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The University of the West Indies

Title: The risk factors associated with the development of Colorectal Cancer among University Students

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THE RISK FACTORS ASSOCIATED WITH THE DEVELOPMENT OF COLORECTAL CANCER AMONG UNIVERSITY STUDENTS

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The University of the West Indies

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TABLE OF CONTENTS

LIST OF TABELS

Page No.

LIST OF FIGURES

Page No

ABSTRACT

Background: The increasing prevalence, incidence, morbidity and mortality of colorectal cancer and preventive measures are paramount in reducing the number of new cases in Trinidad and Tobago and the wider world. Of great concern is the high level of exposure of modifiable risk factors related to colorectal cancer to students who are enrolled in tertiary education institutions.

Objective: To determine the prevalence and knowledge level of the risk factors associated with the development of colorectal cancer among the student population of the University of the West Indies, St. Augustine Campus.

Methodology: A structured questionnaire was given to a total of 1,300 students who were selected via convenience sampling over a 6 week period. Knowledge and prevalence of risk factors were assessed through the questionnaire. Data were analysed using SPSS version 12.0 to perform descriptive statistics, correlations, Mann-Whitney U, Kruskal-Wallis and Post Hoc tests.

Results: The mean knowledge score was 10.36 ± 3.765 (54.55 ± 19.818%) and the mean overall risk factor index score was 4.36 ± 1.496 for the study population. Overall it was found that 47% of participants had ≥ 5 risk factors which are associated with colorectal cancer.

Conclusion: The student population of the university were seen to have a poor knowledge of colorectal cancer and its risk factors. There were not any statistically significant associations between the number of risk factors and one's perceived risk of developing colorectal cancer. Overall, the student population was found to have an overall prevalence of at least 3-4 risk factors.

CHAPTER I

INTRODUCTION

Background

Cancer is currently among one of the top causes of mortality worldwide where it is ranked second in the leading causes of death worldwide and in developing countries. (American Cancer Society 2013) As of the year 2008 it was estimated that there were 12.7 million cancer cases worldwide with an expectation of an increase to 21 million by the year 2030. (WCRF 2008) The term "Cancer" originated from a Greek physician named Hippocrates whereby this term was used to describe tumors. It was firstly called "karkinos" and was then referred to as carcinos, carcinoma and presently the more commonly used term Cancer. He believed that a substance he termed as "black bile" was the cause of cancer. The oldest documented case of cancer in humans was reported from ancient Egypt in 1500 BC and there was no known treatment for the disease to cure it, however treatment given was to prevent suffering. (Schwab 2011)

As time has elapsed scientific research has advanced thereby expanding the scope of knowledge and awareness to the wider world of the types, risk factors, protective factors and treatment methods of cancer. However based on advancing research, cancer is a more complex disease than Hippocrates previously understood and described. To this date cancer is not fully understood by scientists and researchers but modern science has allowed for many scientific breakthroughs in this field of study. Cancer can begin in any cell in the body whereby the genetic material of the cell called DNA (deoxy ribonucleic acid) is either altered or damaged by harmful compounds which causes mutations to occur which affect the normal cell growth and division. These cells do not die and this is further compounded when new cells are created which allows

for an accumulation of extra cells to form a tumor (mass of tissues combined together). These tumors are classed as either being benign or malignant. Of these two, malignant tumors are cancerous and have the ability to infect nearby tissues which can multiply to various parts of the body which is called metastasis. (National Cancer Institute 2013)

There are various types of cancer but the following cancers are the most prevalent worldwide currently: Lung, Breast, Colorectum, Stomach, Prostate, Liver, Cervical, Oesophageal and Bladder Cancer. (WCRF 2008) Colorectal cancer has been reported to have highest reported incidence among other cancers worldwide among both the male and female population, with over 1.2 million new cases noted in the year 2008. (WCRF 2008) The country with the highest rate of reported colorectal cancer cases worldwide is Slovakia, followed by Hungary and New Zealand. However, approximately 59 percent of colorectal cancer cases occur in more developed countries while 41 percent are seen in developing countries. (WCRF 2008)

