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Original Article

Nutrition and Cancer Prevention: An Assessment of Undergraduates' Knowledge and Nutritional Practices

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ABSTRACT

Context: Unhealthy eating habits combined with risky lifestyle behaviour developed early in life, may over a long time, increase the risk of developing a chronic non-communicable disease, such as cancer. The level of knowledge and understanding of cancer risk factors influences an individual's decision to adopt preventive measures. The assessment of this vital information has received much less attention among university undergraduates.

Aim: This study assessed the nutrition knowledge of cancer prevention and nutritional practices of undergraduates.

Settings and Design: The study was done in Obafemi Awolowo University, Ile-Ife, Osun State, using a descriptive cross-sectional study design.

Materials and Methods: A sample of 400 undergraduates completed the semi-structured self-administered questionnaire used for the study. Questions cover sociodemographic characteristics, nutrition knowledge of cancer prevention, nutritional practices and nutritional status of undergraduates. The resulting data were analysed using IBM SPSS (version 22).

Results: The mean age standard deviation of the respondents was 20.7 (±2.5) years and were mostly (57.0%) in their 2nd year of the study. Half had good knowledge of foods that are protective against cancer; 61%–81% consumed whole grains, foods of animal origin and added salts thrice or more per week, whereas fruits and vegetables, legumes and nuts, were less consumed per week (25%–34%). Waist-hip-ratio revealed that 51% were at risk of malnutrition. There were statistically significant relationships between nutrition knowledge and intake of fruits, vegetable, foods of animal origin, coffee and physical exercise at $P < 0.05$.

Conclusion: This study shows that the level of nutrition-related cancer prevention knowledge of the participants was average. Public health interventions should focus on the promotion of healthy nutritional practices and lifestyles in the population.

Key words: Cancer prevention, nutrition knowledge, nutritional practices, undergraduates

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INTRODUCTION

Non-communicable diseases (NCDs) such as cancer are responsible for the majority of deaths reported globally. In 2008, a global cancer incidence of 12.7 million and 7.6 million cancer deaths was recorded.[1] The new cases of cancer kept increasing in the figure to 14.1 million new cases and 8.2 million cancer deaths in 2012,[2] 14.9 million new cases and 8.2 million deaths in 2013,[3] and 8.8 million deaths in 2015.[4] According to the World Health Organisation (WHO) report in 2018, cancer remains the second leading cause of death globally, and it is responsible for an estimated 9.6 million deaths.[5] Approximately two-thirds of these deaths occur in low- and middle-income countries. There are projections that the incidence of cancer and the resulting death might double in the next two decades because of increasing population and ageing.[6] Cancer of the lung, female breast and colorectum represents one-third of cancer incidence and mortality globally in 2018. In males, lung cancer is most frequently diagnosed and is the leading cause of cancer death, followed by prostate cancer, colorectal cancer, liver and stomach cancer. However, in females, breast cancer has the highest incidence and the leading cause of death, followed by lung cancer, colorectal

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cancer and cervical cancer.[5] In 2018, breast cancer was the leading case among females with 26,310 (22.7%) and prostate cancer among males with 13,078 (29.1%) in Nigeria.[7] Dietary and lifestyle risks such as low fruit and vegetable intake, lack of physical activity, tobacco use and alcohol abuse were associated with one-third of mortality from cancer.[5] Public awareness of adopting healthy lifestyles is an appropriate investment that can reduce the risk of cancer.

Unhealthful eating combined with other lifestyle factors (cigarette smoking, sedentary lifestyle, alcohol abuse, being overweight and too much sunlight exposure) may over a long time, increase the risk of developing some cancers.[8] Notably, the American Institute of Cancer Research established that diet played a crucial role in the aetiology of many chronic degenerative diseases.[9] The burden of cancer is increasing in economically developing countries partly due to increased adoption of westernised diets, which includes consumption of calorie-dense foods, high fatty foods, high salts and low fruits and vegetable intake.[10] The dietary shift from traditional-based healthy diets rich in nutrients and dietary fibre in favour of refined and overly processed foods has resulted in a cascade in diet-related, chronic NCDs.[11] Nutrition knowledge is imperative to correct these anomalies.[12] Healthy diets, such as high consumption of fruits and vegetables and lower fat intake, are associated with reduced risk for obesity, cardiovascular disease, diabetes and many cancers,[13] whereas unhealthy diets lead to excessive body weight resulting in the emergence of different cancers of the body parts.[14,15]

