [1.0]
Weight Training	10.0 [1.0]	15.0 [1.0]	32.5 [3.0]
Household Work	15.0 [2.0]	30.0 [3.0]	45.0 [4.3]
Other Sports	6.5 [2.5]	15.0 [3.0]	60.0 [5.0]

Table 2. Difference in physical activity patterns between males and females

Physical Activities	Mean rank		P-value
	Males	Females	
	Time (minutes) per session [Days/week]	Time (minutes) per session Days/week]	Time (minutes) per session Days/week]
Jogging/Running	50.54 [ 144.46]	53.34 [132.68]	1108.0 [8620.0]
Treadmill/Cycling	9.60 [138.80]	16.86 [140.47]	34.5* [9305.5]
Swimming	5.50 [139.69]	5.50 [139. 24]	12.0 [9388.0]
Moderate Intensity Sports	39.32 [133.97]	33.68 [147.11]	546.5 [8528.0]
High Intensity Sports	32.73 [147.90]	28.24 [127.94]	327.0 [8066.0*]
Self-Defence Sports	3.50 [139.09]	2.67 [140.06]	2.0 [9352.0]
Weight Training	53.79 [144.56]	46.37 [132.54]	1021.0 [8604.0]
Household Work	112.03[130.88]	120.76[151.37]	6115.0 [8030.0*]
Other Sports	8.50[5.50]	6.55 [7.45]	10.5 [10.5]

\*Significant at  $P < 0.05$ .

Table 3. Distribution of dietary habits

Diets	Daily N (%)	Once a week N (%)	Twice / three times a week N (%)	More than 3 times a week N (%)	Once a month N (%)	More than once a month N (%)	Seldom N (%)
Breakfast	62 (22.2)	24 (8.6)	81 (29.0)	57 (20.4)	3 (1.1)	2 (0.7)	49 (17.6)
Drinks / Soft drinks	27 (9.7)	53(12.5)	89 (31.9)	64 (22.9)	9 (3.2)	9(3.2)	45(16.1)
Energy drinks	4(1.4)	36(12.9)	9 (3.2)	5(1.8)	21(7.5)	7(2.5)	196(70.3)
Vegetables	48(17.2)	35(12.5)	71(25.4)	64(22.9)	8(2.9)	7(2.5)	44(15.8)
Fresh fruits	14(5.0)	49(17.6)	80(28.7)	35(12.5)	13(4.7)	8(2.9)	78(28.0)
Dairy products	23(8.2)	41(14.7)	93(33.3)	62(22.2)	8(2.9)	8(2.9)	43(15.4)
Fast foods	11 (3.9)	47(16.8)	77(27.6)	43(15.4)	15(5.4)	14(5.0)	71(25.5)
Fried foods	8(2.9)	67(24.0)	72(25.8)	49(17.6)	4(1.4)	7(2.5)	71(25.5)
Cakes / biscuits	17(6.1)	56(20.1)	62(22.2)	23(8.2)	16(5.7)	12(4.3)	92(33.0)
Main meals	139(49.8)	11(3.9)	43(15.4)	73(26.2)	2(0.7)	4(1.4)	6(2.2)

Table 4. Dietary habits between males and females

Diets	Sex	Daily N (%)	Once a week N (%)	Twice / three times a week N (%)	More than 3 times a week N (%)	Once a month N (%)	More than once a month N (%)	Seldom N (%)	P-value
Breakfast	Male	34 (54.8)	8 (33.3)	53 (65.4)	33 (57.9)	3 (100)	1 (50.0)	29 (59.2)	0.077
	Female	28 (45.2)	16 (66.7)	28 (34.6)	24 (42.1)	0	1 (50.0)	20 (40.8)	
Drinks / Soft Drinks	Male	12 (44.4)	16 (45.7)	55 (61.8)	38 (59.4)	7 (77.8)	7 (77.8)	26 (57.8)	0.250
	Female	15 (55.6)	19 (54.3)	34 (38.2)	26 (40.6)	2 (22.2)	2 (22.2)	19 (42.2)	
Energy Drinks	Male	4 (100)	20 (55.6)	4 (44.4)	5 (100)	14 (66.7)	5 (71.4)	109 (55.6)	0.057
	Female	0	16 (44.4)	5 (55.6)	0	7 (33.3)	2 (28.6)	87 (44.6)	
Vegetables	Male	19 (39.6)	22 (62.9)	42 (59.2)	40 (62.5)	4 (50)	4 (57.1)	29 (65.9)	0.192
	Female	29 (60.4)	13 (37.1)	29 (40.8)	24 (37.5)	4 (50)	3 (42.9)	15 (34.1)	
Fresh Fruits	Male	7 (50.0)	33 (67.3)	41 (51.2)	23 (65.7)	6 (46.2)	5 (62.5)	46 (59.0)	0.420
	Female	7 (50.0)	16 (32.7)	39 (48.8)	12 (43.3)	7 (53.8)	3 (37.5)	32 (41.0)	
Dairy Products	Male	13 (56.5)	21 (52.2)	57 (61.3)	35 (56.5)	6 (75.)	5 (62.5)	24 (55.8)	0.877
	Female	10 (43.5)	20 (48.8)	36 (38.7)	27 (43.5)	2 (25.)	3 (37.5)	19 (44.2)	
Fast Foods	Male	8 (72.7)	20 (42.6)	51 (66.2)	25 (58.1)	11 (73.3)	10 (71.4)	36 (50.7)	0.064
	Female	3 (27.30)	27 (57.4)	26 (33.8)	18 (41.9)	4 (26.7)	4 (28.6)	35 (49.3)	
Fried foods	Male	6 (75.0)	39 (58.2)	39 (54.2)	25 (51.0)	4 (100)	7 (100)	41 (57.7)	0.026*
	Female	2 (25.0)	28 (41.8)	33 (45.8)	24 (49.0)	0	0	30 (42.3)	
Cakes / Biscuits	Male	8 (47.1)	27 (48.2)	34 (54.8)	13 (56.5)	10 (62.5)	10 (83.3)	59 (64.1)	0.211
	Female	9 (52.9)	29 (51.8)	28 (45.2)	10 (43.5)	6 (37.5)	2 (16.7)	33 (35.9)	
Main Meals	Male	83 (59.7)	9 (81.8)	20 (46.5)	43 (58.9)	2 (100)	2 (50)	2 (33.3)	0.168
	Female	56 (40.3)	2 (18.2)	23 (53.5)	30 (41.1)	0	2 (50)	4 (66.7)	