Colorectum, more commonly known as colorectal cancer is the slow growth of malignant tumors in the bowel or rectum areas of the human body. (Canadian Cancer Society 2009) The most well-known staging system for colorectal cancer is the AJCC (American Joint Committee on Cancer) whereby an individual with colorectal cancer can be categorized into three categories: 1) T which describes the progression of the tumor growth into the wall of the large intestine and in other nearby areas. 2) N which describes the extent to which the tumor growth has reached the lymph nodes of the body. 3) M which describes the extent to which the tumor has proliferated to other organs of the body. There are 10 stage groupings for colorectal cancers which are as follows: Stage 0, I, IIA, IIB, IIC, IIIA, IIIB, IIIC, IVA, and IVB. However the categories must first be determined before staging can be defined. (American Cancer Society 2013)

In Trinidad and Tobago specifically, in a report from the Trinidad and Tobago Cancer Registry it was found that the incidence rate for colon and rectum cancer among the country's population was 24.5. Colorectal cancer is ranked as the most prevalent cancer among both males and females as opposed to the higher overall ranked gender specific cancers of prostate and breast cancers. More recent data on the incidence of colorectal cancer is needed for a more holistic vantage point in preventing the disease from developing. The increasing prevalence, incidence, morbidity and mortality of colorectal cancer and preventive measures are paramount in reducing the number of new cases in Trinidad and Tobago and the wider world. This can be done by reducing the risk factors which are associated with the development of colon and rectal cancer. These risk factors as research has discovered are: genetic predisposition, diabetes, increasing age which are non-modifiable and, obesity, physical inactivity, chronic alcohol consumption and smoking, and diet (low fiber, fruit and vegetable and high red meat, processed meats and high fat consumption) are modifiable. (WCRF 2008) These modifiable risk factors which are associated with colorectal cancer are highly prevalent among the population due to the rise of unhealthy lifestyle behaviours. It has been noted that approximately between 5 to 10 percent of colorectal cancer are as a consequence of recognised hereditary conditions such as familial adenomatous polyposis and hereditary nonpolyposis colorectal cancer. (WCRF 2012) Additionally, 20 percent of colorectal cancers are seen in people who have a family history of the cancer. (WCRF 2012)

Furthermore, research has shown that body size particularly in terms of central abdominal fat increases one's risk of developing tumour cells associated with colon and rectal cancer (Hughes 2011, e18571) Particularly high levels of body fat in terms of obesity during preadolescent and adolescent stages of the life cycle has shown to increase one's risk of

developing the disease, however more extensive research is needed is this aspect. (Hughes 2011, e18571) On the other hand, there is substantial evidence which have been investigated and discusses the relationship between physical inactivity and the risk of colon cancer among both males and females. (WCRF 2008) However there have been no formal results which have indicated the level of risk reduction which would appear with frequent and regular physical activity. Interestingly there is substantial epidemiological evidence which shows that there is a direct relationship that the factors which lead to greater attained height in women are related to the cause of colon cancer in this population. (WCRF 2012) It has been shown that the increased height on its own is not what researchers have considered a factor but the causal factors which promotes linear growth during childhood. (WCRF 2012)

Moreover, as evidenced from twenty four (24) cohort studies that the association of consumption of ethanol of greater than 30 grams per day from alcoholic beverages is a significant reason for colon cancer in men, but there is possibly a significant relationship with the advancement of the disease in women. Nevertheless more comprehensive research is needed for women. (WCRF 2012) Equally important from analysis and research conducted is that there is a strong correlation between chronic tobacco smoking and the risk of acquiring colon cancer. (Hansen 2012) There was no substantial evidence to support the fact that consumption of antioxidant micronutrients helps reduce the effects of chronic smoking on increasing the risk of colorectal cancer in any gender. (Hansen 2012)

In addition to the other risk factors, there has been a considerable amount of research conducted on risk factors related to the diet in terms of low fiber, fruit and vegetable and high red meat, processed meats and high fat consumption. Research has shown that a diet high in red meats and saturated fat increases one's risk of colon cancer. (Sandler 1996, 717-735) Data

obtained on red and processed meats have shown very strong and significant relationships in the frequent consumption of these foods with the cause of colon or rectal cancer. (WCRF 2012) One of the more commonly known risk factors associated with colorectal cancer in terms of the diet is that of low fiber and fruit and vegetable intakes. Several cohort studies and meta-analysis have shown that an increased intake of fiber in the diet of 10g/ day is correlated with a 10 percent reduction in the risk of developing the disease. (WCRF 2012) However there isn't conclusive evidence about the potential benefits of fruit and vegetable intake in diminishing the risk of developing the disease. (WCRF 2012) There is now a vast amount of studies observing and analysing newly proposed protective and causal factors such as garlic, folate, selenium, fish, iron, milk, calcium, vitamin D, sugars and animal fat intake. Nevertheless more substantial research is needed to provide greater evidence whether in support of or against the proposed mechanisms of these items. (WCRF 2012)

