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AT ST. AUGUSTINE, TRINIDAD AND TOBAGO

A Research Paper
Submitted in partial requirements
for HUEC 3012
of
The University of the West Indies

Title: Basic nutrition knowledge and behavior among Students on the University
of the West Indies, St. Augustine Campus

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**BASIC NUTRITION KNOWLEDGE AND BEHAVIOUR AMONG STUDENTS OF THE
UNIVERSITY OF THE WEST INDIES, ST AUGUSTINE CAMPUS**

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PROGRAM: HUMAN NUTRITION AND DIETETICS

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ABSTRACT

Objective: Research indicates that the nutritional knowledge among university students is minimal and vary based on the area/major of study. The purpose of this study was to investigate the level of nutrition knowledge of students at the University of the West Indies, St. Augustine campus.

Method: A self-administered questionnaire incorporating questions of demographic information, meal background information and basic nutrition knowledge questions was distributed to the target population and consisted of 230 undergraduate students with males (n=66) and females (n=164). The data collected was analyzed by descriptive statistics, one way ANOVA and two tailed Pearson correlation coefficient ($p \leq 0.05$).

Results: The results show that both male and female had average nutrition knowledge. Also nutrition knowledge correct response score was higher in female than male students. The ANOVA shows that there was a significant difference among majors, where nutrition major students demonstrated higher knowledge than non nutrition major students. Results showed significant correlations between levels of knowledge preparation of nutritious breakfast and lunch ($r = 0.736$; $p \leq 0.001$), dinner ($r = 0.797$; $p \leq 0.001$) and significant correlations between knowledge of preparation of nutritious lunch and dinner ($r = 0.807$; $p \leq 0.001$).

Conclusion: The university arena represents the final opportunity for learning on a large scale. Therefore, nutrition education and strategies to achieve desirable diet behaviours is needed.

INTRODUCTION

1.0 Background

Nutrition is the sum of the total processes involved in the intake and utilization of food substances by living organisms, including ingestion, digestion, absorption, transport and metabolism of nutrients in food (Melvin, 2005). Sufficient nutrition during early childhood is essential for the development of each child's potential. Hence good food is vital for good health. Too often, university students are left with very little time to meet their nutrition needs. They tend to grab the easiest on the go food for their meal; little do they know that this lack of nutritious food can affect their performance. The World Health Organization has stated that nutrition is an input to and the foundation for health and development. Proper nutrition is essential for a more productive and stronger individual. Healthy eating practices are linked to a stronger immune system, with fewer illnesses. The fundamental key to a better quality of life is proper and healthy nutrition (WHO, 2007). In the United States, four of the ten of the leading causes of death are directly related to nutrition, these include coronary heart disease, cancer, stroke and diabetes mellitus (Abood, Black, & Feral, 2003). Also Willet et al., (1994) and Tavani et al., (1995) state that diseases such as obesity, cancer, cardio vascular diseases, obesity and hypertension are strongly linked to eating knowledge, behaviors and dietary practices.

Nutrition is the term given to the study of food eaten and its utilization by the body, for growth and repair of tissues, prevention of diseases, digestion and the functioning of body parts such as heart.

Nutrients that play such an important role in the body are protein, carbohydrates, lipids, minerals, vitamins and water. However, good nutrition depends on an adequate diet that is capable of sustaining a state of good health via means of the provision of the recommended desired nutrient amounts. Furthermore, a state of under-nutrition may arise if the required amount of nutrients is insufficient in the diet. This can lead to reduced immunity, impaired physical and mental development, reduce productivity and increase susceptibility to disease. The importance of sound nutrition is widely recognized, given that proper and adequate nutrition is linked closely to optimal growth, healthy life (including social, economical and emotional health) and good education outcomes. Sound nutrition is also fundamental in the prevention of diseases and disabilities. Families and individual eating patterns are constantly being changed and shaped by factors such as cultural, social, economical and geographical aspects. For instance, an individual or family's nutritional intake may be affected by the kinds of food they purchase that are available at the markets, supermarkets and other local shop, their cultural and family background, attitude and belief toward foods, time availability to prepare meals, storage facilities for food, nutritional knowledge about food, amount of cash available to purchase foods and advertisement and promotion of food items.

Studies have indicated that nutrition knowledge has a positive relation to attitude and behavior (Azizi et al. 2011, Choi et al. 2008, Lin et al. 2007 and Lin et al. 2011). The focus of this study is to investigate the nutrition knowledge and behaviour of university students in order to better understand their level of knowledge and explore reasons for their choice of food (nutritious or otherwise).

1.1 Purpose of the Study:

The purpose of this study is to investigate the level of nutrition knowledge of students at the University of the West Indies, St Augustine campus.

1.2 Rationale of the Study:

Nutrition is important to health and well being. The University of the West Indies poses a risk to proper eating behaviour based on the various fast food type cuisines available on the campus. On an average daily basis students' food intake are usually characterized by high consumption of KFC, pizza, Chinese food, doughnuts, fries, doubles, aloo pies and snacks. However, due to limited studies having been done in relation to nutrition knowledge and proper nutrition behaviour in Trinidad and Tobago, there is the need to assess the level of nutrition knowledge of students at the University of the West Indies, St Augustine campus.

1.3 Research Question:

What is the link between nutrition knowledge and diet behaviour among students at the University of the West Indies, St Augustine campus?

1.4 Hypothesis:

1. There is a positive relationship between nutrition knowledge and healthy eating among students.
2. Level of nutrition knowledge is higher among nutrition students.

1.5 Aim:

To evaluate basic nutritional knowledge and diet behaviour of Undergraduate students at the University of the West Indies, St Augustine campus

1.6 Specific Objectives:

1. To assess level of nutrition knowledge among students of the UWI.
2. To measure the relationship between diet behaviour and nutrition knowledge among students.

LITERATURE REVIEW

Nutrition is the science of foods and the nutrients and other substances they contain, and of their actions within the body including ingestion, digestion, absorption, transport, metabolism and excretion (Whitney and Rolfes 2007).