Previous studies have revealed that university students have unhealthy nutritional practices; eat more fast foods usually high in fat, sugar and salt, low fruit and vegetable consumption, meal skipping and engage in little physical activity.[16-19] These unhealthy practices are known to be linked with increased cancer risk later in life. The knowledge and understanding of cancer risk factors and the outcome of the disease influence an individual's decisions to adopt preventive measures.[20] University students make positive changes in exercise and dietary habits, and when these changes persist into the adult years, the risk of chronic diseases may be reduced.[21] This study, therefore, assessed the nutrition knowledge of cancer prevention and nutritional practices of undergraduates of Obafemi Awolowo University (OAU), Ile-Ife, Osun State, Nigeria.

MATERIALS AND METHODS

This study employed a descriptive cross-sectional design. OAU, Ile-Ife, Osun State, Nigeria, was the location of the study. OAU currently has a total number of 35,000 students with 13 faculties, 82 departments and 2 colleges. The university comprises of central campus, students residential areas, staff quarters, market and many fast food arenas. These fast food arenas serve both local and westernised foods and enjoy good patronage from the students, especially during the examination periods. There are also satellite eateries in the halls of residence and at the student union building which serves mostly local diets and enjoy good patronage by students. Each hall of residence, however, has a buttery where snacks, fried chips and sugary drinks can be purchased, and there are other outlets around that provide similar services. There are spots located near all the halls of residence where grilled meat (suya) and fried eggs with bread are display every night, and they enjoy good patronage from students.

The study population was undergraduates of OAU, Ile-Ife. All undergraduates from year 2 with the assumption that respondents must have spent at least 1 year on campus were eligible. The sample size was determined using Leslie Fischer's formula for a single population proportion ($n = Z^2p\,[1 - p]/d^2$). The prevalence of good nutrition-related knowledge of cancer prevention was 49% from a previous study,[22] with a 95% confidence interval and precision of 5%. After accounting for a non-response rate of 10%, the total sample size was rounded up to 420. Respondents were selected using a multistage sampling technique. Six faculties were selected using simple random sampling technique (balloting method) which include Arts, law, Technology, Sciences, College of Health Sciences and Administration. In the second stage, a simple random technique (balloting) was also used to select two departments from each faculty, except the Faculty of Law, which has no departments. In the third stage, a simple random sampling technique was used to recruit 35 respondents from each department.

A semi-structured self-administered questionnaire, which had four sections, was used. Questions cover sociodemographic characteristics, nutrition knowledge of cancer prevention, nutritional practices and nutritional status of undergraduates. The questionnaire was pretested in the faculty of pharmacy, and ambiguous questions were adjusted accordingly.

Data entry and analysis were done using the IBM-Statistical Product and Service Solutions (SPSS) version 20 (IBM SPSS Statistics for Windows, version 22.0, IBM Corp., Armonk, NY, USA). Each question was coded by appropriates numbers. Univariate analysis was done to analyse descriptive data, and the results are presented as frequencies and percentages for the categorical variables and as means and standard deviation (SD) for the continuous variables. Bivariate analysis was done using Chi-square to determine the relationship between cancer prevention nutrition-related knowledge and dietary intake of respondents. The level of significance was set at $P < 0.05$.

Nutritional knowledge

Questions were asked to assess the respondents' nutrition knowledge of cancer prevention based on guidelines from the literature.[9] A total of 22 questions were asked accordingly, and categorical responses (true/false/I don't know) were used. A score of '1' was given for a correct response while '0' for incorrect or 'I don't know' response. Knowledge score was calculated for each respondent, and score <50% of the total point was classified as poor knowledge.

Nutritional practices

Questions were asked to assess the respondents' dietary intake and lifestyle factors that can pre-dispose an individual to the

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risk of cancer in the future.[9] The participant's dietary intake was assessed with a food frequency questionnaire. The frequency of consumption of healthy foods (fruits, vegetables, whole grains, legumes and nuts) and unhealthy foods (sugary drinks, processed cereals, grilled meat, smoked fish, red meat and high salts) were obtained. Responses were dichotomised to >3 times/week (acceptable for healthy foods) and <3 times/week (acceptable for unhealthy foods).[22] Lifestyle factors assessed include meal preparation, smoking history, alcohol intake, physical activity, meal skipping and fast food patronage. Responses were also dichotomise to >3 times/week or <3 times/week.