Currently in the Caribbean and particularly in Trinidad and Tobago there has been little to no scientific documentation of the prevalence of the risk factors associated with the development of colorectal cancer, however there has been research on risk factors such as physical inactivity frequent alcohol consumption and smoking in relation to development of breast prostate and lung cancer. Additionally it is hypothesized that most of people of Trinidad and Tobago lack the awareness and knowledge of these risk factors. Of great concern is the high level of exposure of these modifiable risk factors to the students who are enrolled in tertiary education institutions which increases their risk of developing colorectal cancer. Therefore, this study determines the prevalence and knowledge level among the student population of the University of the West Indies of the risk factors which are associated with the development of colorectal cancer.

Purpose of the Study

The purpose of this study was to determine the prevalence and knowledge level of the risk factors which are associated with the development of colorectal cancer, of the student population of the University of the West Indies St. Augustine Campus.

Objectives of the Study

General Objective

To determine the prevalence and knowledge level of the risk factors associated with the development of colorectal cancer among the student population of the University of the West Indies, St. Augustine Campus.

Specific Objective

1. To determine the prevalence of low fiber, fruit and vegetable consumption among the student population of UWI, St. Augustine Campus.
2. To determine the prevalence of high fat, red meat and processed meat consumption among the student population of UWI, St. Augustine Campus.
3. To determine the prevalence of chronic alcohol, smoking and overweight/ obesity among the student population of UWI, St. Augustine Campus.
4. To determine the levels and frequency of physical activity among the student population of UWI, St. Augustine Campus.
5. To determine if the knowledge of the students of the risk factors related to the development of colorectal cancer is significantly associated with the high fat, red

meat and processed meat, and low fiber, fruit and vegetable intake among the study population.

6. To determine if there is a linear relationship between unhealthy lifestyles (high fat, red meat and processed meat intake, low fiber, fruit and vegetable intake, chronic alcohol consumption, smoking, overweight/ obesity, family history of cancer and physical inactivity and the perceived risk of developing colorectal cancer among the study population.
7. To determine which faculty of the has the highest knowledge and prevalence of these risk factors.
8. To determine if there are any gender differences between knowledge and prevalence of risk factors in the student population.

Hypotheses

1. Female students will have a higher and knowledge level as opposed to male students.
2. Female students will have a higher prevalence level than male students.
3. There is a high prevalence of ≥ 3 risk factors associated with the development of colorectal cancer among the student population of UWI, St. Augustine.
4. There is a high prevalence of low fiber, fruit, vegetable and high fat, processed and red meat consumption among the student population of UWI, St. Augustine.
5. There is a high level of physical inactivity among the student population of UWI, St. Augustine.
6. There will be a negative correlation between prevalence and knowledge level.

7. Students who are current or past smokers will have a low fruit and vegetable intake.
8. There will be a negative correlation between students' perception of their own health status and their perception of their risk for developing colorectal cancer.
9. Students eating habits are influenced by the cost, location, cultural aspect, peer pressure, perceived health benefits and food safety of the items they consume.
10. There is a gender difference between knowledge and prevalence of risk factors among gender groups.
11. Knowledge and prevalence of risk factors are not evenly distributed thought out the university as depicted by faculty.

Significance of the Study

A high prevalence level of these non-modifiable and modifiable risk factors increases one's risk of developing colorectal cancer greatly which if not addressed can increase the number of cases of colorectal cancer and also increase the incidence of the disease in Trinidad and Tobago considerably. Furthermore the knowledge level of these risk factors is of utmost importance because exposure to such information is paramount in helping reduce the prevalence of these risk factors. From the vast amount of literature and research conducted worldwide, however there is only a diminutive amount of research on risk factors in developing countries in particular in the Caribbean. In addition, there is no current published information on the prevalence, and knowledge level of the risk factors for colorectal cancer in Trinidad and Tobago. Therefore, in an attempt to lower the incidence of colorectal cancer cases and its risk factors in

Trinidad and Tobago for the foreseeable future, the prevalence and knowledge level of the risk factors associated with the development of colorectal cancer of these tertiary education students must be determined and from the results obtained implement privative measures in dealing with this problem. Additionally the findings of this research would add to the current body literature currently existing and would provide data on the prevalence of risk factors for colorectal cancer in Trinidad among university students.