\*Significant at  $P < 0.05$ .

## DISCUSSION

With more studies on the need to encourage physical activity and good eating habit among adolescent individuals, the present study investigated the physical activity patterns and dietary habits of Ghanaian undergraduate students. Generally, participants demonstrated physically inactive lifestyle, which is consistent with previous research with a similar population [26–29]. To promote and maintain healthy living, individuals should perform vigorous-intensity physical activity for a minimum of 20 minutes three days per week, or moderate-intensity physical activity for a minimum of 30 minutes five days per week [26]. Overall, participants engaged in PA at an average of 2 days per week except household work. This pattern is less than the recommended minimum of 3 or 5 days for physical activity participation per week [27]. Although the majority of the sample in this study do not meet the recommended minimum days (3 or 5 days) to be physically active, they met the recommended amount of time (duration) required for each session of physical activity participation [27].



Students spent most of their time in lecture halls, laboratory and library to learn coupled with active transport system which could contribute to physical inactivity. The majority of the sample do not prefer any of the presented sports (soccer, basketball, athletics, and tennis) which reiterates the findings of Fagaras, Radu, & Vanvu [28]. The reason being that students preferred walking and running activities which they can perform anytime, anywhere and with no cost as compared to soccer, rugby, hockey, netball, basketball, handball, athletics, tennis, and squash that have some cost implications.

The present study revealed that 43.7% of the students engaged in physical activity in the morning while 1.8% participated in physical activity after evening meal and noon time. This could be because students become refreshed and regain energy from the night rest for physical activity in the morning through cool weather conditions. Also few students engaged in physical activities after the evening meal due to tiredness accumulated during the day. These do not support the outcome of Rosenberg and Wood [29] that almost half the cohort (45.5%) exercise in the evening while fewer people exercised in the morning. Goodman, Page and Cooper [30] also reported that there was association with increased daily activity across the full range of time after sunset.

Almost half of the study population engaged in physical activity for health reasons while 11.1% participated in physical activity for recreation. Health benefits of the reported active lifestyle include reduction in CVD risk factors [31], building and maintaining healthy bones and muscles [32], reduces obesity, reduced stress and anxiety and promoting well-being and a healthy lifestyle [33]. Ruiz [34] testified that the main reasons for failing to practice physical activities are the lack of time, costs, and the distance from exercise facilities.

Participant's intake of fruits and vegetables per week on average was 3 to 4 days. Studies have reported similar findings that university students consume less than the recommended intake of fruits and vegetables [4, 35, 36]. For individuals to eat healthier, Hall, Moore, Harper, & Lynch [36] recommended the consumption of at least five servings or 400 g of fruit and vegetable each day. This showed that the sampled students in this study do not meet the said recommendation since they do not consume fruits and vegetables every day due to the assumed high cost of fruits and vegetables, compared with other foods. Consumption of "takeaway" or fast food was more than twice a week and this is similar to previous studies [36-38]. Students consumed fast foods more than twice a week because of the claimed lack of time to prepare food and much available fast foods restaurants to purchase from. High prevalence of takeaway and fast foods consumption is associated with poorer diet quality and body weight [38].

## CONCLUSIONS

Most of the undergraduate students in this study mainly engaged in low physical activity and consumed less than the recommended amounts of fruits and vegetables per week. University health stakeholders should be proactive in organizing regular physical activity and health education interventions to promote good healthy living among students. Future studies of university student's dietary habits and physical activity patterns with a larger sample size and many universities are recommended.

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