A report documented by the World Health Organization (2011), acknowledged that cardiovascular diseases (CVD) are the leading causes of both death and disability in the world, an estimated 17.3 million dying from heart disease and strokes in 2008. The WHO (2008) acknowledges that the fifth leading risk factors for the world's death are overweight and obesity. In each year at least 2.8 million adults died as a result of being overweight or obese. WHO also states that 1.4 billion adults, ages 20 and older were overweight, of these over 200 million men and nearly 300 million women. Overall, more than one in ten adults in the world's population was obese.

Data from the 2011 National Diabetes Fact Sheet, states that of the 25.8 million people living in the United States 8.3% of the population suffered from diabetes. Persons 19 years and under - 215,000 or 0.26% of all people in this age group have diabetes. Also 25.6 million, or 11.3% of all people in the 20 years and older age group have diabetes, whilst 10.9 million or 26.9% of all people in the 65 years and older age group have diabetes. The data also reveal that 11.8% of men, 13.0 million aged 20 years or older have diabetes and 10.8% of women, 12.6 million, aged 20 years or older have diabetes.

Numerous studies show that knowledge, in fact, influences one's eating habits. One such study was performed by Azizi et al. (2011) on a group of 360 university students from Azad. The study focused on measuring the participant's nutrition knowledge, attitude and practices randomly. The analysis of the data using Cronbach Alpha scales reveal values of 0.80 for knowledge and 0.81 for attitude. The results showed that the nutrition knowledge scores were the highest in the nursing students and were the lowest in business management students; also there were significant differences among the nutrition knowledge of all the majors. The nutrition attitude scores were the highest for physical education majors and the lowest for business management majors. The differences between nutrition attitudes amongst all of the majors were significant. In addition, results reveal that a positive and significant correlation exist among the nutrition knowledge and attitude of female ($r=0.001$; $\text{sig}= 0.03$) and male ($r= 0.30$; $\text{sig}= 0.03$) students. There was also a positive and significant correlation between the nutrition attitude and practices of both male and female students ($r= 0.18$; $\text{sig}=0.000$). The authors conclude that students should pay more attention to nutrition.

Another similar study conducted by Azizi, et al. (2011), among the Iran population, also put forward supporting evidence on nutrition knowledge and attitude. Results from this study show that the mean value score for nutrition knowledge and attitude for male and females were 52.36 ± 6.2 ; 50.61 ± 5 and 54.3 ± 6.3 ; 52.03 ± 5.8 respectively. Also the score for nutrition knowledge and attitude in P.E. females were highly significant than all the other majors ($p<0.05$), while no significant difference exist between P.E. males and all the other majors.

There was a positive and significant correlation among males ($r= 0.424, p \leq 0.01$) and female ($r= 0.422, p \leq 0.01$) between nutrition knowledge and attitude among elite athletes. The authors concluded that based on the results, knowledge of the college athletes is moderate and nutrition knowledge and attitudes need to improve.

One study conducted by Lin et al. (2011), on Taiwanese adults in relation to nutrition knowledge, attitude, and behaviour, show that young and prime have a better knowledge than the middle adults. Also the prime adults(31 to 44 years age group) have a more positive attitude than young adults (19 to 30 years age group). As for the prime and middle age adults they demonstrated better nutrition behaviour, than the young adults. Additionally, the urban adults had better nutrition knowledge and attitude as well as a more frequent emotional and external cued eating than those adults living in the suburban and remote areas. Also adults in urban areas perform “emotional and external cued eating” more frequently than those in suburban and remote areas. There was a positive and significant correlation between nutrition knowledge, attitude and behaviour, whilst attitude and behaviour have a stronger correlation ($r=0.42$) than knowledge and behaviour ($r=0.27$). Hence, the authors concluded that to achieve desirable eating behaviours, knowledge on what balance diet constitutes as well as what constitutes being overweight along with strategies to enhance motivation toward behaviour in healthy food selection should be included.

Conversely, this study by Lin et al. (2007), explored the nutrition knowledge, attitude and behaviour of Taiwanese elementary children. In this study the children’s nutrition knowledge,

attitude, and behaviour was observed with its relationship of these various components like dietary quality, nutrition knowledge, attitudes and behaviour and restraint in eating behaviour. Results show that children's knowledge was fair in nutrition basics and poor in the nutrients physiological function. Also knowledge was poor in the relationships between diet and nutrients and disease and also the serving per food groups. The children in this study were not concerned about health benefit of foods in the food group but they value the importance of nutrition. Additionally most children's dietary quality was unsatisfactory, and their diet did not meet the required recommended serving for each food group. There was a positive relationship among the scores between nutrition knowledge, attitude, dietary quality and caring- about-nutrition behaviour. The restraint or disinhibited eating behaviour of 4th, 5th and 6th graders was not serious, but a large number of children occasionally performed self-controlling practices to avoid becoming obese. One fourth of the children skipped meals, mainly breakfast, while one quarter of 4th, 5th and 6th graders prepared their own breakfast; which might have various impacts on their diet quality. Moreover a gap was found among nutrition knowledge, attitude and eating behaviour, mainly the consumption of vegetable and fruit. This indicates that there was not a strong attitude towards eating for health among this age group. The authors conclude that this may indicate there is a need for potential nutrition education in the near future for elementary school children, which should include both serving requirements for each food groups and appropriate theories to continuously motivate healthy eating.

Another study by Choi et al. (2008) investigated the nutrition and diet relating knowledge, attitude, and behaviour of Seoul elementary school children.

The study was conducted using 439 school children from 4th, 5th and 6th grades. The results show that males had a higher average obesity index than females 104.98 and 99.82, respectively. The average percentage of underweight, normal, overweight and obese of the children was 33.7%, 32.8%, 12.3%, and 19.4%, respectively. Additionally, the results reveal that females had a higher underweight percentage than males and that male had a higher obesity percentage than females. The nutrition knowledge, nutrition attitude and dietary behaviour had an average score of 6.8, 7.44, and 7.34, respectively. The dietary behaviour of male was positively correlated with their parents' education levels, monthly household income and nutrition attitude, whilst female dietary behaviour was positively correlated with monthly household income, nutrition knowledge, nutrition attitude and with obesity index (OI). Hence, the authors conclude that proper nutrition education and intervention should be implemented as to improve elementary school children's nutrition knowledge, nutrition attitudes and dietary behaviours.