CHAPTER II

LITERATURE REVIEW

Introduction

Malignant neoplasm or commonly known as cancer is a disorder of cell growth and regulation in the body, there is an abnormal division and reproduction of specific cells throughout the body via the blood and the lymph systems which then mutate and develop into a mass known as a tumor. (Yeatman 2001) During the modern era cancer has been ranked as the seconded ranked cause of mortality worldwide among both men and women. (WCRF 2012) As stated by the World Cancer Research Fund (WCRF) the most common sites where cancer is developed in individuals are of the lung, breast, prostate, colorectum, liver, stomach and cervix uteri. (WCRF 2008) The most common cancer worldwide is lung cancer followed by breast and colorectal cancer respectively. (WCRF 2008) Colorectal Cancer is a neoplastic disease of the large intestines (Ascending, Transverse and Descending Colon) and the rectum that develops over the course of a lifetime. It is a mucosal disease whereby the tumours develop on the mucosal lining of the wall of the bowel. This type of cancer is most commonly known to be a disease of the developed countries of the Western culture. (American Cancer Society 2013) As this cancer has become more prevalent worldwide and the rise of the incidence of the disease increase, in depth investigations have be conducted to determine the factors which contribute to the development of the this particular type of cancer. It was found that lifestyle, dietary factors and a family history of the disease are among the leading causes for the development of colorectal cancer.

According to the WCRF in the year 2008 over 1.2 million new cases of colorectal cancer cases were reported among both developing and developed countries. (WCRF 2008) Cancer of the colorectum has been extensively researched on developed societies however in the Caribbean there is only little to no research being conducted on determining the reason why colorectal cancer is becoming more prevalent among the various territories. This type of cancer is not gender specific nor is it ethnic specific, anyone can develop colorectal cancer; additionally it is ranked the third highest cause of deaths as a result of cancer in both males and females. (WCRF 2008) In Trinidad and Tobago cancer of the colon & rectum is the third most prevalent cancer among both males and females with an incidence rate of 24.5; however it accounts for a mortality rate of 0.9. (National Cancer Registry 2002) Colorectal cancer cases are more commonly reported among the age group of 60-84 years (259 cases) in the Trinidad and Tobago population (National Cancer Registry 2002) One's likelihood of developing colorectal cancer are determined by their exposure to nonmodifable and modifiable risk factors which increases the risk of being diagnosed with this type of cancer. These non-modifiable risk factors consist of age whereby the older one gets the greater the risk developing cancer and a family history of colorectal cancer. The modifiable risk factors which have a positive influence in the development of colorectal cancer are all lifestyle factors for example dietary, obesity, smoking,, physical inactivity and alcohol consumption. (WCRF 2008)

Due to colorectal cancer rising prevalence and incidence prevention through lifestyle modification is paramount in reducing the number of new cases of this cancer. Nutrition is a key factor in this preventative treatment, by adopting healthier lifestyles such as smoking cessation, reducing alcohol intake, increasing one's physical activity, increasing consumption of fiber, fruits and vegetables and maintain a healthy weight. Not only does this multifactorial

preventative measure help reduce one's risk of developing colorectal cancer but it improves their nutritional status also.

Factors Affecting Purchasing Behaviour

Research conducted by Radder et al. (2005) studied the preference, perception and opinion of consumers in South Africa and found that the major factor affect consumers preference was the price of the items they consumed and location. (Radder 2005, 583-589) Additionally Hyun et al. (2010) studied the purchasing behaviour of university students in Korea found that the main factor affecting purchasing was convenience; however the second main factor was that of cost and location. (Hyun 2010, 332-338)

Perceived Risk of Colorectal Cancer

There has not been a vast amount of research conducted which have examined the factors which are associated with an individual's perceived risk of colorectal cancer. However, Vernon et al. (1999) found that males and those who reported a poor health status believed they were at an increased risk for developing colorectal cancer as opposed females and those who reported an improved health status. (Vernon 1999, 101-119). Furthermore, Stark et al. (2006) investigated the factors which were associated with perceived risk of developing colorectal cancer among individuals who were aged between the ages of 50-75 years. There was a significant difference in the mean perceived risk score with the self-reported health status ($p=<0.0001$), whereby poor health status was seen to have a higher perceived risk score. (Stark 2006, 740-749) Additionally, Hay et al. (2006) found that individuals who reported a poor health status had a higher absolute risk of developing colon cancer ($p=0.05$). (Hay 2006, 71-92)

Colorectal Cancer Knowledge.