Nutritional status

Body mass index (BMI) and waist-hip ratio (WHR) were used to assess the nutritional status of respondents. The measurements obtained were categorised using the WHO classifications. Respondents were classified as having either good or poor nutritional status. For the WHR, values above 0.85 for females and 0.90 for males were considered to be poor nutritional status and those having less than those values for either gender was said to be good nutritional status.

Ethical approval

Ethical approval was obtained from the Institute of Public Health Research and Ethics Committee, OAU, Ile-Ife, Nigeria. A written informed consent was obtained from participants before the administration of the study questionnaire. All data received were kept secure in a passworded computer.

RESULTS

A total of 400 undergraduates filled the questionnaire correctly out of 420, giving a response rate of 95%. The mean age (SD) was 20.7 (±2.5) years with the majority (95%) <25 years. Most respondents were female (52%), single (98.2%), Christians (86.5%) and belong to the Yoruba ethnic group (86.2%). Most respondents stayed off campus (68.2%), were in their 2nd year of study (57.0%), received <20,000 naira as monthly stipends (78.0%) and involved in personal cooking (85.5%) [Table I].

More than half of the respondents knew that limiting energy intake (54%), sugary drinks (57.8%), alcohol intake (70.2%), cigarette smoking (76%) and salts (51.8%) are good practice. Furthermore, eating fibre-rich foods (66%), daily intake of vegetables (70.5%) and fruits (73.2%), consuming fresh foods (74.8%) and maintaining a healthy weight (58%) are protective against cancer. Whereas, less than half knew that sedentary habits (38%), intake of refined foods (47.5%), quantity of vegetables (15%) and fruits (17.5%) consumed, foods of plant origin (30.5%), red meat (41%), fried foods (13.8%), smoked fish (38.2%), increased waistline (21.8%) and high-fat diets (37.2%) have a link with cancer [Table II]. About half (50.5%) of the respondents had good knowledge of nutrition-related cancer prevention, with males (51.5%) scoring higher than females (48.5%) [Figure 1]. There is no significant gender difference in the knowledge of cancer prevention ($\chi^2 = 1.986$; $P = 0.159$).

Table I: Sociodemographic characteristics of respondents ($n = 400$)

Variables	Frequency, *n* (%)
Age (years)	
≤25	380 (95.0)
>25	20 (5.0)
Mean±SD	20.7±2.5
Sex	
Male	192 (48.0)
Female	208 (52.0)
Marital status	
Single	393 (98.2)
Married	7 (1.8)
Religion	
Christianity	346 (86.5)
Islam	54 (13.5)
Ethnicity	
Yoruba	345 (86.2)
Others (Igbo and Hausa)	55 (13.8)
Residence	
Campus	127 (31.8)
Off campus	273 (68.2)
Level of study	
200	228 (57.0)
300	43 (10.8)
400	73 (18.2)
500	41 (10.2)
600	15 (3.8)
Monthly stipend	
≤20,000	312 (78.0)
>20,000	88 (22.0)
Amount spent on food/month	
<5000	132 (33.0)
5000–10,999	173 (43.2)
≥11,000	95 (23.8)
Source of food	
Personal cooking	342 (85.5)
Restaurant	58 (14.5)

SD: Standard deviation

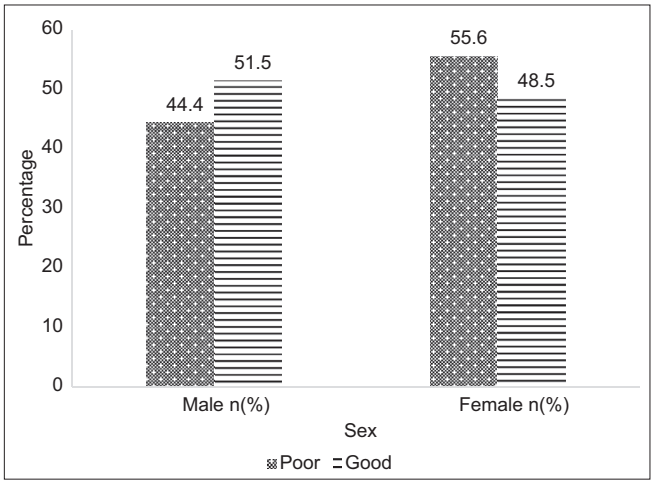

Figure 1: Cancer prevention nutrition-related knowledge score by sex

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Table II: Nutrition-related knowledge of cancer prevention