Another study was conducted by Turconi, et al. (2008) on the eating habits and behaviors, physical activity, nutritional and food safety knowledge and beliefs adolescents. This study was conducted in Italy as part of a nutritional surveillance project. Results show that only 37.0% of the participants have satisfactory eating habits. The results also reveal that 18.5% of the adolescents have a very active lifestyle. There was also an 8.6% good nutritional knowledge and 2.4% satisfactory food safety knowledge among the children. The highest percentage was found in good hygiene 43.7% among the children. For this reason, the author concluded that adolescent eating habits are influenced by unhealthy behaviours, hence the need for a modified nutrition intervention aiming toward improving adolescents lifestyle.

Another study by Barzegari, et al.(2011) to understand the nutrition knowledge, attitudes and food habits of College Students at PayamNour Universities; was conducted among 415 randomly students, with a standard questionnaire which was developed to measure students nutrition knowledge, attitude and food habits. Results show that nutritionknowledge scoreswere higher in physical education student than business management student. ANOVA results show that no significant differences exist between nutrition knowledge of all majors and genders. Also nutrition attitude scores were higher in physical education and lowerin psychology. The nutrition attitude and all majors show no significant differences between them. There was a positive and significant correlationamong nutrition knowledge and attitude and among nutrition attitude and food habits all students. According to our results, we suggest that student should more attention to nutrition. Hence the author suggests nutrition in various college curriculums and the improvement of the learning environment, in relation to nutrition need be emphasized on college campuses.

Additionally, another study was conducted by Musikthong, et al. in Mahidol University on nutritional knowledge, attitude towards food, foodconsumption behavior, and nutritional status of nursing students. This study on 258 nursing students, results indicated that nursing students had average percentages of 67.2 % nutritional knowledge and 77.6% attitudetowards food at moderate levels. The overall food consumption behaviors were average 57.4%. The student's nutritional status was 30% which was less than normal level, while 11% of the students were overnutritional status and obesity. Of the sample, 45.5 %had body fat higher than normal level.

There was a positive significant relation between age and nutritional knowledge, attitude towards food, and nutritional status. Also negative significant relation exists between age and foodconsumption behavior($p < .01$). There was also a positive significance between attitudes towardsfood and nutritional status ($p < .05$). Based on these results the author suggests, that faculty of Nursing should developnutrition related education in their curriculum at undergraduate level. Also promote good attitudesand appropriate food consumption behaviour for better health and nutrition status.

2.0 Theoretical Framework

In contrast to published literature it is evident that the motivation to perform certain actions or behaviour can be ascribed to existing external factors which may influence and shape certain behavioural pattern. Based on the dynamic of this study, Social Cognitive Theory's also known as Social Learning Theory which was developed to explain how people acquire and maintain certain behaviours,and can be applied to this study. This principle is a behaviour model, in which behaviour, personal factors (e.g. cognition) and environment interact constantly such that a change in one area has implications for the other, this is known as reciprocal determinism (Boyle and Holben 2010). This model as it relates to this study explains how self efficacy of individuals and their ability to perform a particular or certain behaviours and the perception of the outcome influences the amount of invested effort in a behaviour change.

This means, that a person's knowledge of outcomes due to certain practices, such as unhealthy eating habits (e.g. plenty fast food) can lead to obesity, would not be solely influential in their behaviour or eating pattern. Rather, the interactions with the environment, in the social realm (family, friends and peers) and physical realm (school environment and layout) are more influential.

METHODOLOGY

3.0 Subjects/ Participants

In this cross-sectional study, a sample of the student population of the University of the West Indies, St Augustine campus, was chosen to fulfill the required sample size based on the ease of access to the participants. To obtain a representative sample of the entire student population, a five percent level (95% Confidence Interval) and the equation $n = \frac{Z_{\alpha/2} \hat{p} \hat{q}}{d^2}$ was used to determine the number of students; where n = the sample population, p = percentage of student doing the particular action, q = percentage of students not doing the particular action and d^2 = margin of error.

The sample population comprised of two hundred and thirty (230) students with males ($n=66$) and females ($n=164$). The participants were from various faculties on campus, namely the Faculties of Engineering, Humanities and Education, Law, Medical Sciences, Food and Agriculture, Science and Technology and Social Sciences. Eligibility criteria included students that were registered to the University of the West Indies, St Augustine campus as undergraduate students. Exclusion criteria were students registered to the University's Open Campus, Postgraduate students and administrators or staff of the university.

3.1 Study Design and Procedure

The study was conducted as a census using a questionnaire as the method of data collection. The questionnaires were self-administered and no personal interview was conducted in the study.

The questionnaire was pretested prior to distribution with four undergraduate colleagues, to ensure clarity and validity of the questions being asked. Adjustments were made to some questions so participants would better understand the questions.

The questionnaire consisted of twenty four questions which were divided into three sections.

They include:–

- Demographic- the sex, age, ethnicity, Major / programme of study, degree level and nationality
- Background: meal consumption (where, how often and type) and ability to prepare meals (breakfast, lunch and dinner)
- Basic nutrition knowledge - four true and false questions, one yes and no or don't know question, five multiple choice questions and four ranking scale questions.

The questionnaires were distributed to individual students at the University of the West Indies, St Augustine campus between the periods of 8th of October 2012, to the 22th October 2012.

3.2 Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) Software, version 16.0 for Windows and Microsoft Office Excel 2007.

The results obtained, were analyzed using means, standard deviation and percentage calculated for the score from nutrition, knowledge, attitude and food choice section. Cross tabulations as well as frequency tests were run on demographic data and meal background data to describe the different characteristic of the study sample population.

Additionally, Analysis of Variance Analysis (ANOVA) was used to compare the differences between nutrition knowledge, and behaviour among majors. Pearson's correlation coefficient was used to assess the correlation between nutrition knowledge and behaviour of university students. Statistical results were considered significant at $p \leq 0.05$.

RESULTS

4.0 DEMOGRAPHIC CHARACTERISTICS

Table 1 provides the demographic data results obtained in the study. The demographic characteristics of the 230 respondents revealed that the majority consisted of female which were 71.3% (n=164) and 28.7% (n=66) males. Also, it was found that the majority of the respondents were between the ages of 19-29 years 88.3% (n=203); 6.5% (n=15) were between the ages of 30-49 years; 5.2% (n=12) were 18 or younger and 50 and over 0% (n=0).

Additionally, the ethnic composition of the study respondents showed a small variation between respondent of East Indian decent (n=96) which contributed 41.7% and African decent (n=91) which contributed 39.6%. The other participating respondents were others (mixed ethnicity)(n=40) which contributed 17.4%, Caucasian(n=2) contributed 0.9%, Hispanic (n=1) contributed 0.4% and Chinese(n=0) contributed 0% to the sample of the studied respondents.

The sample respondents comprised of 63.9% non nutrition students (n=147) and 36.1% were nutrition students (n=83). The majority of the respondents were year 3 students 47% (n=108); 26.1% (n=60) were year 2 students; 13.9% (n=32) were year 4 students; and 13% (n=30) were year 1 students.

Nationality of the respondents showed that the majority of the sampled students were Trinidadians 81.3% (n=187), 14.8% (n=34) were Tobagonians and 3.9% (n=90) were others i.e. Jamaican, Canadian, St. Lucian, Grenadian, Barbadian, St. Vincentian, Bahamian and American.

Table 1: Table Showing Demographic Profile of the Study Population (n=230)

Characteristics	Categories	Frequency	Percent %
Sex	Male	66	28.7
	Female	164	71.3
Age	≤18	12	5.2
	19- 29	203	88.3
	30-49	15	6.5
	>50	0	0
Ethnicity	East Indian	96	41.7
	African	91	39.6
	Chinese	0	0
	Hispanic	1	0.4
	Caucasian	2	0.9
	Others	40	17.4
Programme	Non nutrition students	147	63.9
	Nutrition students	83	36.1
Programme Level	Year 1	30	13
	Tear 2	60	26.1
	Year 3	108	47
	Year 4	32	13.9
Nationality	Trinidadian	187	81.3
	Tobagonian	34	14.8
	Others	9	3.9

4.1 MEAL CONSUMPTION PATTERNS

Table 2 provides the meal consumption data results obtained in the study. From the results reported, it was shown that the majority of the respondents 71.3% (n=164) consumed their meals at home given that their meals was prepared there, followed by 20.9% (n=48) consumed their meal at UWI cafeteria and the minority of the respondents 7.8% (n=18) consumed their meals at a fast food outlet.

Additionally, the majority of the respondents reported that they purchased meals 2 to 3 times per week (48.3% (n= 111), whilst 32.6% (n= 75) purchased meals once per week. The minority of the respondents purchased meals ≥ 4 times per week 15.2% (n=3). Additionally, it was reported that 3.9% (n=9) never purchase meals.

From the cuisine categories, the majority of the respondents consumed fast food: 40.9% (n=98), followed by Creole food: 29.6% (n=68), East Indian food: 16.1% (n=37), Vegetarian food: 8.9% (n=19) and the least consumed cuisine being Chinese: 5.6% (n=12).

The results show, that even if most meal was consumed at home, most respondents purchase food regularly, which was a mainly fast food.

Table 2: Table Showing Meal Consumption and Purchase of Respondents

	Frequency	%
Meal Consumption:		
At Home	164	71.3
At UWI cafeteria	48	20.9
At fast food outlet	18	7.8
Food purchase:		
Never	9	3.9
Once per week	75	32.6
2 to 3 times per week	111	48.3
≥ 4 times per week	35	15.2
Foods most often eaten:		
Chinese Cuisine	12	5.2
Vegetarian cuisine	19	8.3
East Indian Cuisine	37	16.1
Creole Cuisine	68	29.6
Fast Food	98	40.9

4.2 MEAL PREPARATION

Table 3 below, describes the mean values of meal preparation abilities for breakfast, lunch and dinner of the study population. Within this sample, it was found that mean breakfast preparation ability was 6.46 ± 2.279 . The mean for lunch preparation ability was reported as 6.25 ± 2.296 . Dinner preparation ability showed a mean value of 6.22 ± 2.240 . This shows that students have an average ability to prepare meals.

Table3: Table Showing Meal Preparation of Respondents

Variables	Mean	SD
Breakfast	6.46	2.279
Lunch	6.25	2.296
Dinner	6.22	2.240

Abbreviations: SD- Standard Deviation

4.3 KNOWLEDGE ON BASIC NUTRITION

Table 4 shows the nutrition knowledge of respondents. From the results it is shown that the majority of the respondents 67.8% (n=156) indicated that sweets and fats was not part of the local food group.

With regards to factors affecting nutrition, 86.5% (n=199) believed that exercise, sleep and water affects nutrition.

The majority of respondents 62.6% (n=144) correctly indicated what fat soluble vitamin meant.

Only 68.7% (n=158) were able to identify the most balanced breakfast among the options.

Regarding diet and exercise playing an important role in healthy lifestyle, 97.4% (n=224) believe that to be true.

Response data indicated that 55.7% (n=128), did not believe that it's ok to replace fruit consumption with fruit juice, while 44.3% (n=103) believed that it's ok to replace fruit consumption with fruit juices.

The majority, a total of 79.1% (n=182), stated that diet is not a fast way to look good.

Only 73% (n=168) respondents, indicated that they not believe that replacing lunch and dinner with a plain salad is a great way to control weight.

With regard to what constitutes healthy eating, 95.2% (n=219) indicated "balanced eating" e.g. cereal, orange, low-fat milk tea, whole-grain bread, eggs.