Parameters	Correct response		
	Male, *n* (%)	Female, *n* (%)	Total, *n* (%)
Limiting the intake of energy-dense foods protects against cancer?	100 (46.3)	116 (53.7)	216 (54.0)
Limiting sedentary habits can prevent cancer	73 (48.0)	79 (52.0)	152 (38.0)
Limiting sugary drinks can reduce the chance of cancer	108 (46.8)	123 (53.2)	231 (57.8)
Eating more fibre-rich food is protective against cancer?	138 (52.3)	126 (47.7)	264 (66.0)
Intake of refined starchy food prevent cancers?	84 (44.2)	106 (55.8)	190 (47.5)
Daily eating of vegetables should be avoided	127 (45.0)	155 (55.0)	282 (70.5)
Daily intake of fruits should be avoided	143 (48.8)	150 (51.2)	293 (73.2)
A variety of starchy roots and tubers are good daily	58 (50.0)	58 (50.0)	116 (29.0)
Vegetables should amount to about half the plate	39 (65.0)	21 (35.0)	60 (15.0)
Fruits should amount to about half the plate of an adult	41 (58.6)	29 (41.4)	70 (17.5)
Foods of plant origin are least protective against cancers	72 (59.0)	50 (41.0)	122 (30.5)
Avoiding excessive intake of red meat is not protective	78 (47.6)	86 (52.4)	164 (41.0)
Fried fish is better consumed compared with red meat	36 (65.5)	19 (34.5)	55 (13.8)
Regular consumption of smoked fish increases the chances of having cancer	95 (62.1)	58 (37.9)	153 (38.2)
Reducing alcohol intake is protective against cancer	124 (44.1)	157 (55.9)	281 (70.2)
Avoiding smoking is protective against cancer	142 (46.7)	162 (53.3)	304 (76.0)
Eating food fresh is important to protect against cancer	145 (48.5)	154 (51.5)	299 (74.8)
Avoiding stale foods protect against cancers	125 (48.8)	131 (51.2)	256 (64.0)
Limiting salt intake can protect against cancers	97 (46.9)	110 (53.1)	207 (51.8)
Maintaining a healthy weight is protective	117 (50.4)	115 (49.6)	232 (58.0)
Increase in waistline lead to cancers	46 (52.9)	41 (47.1)	87 (21.8)
High intake fatty diets decreases developing cancer	79 (53.0)	70 (47.0)	149 (37.2)

Dietary intake of the respondents revealed that 80.8% consumed whole grains, 61.2% consumed foods of animal origin and 63.5% used added salts three times or more per week while less than half consumed fruits (26.5%) and vegetables (24.8%), sugary drinks (45.2%), dairy products (20.5%), processed cereals (26.2%), roots and tubers (14.8%), red meat (36.5%), smoked fish (22.2%), grilled meat (19.5%), legumes and nuts (33.5%) and coffee (10.5%) three times or more per week [Table III].

The lifestyle habits of the respondents showed that majority prepare their meals (77.8%) and also skipped breakfast (62.2%) more than 3 times/week. Approximately one in five respondents patronise fast food joints (22%) and consumed canned foods (23%) more than 3 times per week. Seven out of 65 respondents consumed alcoholic beverages thrice or more per week (10.8%) and three out of 13 respondents also smoke a cigarette (23.1%). Approximately half of the respondents engage in physical exercise (49.5%) and mostly males (52%) [Table III].

Table IV shows the nutritional assessment of the respondents. The BMI revealed that the majority (71.4%) had a normal body weight, 13% were overweight and 5.8% were obese. Females have higher BMI (71.2%; 60.9%) compared to males (28.8%; 39.1%). WHR revealed that approximately, half of the respondents were at risk of malnutrition (51%) and were more of females (57.8%).

Table V shows the relationship between cancer prevention nutrition-related knowledge and dietary intake. There is statistically significant relationships between cancer prevention nutrition-related knowledge and fruit intake ($P = 0.045$), vegetables consumption ($P = 0.02$), intake of foods of animal origin ($P = 0.003$), coffee intake ($P = 0.027$) and physical exercise ($P = 0.001$).

DISCUSSION

This study assessed the nutrition knowledge of cancer prevention of undergraduates and their nutritional practices. About half of the respondents showed good cancer prevention nutrition-related knowledge. In terms of nutrition practices, the majority consumed whole grains, foods of animal origin and added salts thrice or more per week, whereas fruits and vegetables, legumes and nuts were less consumed per week. The lifestyle habits showed that majority prepare their meals, do not consume canned foods, alcohol and smoke cigarette. However, majority skipped breakfast foods. Approximately one in five students had higher BMI. The WHR revealed that more than half were at the risk of malnutrition. Statistically significant relationships exist between nutrition-related knowledge of cancer prevention and fruits and vegetable consumptions, intake of foods of animal origin, coffee and physical exercise.