Table 4: Table Showing Nutrition Knowledge of Respondents

Questions	Frequency	%
What's not part of the local food group?		
Fruit	2	0.9
Vegetables	2	0.9
Grains	63	27.4
Meats and legumes	7	3.0
Sweets and fat	156	67.8
What Factors affecting nutrition?		
Exercise	20	8.7
Sleep	5	2.2
Water	6	2.6
All of the above	199	86.5
What does fat soluble mean?		
Absorbed or dissolved in fat	144	62.6
Made of fat	36	15.7
Absorbed or dissolve in water	46	20.0
Eaten only with fat	4	1.7
Which offers the mast balanced breakfast?		
Whole wheat bagel with peanut butter and a fruit smoothie	158	68.7
Croissant, strawberry, orange juice	52	22.6
Fruit salad	18	7.8
Crispy crème donut with coffee and a banana	2	0.9
Do diet and exercise play an important role in healthy lifestyle?		
No	6	2.6
Yes	224	97.4
Is it ok to replace fruit consumption with fruit juices.		
No	128	55.7
Yes	102	44.3

Is a diet a fast way to look good

No	182	79.1
Yes	62	20.9

Replacing lunch and dinner with a plain green salad is a great way to control weight

No	168	73
Yes	62	27

What do you think constitute healthy eating?

Eating low fat foods (e.g. yogurt)	4	1.7
Eating natural / unprocessed foods (e.g. granola, fruits)	4	1.7
Balanced eating (e.g. cereal, orange, low-fat milk tea, whole-grain bread, eggs)	219	95.2
Eating to control weight	3	1.3

Table 5 shows the knowledge level was higher in relation to diet and exercise playing an important role in a healthy lifestyle 0.97 ± 0.160 (97.4% correct response), constitution of a healthy diet 2.96 ± 0.314 (95.2% correct response) and factors affecting nutrition 3.67 ± 0.889 (86.5% correct response); while knowledge on diet being a fast way to look good was 0.21 ± 0.407 (79.1% correct response), replacing lunch and dinner with green salad to control weight was 0.27 ± 0.445 (73% correct response), most balance breakfast 1.41 ± 0.673 (68.7% correct response), local food group was 4.36 ± 0.969 (67.8% correct response), and meaning of fat soluble 1.61 ± 0.864 (62.6% correct response). The least known response was is it ok to replace fruit juice with fruit juices 0.44 ± 0.498 (55.7% correct response). This show that majority of the respondents have average nutrition knowledge.

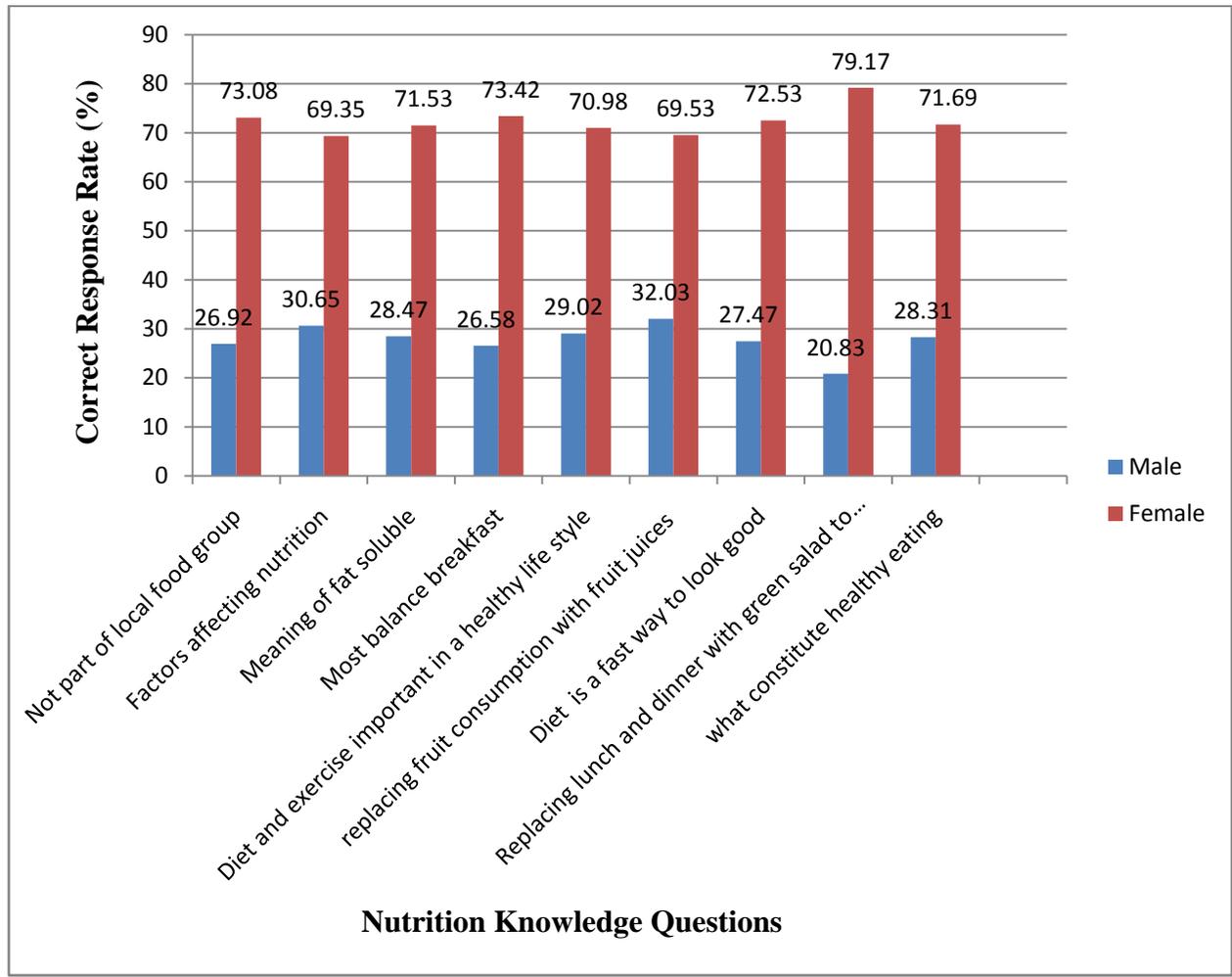
Table 5: Table Showing the Mean and Percentage Score of Correct Responses to Nutrition Knowledge Questions

Variables	Mean	SD	%
Which is not one of the local food groups?	4.36	0.969	69.83
What factors affect nutrition?	3.67	0.889	86.52
What does fat soluble mean?	1.61	0.864	62.61
Which option offers the most balance breakfast?	1.41	0.673	68.70
Diet and exercise play an important role in a healthy lifestyle (T or F)?	0.97	0.160	97.39
It is ok to replace fruits consumption with fruit juices (T or F)?	0.44	0.498	55.62
A diet is a fast way to look good (T or F)?	0.21	0.407	79.13
Replacing lunch and dinner with a plain salad is a great way to control weight (T or F)?	0.27	0.445	73.04
What do you think constitute healthy eating?	2.96	0.314	95.22

Abbreviations: SD- Standard Deviation

Figure 1 is a column graph which shows the variations in correct nutrition question response among male and female students. From the graph, it can be seen that females were found to have a higher correct response rate than that of the male students.

Figure 1: Column Graph Showing Nutrition Knowledge Percentage of Respondents



4.4 HEALTHY EATING AND NUTRITION STATUS

Table 6 describes the mean values for healthy eating and nutrition status of the respondents of the study population. The importance of taste in healthy eating has a mean of 7.81 ± 2.189 . Furthermore the importance of nutrition in healthy eating has showed a mean of 8.92 ± 1.429 . The eating practices in relation to what is considered as healthy eating has a mean of 6.03 ± 1.535 . Respondent's satisfaction of their nutrition status demonstrated a mean value of 5.73 ± 1.896 . This show that the respondents had high average believes that taste and nutrition is important to healthy eating. Also the respondents had average healthy eating practices.

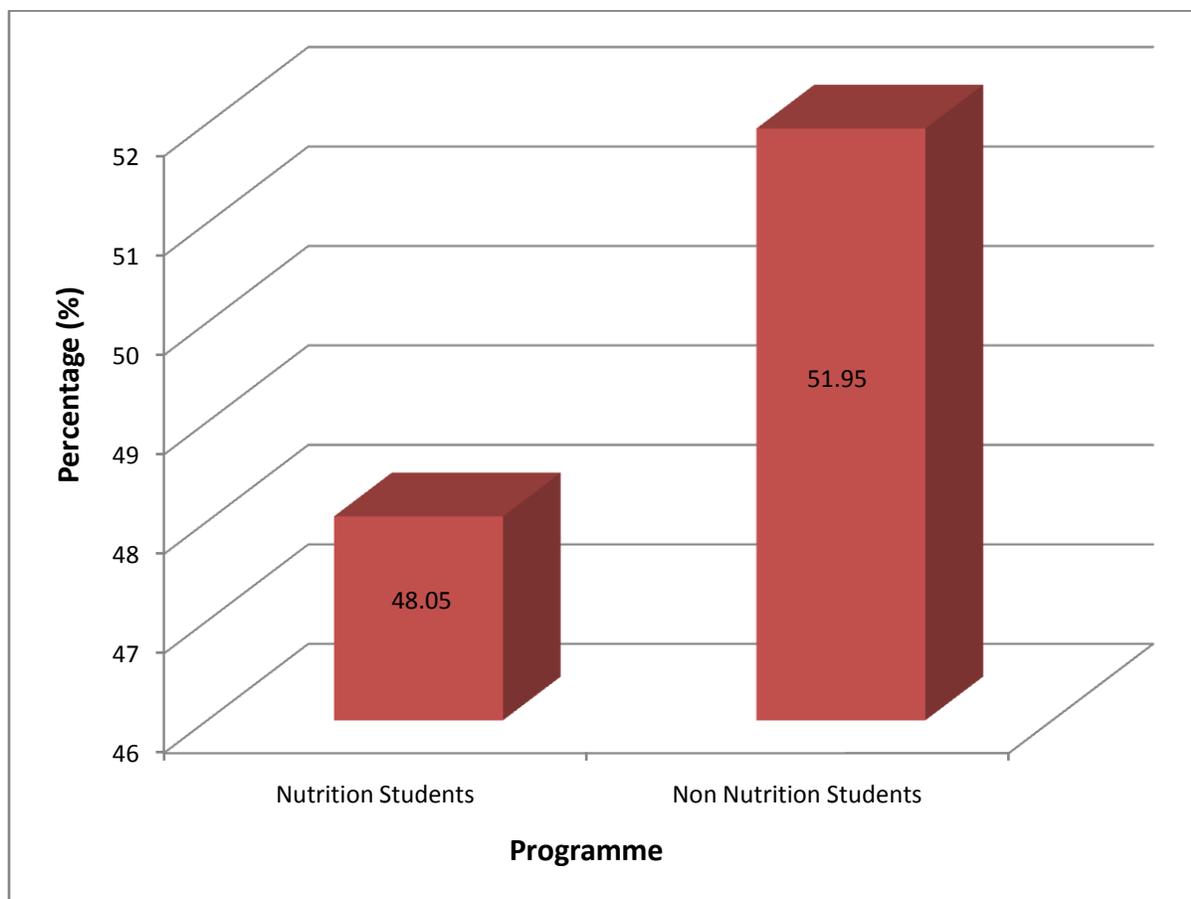
Table 6: Table Showing Healthy Eating and Nutrition Status

Variables	Mean	SD
Importance of taste in healthy eating	7.81	2.189
Importance of nutrition in healthy eating	8.92	1.429
Eating practices in relation to what is consider as healthy eating	6.03	1.535
Satisfaction of nutrition status	5.73	1.896

Abbreviations: SD- Standard Deviation

Graphs 2 shows respondents view on healthy eating. With regards to healthy eating practices of respondents, 34.35% (n=79) agree that healthy eating is commonly practiced, where 51.95% (n=40) were non nutrition students and 48.05% (n=39) were nutrition students. This shows that healthy eating is perceived to be more commonly practiced by non nutrition students.