Almost half of the students had poor nutrition knowledge of cancer prevention. Previous studies had reported similar findings among undergraduates.[23-25] Although the boys had higher correct responses, the result indicates that there is no significant gender difference in knowledge of cancer

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Table III: Nutritional practices of respondents

	Male (≥3 times/week), *n* (%)	Female (≥3 times/week), *n* (%)	Total, *n* (%)
Dietary intake			
Consumption of whole grains	153 (47.4)	170 (52.6)	323 (80.8)
Consumption of fruits	42 (39.6)	64 (60.4)	106 (26.5)
Consumption of vegetables	40 (40.4)	59 (59.6)	99 (24.8)
Intake of sugary drinks	83 (45.9)	98 (54.1)	181 (45.2)
Consumption of foods of animal origin	112 (45.7)	133 (54.3)	245 (61.2)
Intake of dairy products	35 (42.7)	47 (57.3)	82 (20.5)
Consumption of processed cereals	62 (59.0)	43 (41.0)	105 (26.2)
Consumption of root and tuber	30 (50.8)	29 (49.2)	59 (14.8)
Consumption of red meat	70 (47.9)	76 (52.1)	146 (36.5)
Consumption of smoked fish	31 (34.8)	58 (65.2)	89 (22.2)
Consumption of grilled meat	36 (46.2)	42 (53.8)	78 (19.5)
Consumption of legumes and nuts	76 (56.7)	58 (43.3)	134 (33.5)
Intake of added salt/preservatives	104 (40.9)	150 (59.1)	254 (63.5)
Intake of coffee	16 (38.1)	26 (61.9)	42 (10.5)
Lifestyle habits			
Preparation of meals	138 (44.4)	173 (55.6)	311 (77.8)
Fast food patronage	44 (50.0)	44 (50.0)	88 (22.0)
Breakfast skipping	123 (49.4)	126 (50.6)	249 (62.3)
Cigarette smoking	3 (100)	0	3 (23.1)
Drink alcoholic beverages	6 (85.7)	1 (14.3)	7 (10.8)
Use canned foods	41 (44.6)	51 (55.4)	92 (23.0)
Engage in active physical exercise	103 (52.0)	95 (48.0)	198 (49.5)

Table IV: Nutritional assessment of respondents

	Male, *n* (%)	Female, *n* (%)	Total, *n* (%)
BMI category			
Underweight	18 (46.2)	21 (53.8)	39 (9.8)
Normal weight	150 (52.4)	136 (47.6)	286 (71.4)
Overweight	15 (28.8)	37 (71.2)	52 (13.0)
Obese	9 (39.1)	14 (60.9)	23 (5.8)
WHR category			
Normal	106 (54.1)	90 (45.9)	196 (49.0)
At risk	86 (42.2)	118 (57.8)	204 (51.0)

BMI: Body mass index, WHR: Waist-hip ratio

prevention. A similar finding had been previously documented among adolescents.[23,26] It is surprising to know that 59%–86% of the students do not know that red meat, sedentary lifestyles, refined foods, high fatty foods, smoked foods, increased waistline and fried foods are associated with cancers. An indication that there exists a nutrition education gap in university curricula, especially in developing countries. If measures are not put in place to correct this anomaly, there may be an upsurge in diet-related chronic diseases in later years.

Healthy dietary intake is essential in the prevention of chronic diseases. In this study, respondents who consumed fruits and vegetables, legumes and nuts frequently were very low. These low consumption of fruits and vegetables in conjunction with low physical activity can cause an increased incidence of colon, prostate, lung and breast cancer.[13] Ample evidence shows that food rich in dietary fibre protects against colorectal cancer.[9] Non-starch vegetables also have been found to probably protect the mouth, pharynx, larynx, oesophagus and stomach cancers. The intake of dairy products was low among the respondents, whereas convincing evidence shows that milk intake protects against colorectal cancer.[9] These low intake of healthy diets among youths have been reported by previous studies, especially in developing countries.[23,24] About half of the students do not engage in active physical exercise, and majority frequently skipped breakfast. The reasons for these could be that youths do not give high priorities to healthful eating, and most of them are ignorant of the role that diets and physical activity play in the pathogenesis of the disease.