Figure 2: Column Graph Showing Respondent View on Healthy Eating



4.5 ANOVA ANALYSIS

ANOVA test show that significant difference in the means was found only for degree/ programme of study of respondents. From table 7 below (3 sections) it was seen that for nutritious breakfast preparation there was a significant value of 0.008, for nutritious lunch preparation 0.001, and for nutritious dinner preparation 0.004 among both nutrition and non-nutrition degree/programme majors. This shows that nutrition students were more knowledgeable than non nutrition students.

Table 7: Tables of ANOVA Showing Significance of Means among Variables

Dependent Variable: Nutritious breakfast preparation by respondents

Independent Variable	F-Value	P- Value	Means
Sex	1.402	0.238	Male- 5.57 Female- 6.75
Age Group	0.675	0.512	≤18-5.25 19-29- 6.44 30-40- 7.67
Degree /Programme	7.153	0.008***	Nutrition students – 7.45 Non nutrition students- 6.46

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Dependent Variable: Nutritious lunch preparation by respondents

Independent Variable	F-Value	P- Value	Means
Sex	0.002	0.962	Male- 5.35 Female- 6.62
Age Group	1.901	0.152	≤18- 5.08 19-29- 6.21 30-40- 7.73
Degree /Programme	11.000	0.001***	Nutrition students- 7.47 Non nutrition students-5.56

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Dependent Variable: Nutritious dinner preparation by respondents

Independent Variable	F-Value	P- Value	Means
Sex	0.491	0.484	Male- 5.39 Female- 6.55
Age Group	1.561	0.212	≤18- 5.33 19-29- 6.16 30-40- 7.67
Degree /Programme	8.508	0.004***	Nutrition students- 7.39 Non nutrition students- 5.56

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

4.6 CORRELATION ANALYSIS (2-tailed)

The correlation between nutrition knowledge and behaviour was analyzed using the Pearson's correlation coefficient(r) test at a 0.01 level. Results show that there was a significant difference between nutrition knowledge and behaviour among students. Regarding the overall scores there was a correlation coefficient of ($r = 0.736$) between respondent's level of knowledge preparation of nutritious breakfast and lunch and the correlation coefficient was also significant ($r = 0.797$) for level of knowledge preparation of nutritious breakfast and dinner and also significant correlation coefficient ($r = 0.807$) for level of knowledge preparation of nutritious lunch and dinner preparation. This indicates that as nutrition knowledge increases, the diet behaviour of the respondents change.

Table 8: Table Showing Relationship between Knowledge and Behaviour of Respondents

	Nutritious Breakfast	Nutritious Lunch	Nutritious Dinner
Nutritious Breakfast	1	0.736**	0.797**
Nutritious Lunch		1	0.807**
Nutritious Dinner			1

** Correlation is significant at the 0.01 level

DISCUSSION

Nutritional knowledge may be influential to dietary behaviour directly or indirectly which may further become dietary habits and thus influence intake of nutrient and health. Therefore, this study aimed to evaluate basic nutritional knowledge, attitude and diet behaviour of university students.

It was observed from this study, that of the total study sample population, which consisted of male and female students from university of West Indies, 71.3% consumed most of their meals at home whilst 48.3% of the students purchased meals at least 2-3 times per week with 40.9% being from fast food such as pizza, fried chicken, French fries, subway and burgers consumed by students. Additionally, the actual intake of the study sample population was not measured, but rather the frequency of these meals consumption was measured.

A study done by Bowman, et al. (2004) reported that on a typical day, 30.3% of the study sample reported that they consumed fast foods which was highly prevalent in male and female, of all ethnic groups and regions of America. The study also revealed that consumption of fast food among the study population had an adverse effect on the dietary quality which may increase the risk for overweight and other diseases.

With regards to the questions relating to knowledge on basic nutrition, from the results it was seen that majority of the respondents knowledge was average in nutrition basics. Data reveal that females were found to have a higher correct response rate than their male counterparts.

This result is similar to that found by Yueching et al. (1999) which indicated that higher nutrition knowledge was found among the female students. Another study by Pirouznia M (2001) done in America indicated that girls had higher mean nutrition knowledge scores than their male counterparts in the seventh and eighth grades. In contrast, Georgia et al. (1993) reported that gender had no relation to nutrition knowledge.

With respect to healthy eating and nutrition status of the respondents of the study population, the respondents believed that taste and nutrition is important in healthy eating. Also their eating practices in relation to healthy eating were average, while satisfaction of their nutrition status was slightly below average.

Among the two study groups with regards to healthy eating practices of respondents, 34.35% agree that healthy eating is commonly practiced. The majority of the respondents was non nutrition students and the least being nutrition students. In a study by Turconi, et al. (2008) on adolescents in Italy in regard to eating habits and behaviour, physical activity, nutritional and food safety knowledge and beliefs, there was a 37% satisfactory eating habits of the sample.

Pertaining to meal preparation when asked about one's ability to prepare nutritious breakfast, lunch and dinner, the respondents has an average mean ability. This shows that the respondent of the study population has an average ability to prepare nutritious meals.

Additionally there was a significant difference in the means, based on the results it was seen that for nutritious breakfast preparation there was a significant value of 0.008, for nutritious lunch preparation 0.001, and for nutritious dinner preparation 0.004 among both nutrition and non-nutrition degree/programme majors .

The study conducted on the relationship between nutrition knowledge and diet behaviour was analyzed using the Pearson's correlation coefficient(r) test at a $p < 0.01$. Results showed significant correlations between levels of knowledge preparation of nutritious breakfast and lunch, nutritious breakfast and dinner and also significant correlations between knowledge of preparation of nutritious lunch and dinner, which suggests that nutrition knowledge, does in fact influence diet behaviour. These findings are supported, in part, by the findings of Sun et al. (1999) on a sample of Chinese college students showed that increasing nutritional knowledge can improve dietary habits. Another study by Packman and Kirk (2000) conducted on male students shows that nutritional knowledge and behavior are associated.

A study performed by Wardle et al. (2000) in England 18–75-year-old participants resulted in significant association between nutrition knowledge and healthy eating. It also reveals that knowledgeable persons were 25 times more likely to consume ample amounts of fruit and vegetables daily.

LIMITATIONS

During the conduction of this study, limitations were encountered which may have implicated the final results of the study. These limitations include:

1. Time was the prime constraint of the study, which did not permit for a more in-depth analysis of this research.
2. The respondents of this study consisted of more females (71.3%) than males (28.7%). This can be a bias in the study given that the male's population was smaller.
3. The type of question asked on the questionnaires, may not have allowed for a proper and full assessment of the respondents knowledge, attitude and behaviour.
4. The questions asked in the study may have been interpreted differently by the respondents.
5. During distribution of questionnaires, respondents may have given socially desirable choices which may or may not have been the truth.
6. The studied student population was not a full representation of all the faculties given that most students were from the faculties of Food and Agriculture, Science and Technology and Social Sciences.
7. Source of information was unclear as to where students obtain basic nutrition knowledge.

RECOMMENDATIONS

The following recommendations are suggested:-

- The introduction of a wider variety of healthier fast food options available to students on campus.
- Brochures on healthy eating along with awareness programs can be strategically placed such as administration building, halls of residents, notice boards and healthy centers on campus and incorporated in the university curriculum where students can have access.
- The media can also be used to motivate and educate students on the importance and consequences of healthy eating practices, given the increasing death rate of the Caribbean people due to chronic diseases.
- Further studies should be carried out to come up with effective ways to promote healthy eating habits and different ways in which individuals can apply nutritional knowledge directly to their diet behavior.

CONCLUSION

Interest in healthy eating practices is becoming more and more prevalent in the world today. Our finding of this study on basic nutritional knowledge, attitude and diet behaviour among university students reveal that both male and female had average nutrition knowledge. Also the correct response to the nutrition knowledge questions score was higher in female than male students. The ANOVA shows that there was a significant difference among majors; where nutrition major students demonstrated higher knowledge than non nutrition students. There was a significant correlation between levels of knowledge preparation of nutritious breakfast and lunch, nutritious breakfast and dinner and significant correlations between knowledge of preparation of nutritious lunch and dinner. Our results suggest that there is definitely a need for nutrition education intervention programmes and strategies for desirable diet behaviour for all students (different majors/ degree) in order to improve their knowledge, attitude and diet behaviour towards improving nutritional well being of the students.

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APPENDICES

Appendix A- Sample Questionnaire

Participant Code #: _____

Dear Respondent,

The following is a questionnaire which is aimed at collecting data towards a final year research project. The questionnaire contains three (3) sections which examines nutritional knowledge, attitude and behaviour. You are kindly asked to answer the questions honestly and truthfully, by placing a tick (✓) for the answer of your choice.

Thanks for your time and cooperation.

Section I – Demographic Data

1. Sex : Male Female

2. Age: ≤ 18 29 30- ≥ 50

3. Ethnicity: East Indian African Chinese

 Hispanic Caucasian Other _____

4. Degree / Programme : Nutrition Student Non-nutrition student

5. Degree/Course Level: Year 1 Year 2 Year 3 Year 4

6. Nationality : Trinidad Tobago Others _____

Section II – Background Data

1. Where are most of your meals consumed? (2 or more meals)

At home (homemade food)

At UWI cafeterias

At fast food restaurant

2. How often do you purchase food?

Never

Once per week

2-3 times per week

4 times per week

3. What type of food do you most often eat?

Chinese Cuisine (e.g. Chow Mein,)

Vegetarian cuisine (e.g Soya, stew vegetables)

East Indian Cuisine (e.g. Roti, Doubles)

Creole Cuisine (e.g. Pelau, macaroni pie)

Fast Food (e.g. Subway, KFC)

For each of the following, please circle the number on the ranked scale that best represents how you feel; with 0 being the lowest and 10 being the highest):

4. How would you describe your ability to :

a) Prepare nutritious breakfast

Poor 0---1---2---3---4---5---6---7---8---9---10 Excellent

b) Prepare nutritious lunch

Poor 0---1---2---3---4---5---6---7---8---9---10 Excellent

c) Prepare nutritious dinner

Poor 0---1---2---3---4---5---6---7---8---9---10 Excellent

Section III – Basic Nutrition Questions

1. Which of these are not a part of the local food groups?

- Fruit
- Vegetables
- Grains
- Meats and legumes
- Sweets and fat

2. What factors affect nutrition?

- Exercise
- Sleep
- Water
- All of the above

3. What does fat soluble mean?

- Absorbed or dissolved in fat
- Made of fat
- Absorbed or dissolve in water
- Eaten only with fat

4. Which offers the most balanced breakfast?

- Whole wheat bagel with peanut butter and a fruit smoothie
- Croissant, strawberry, orange juice
- Fruit salad
- Crispy crème donut with coffee and a banana

5. Diet and exercise play an important role in a healthy lifestyle.

- True
- False

6. Is it ok to replace fruit consumption with fruit juices.

- True
- False

7. A “diet” is a fast way to look good.

- True
- False

8. Replacing lunch and dinner with a plain green salad is a great way to control weight.

- True
- False

9. What do you think constitute healthy eating?

- Eating low fat foods (e.g. yogurt)
- Eating only natural / unprocessed foods (e.g. granola, raw fruits and vegetables)
- Balanced eating (e.g. fruits, vegetables, low-fat dairy, whole-grain cereals, lean meats & protein foods)
- Eating to control weight

10. Do you think healthy eating is commonly practiced by you?

Yes No Do not Know

For each of the following, please circle the number on the ranked scale that best represents how you feel; with 0 being the lowest and 10 being the highest):

11. How will you rank the importance of taste in healthy eating?

Not important 0----1----2----3----4----5----6----7----8----9----10 Very important

12. How will you rank the importance of nutrition in healthy eating?

Not important 0----1----2----3----4----5----6----7----8----9----10 Very important

13. How will you rate your own eating practices in relation to what you consider healthy eating?

Very poor 0----1----2----3----4----5----6----7----8----9----10 Excellent

14. How satisfied are you with your nutrition status?

Not satisfied 0----1----2----3----4----5----6----7----8----9----10 Very satisfied