There is overwhelming evidence that greater body fatness could lead to cancer occurrence at several sites among adults.[9,10,27] Dietary recommendations to prevent obesity emphasize a reduction in the intake of unhealthy diets, such as refined sugars and processed foods.[28,29] The BMI classification shows that one out of five respondents had a higher BMI. The WHR further revealed that more than half were at risk of malnutrition. The knowledge of weight management and its relationship with quality of life is deficient among the respondents. The vast majority would prefer a sedentary lifestyle, despite having ample time and space to engage in active physical exercise. It is, therefore, pertinent for school management to develop policies that will align the diet and physical activity of students with evolving scientific evidence regarding cancer prevention.

We found that students with good nutrition knowledge engaged in frequent intake of fruits and vegetables. Previous studies have shown that nutrition knowledge influences good dietary behaviour.[23,30,31] Low intake of foods of the animal source was

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Table V: Relationship between cancer prevention nutrition related knowledge and dietary intake

Dietary intake	Nutrition related cancer prevention knowledge		χ^2	*P*
	Poor, *n* (%)	Good, *n* (%)		
Whole grain (times/week)				
≥3	156 (48.3)	167 (51.7)	0.971	0.324
<3	42 (54.5)	35 (45.5)		
Fruits (times/week)				
≥3	44 (41.5)	62 (58.5)	3.884	0.045*
<3	154 (52.4)	140 (47.6)		
Vegetables (times/week)				
≥3	39 (39.4)	60 (60.6)	5.375	0.020*
<3	159 (52.8)	142 (47.2)		
Sugary drinks (times/week)				
≥3	94 (51.9)	87 (48.1)	0.783	0.376
<3	104 (47.5)	115 (52.5)		
Animal origin (times/week)				
≥3	107 (43.7)	138 (56.3)	8.587	0.003*
<3	91 (58.7)	64 (41.3)		
Dairy products (times/week)				
≥3	37 (45.1)	45 (54.9)	0.791	0.374
<3	161 (50.6)	157 (49.4)		
Processed grain (times/week)				
≥3	44 (41.9)	61 (58.1)	3.286	0.070
<3	154 (52.2)	141 (47.8)		
Root and tuber (times/week)				
≥3	28 (47.5)	31 (52.5)	0.115	0.734
<3	170 (49.9)	171 (50.1)		
Red meat (times/week)				
≥3	76 (52.1)	70 (47.9)	0.600	0.438
<3	122 (48.0)	132 (52.0)		
Smoked fish (times/week)				
≥3	48 (53.9)	41 (46.1)	0.900	0.343
<3	150 (48.2)	161 (51.8)		
Grilled meat (times/week)				
≥3	38 (48.7)	40 (51.3)	0.024	0.878
<3	160 (49.7)	162 (50.3)		
Legumes and nuts (times/week)				
≥3	65 (48.5)	69 (51.5)	0.079	0.778
<3	133 (50.0)	133 (50.0)		
Added salt (times/week)				
≥3	126 (49.6)	128 (50.3)	0.003	0.955
<3	72 (49.3)	74 (50.7)		
Coffee (times/week)				
≥3	14 (33.3)	28 (66.7)	4.906	0.027*
<3	184 (51.4)	174 (48.6)		
Physical exercise (times/week)				
≥3	116 (57.4)	86 (42.6)	10.255	0.001*
<3	82 (41.4)	116 (58.6)		

*Significant

higher among students with poor nutrition knowledge. The possible explanation is that the majority came from a poor socioeconomic background and could not afford the high price often attached to foods of animal source.

CONCLUSION

There is a need to educate the students on the potentials of healthy diets in the prevention of diseases. Effective nutrition education should be used to promote healthy dietary choices and lifestyle for the youths. Furthermore, sporting activities should be encouraged and integrated into school curricula across all levels of study. The university management needs to put policies in place to encourage the availability of healthy foods on campus. Furthermore, public health interventions designed to promote healthy nutritional habits and behaviour in the population should be encouraged.

Study limitations

This present study is not without limitations. First, the sample size was taken from a single institution, and this may affect the generalisability of findings, hence a need to exercise caution. Furthermore, responses were self-reported and are subjected to recall bias. However, despite these limitations, this study shows that nutrition education in our higher institution is either absent or ineffective. The level of nutrition-related cancer prevention knowledge of the participants was average, but this could not be translated into practice as sizable number still engages in unhealthy eating habits and unwholesome lifestyles.

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Conflicts of interest

There are no conflicts of interest.

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