As the number of reported cases of colorectal cancer increases worldwide, much media coverage in terms of social, print, radio and video media has highlighted the importance and dangers of this particular cancer. Awareness of what is colorectal cancer, its causes and risk factors, signs and symptoms and preventative methods of reducing one's risk can assist in lowering the projected incidence and mortality of this cancer. Currently there is an extensive amount of available information on nearly all of the different types of cancer. Although colorectal cancer is becoming more prevalent worldwide there seems to be a general lack of knowledge. Beeker et al. (2000) set out to determine the attitudes, beliefs and behaviours in older adults of colorectal cancer screening using qualitative research methods. Subjects overall were poorly informed about their risk through lifestyle risk factors of colorectal cancer. Moreover there was a significant uncertainty from the respondents of which gender they thought was at risk of developing the disease. (Beeker 2000, 263-278)

In a study conducted by Wardle et al. (2001), the awareness of the risk factors for cancer among British adults was investigated. The overall aim of this study was to evaluate the knowledge and awareness of the risk factors for five common cancers in a sample of 3693 adults located in the United Kingdom. Each of the subjects used for this study were surveyed by being asked to identify possibly established risk factors and hypothetical causes from a list of 14 variables for cancers of the breast, cervical uteri, prostate, lung and bowel (colorectum). The corrected score used in this study for bowel cancer consisting of age, low fiber diet, family history, fruit and vegetable intake was given a score of 15. Results specifically showed that there were no significant differences between the beliefs about risk factors for bowel cancer. Additionally only an average of 5 from a total 15 correct causes was identified by participants.

From the overall study females were able to identify more of these risk factors rather than males as evidenced by $F= 30.2$, $p < 0.001$. It was then concluded that adult population of the United Kingdom had a poor awareness of the established risk factors for cancer in general. (Wardle 2001, 173-174)

Similarly research done by Weinstein et al. (2004) set out to determine the colon cancer risk perception of the common laypeople. The sample population comprised of individuals in two primary care practise from a group-model health organization in the United States of America (USA) whereby subjects who were included into the study were of the age range of 40-70 years and had no prior history of cancer of any kind. A computerized questionnaire was given to each of the participants where specific questions examining the presence of the risk factors of colon cancer was asked using the Harvard Colon Cancer Risk Assessment (HCCRA). Only 24.7% of 1428 subjects participated throughout the entire study. It was found that sample population had a healthier lifestyle than the population used to standardize the HCCRA. There was a large overestimation with the absolute risk of colon cancer and the population's risk as compared to similar individuals of the same gender and age. There was a significant association between actual and perceived relative risk with a p value of <0.0001. Correlations between risk judgements and risk factors were significant where subjects believed that red meat consumption and a family history of colon cancer is associated with an increased risk and frequent moderate physical activity and vegetable consumption is associated with a decreased risk of developing colon cancer. (Weinstein 2004, 53-65)

Following up from the work done by Beeker et al., another qualitative cross-sectional study conducted by Shokar et al. (2005) also looked at the knowledge, beliefs and attitude about cancer and also specifically colorectal cancer. It was found that the overall knowledge of cancer

in general was poor far less for colorectal cancer. In terms of showing awareness for risk factors for cancer approximately only 7% of the study population cited increasing age as the strongest factor for the development of cancer. Apart from age diet was the highest ranked risk factor indicated for colorectal cancer as opposed to physical inactivity and polyps. There was a definite lack of knowledge of colorectal cancer and the risk factors in this population which contained a diverse mixture of ethnicities. However due to the small sample size statistical inferences were unable to be made and also the use of convenience sampling the sample population was not representative of the total population. (Shokar 2005, 341-347)

In a study carried out by Robb et al. (2006) noted that there was a better awareness level among the study population of 648 subjects located in south-west England where 42.2% of the subjects identified physical inactivity and 43.3% identified smoking as risk factors for the development of colorectal cancer. (Robb 2006, 187-190) Findings from Ferlay et al., Boyle et al and Parklin et al suggest that both males and females are at equal risk for developing colorectal cancer as opposed to children, the adult male and the adult female. (Ferlay 2004; Boyle 2005and Parklin 2006)

However as weighed against to the findings of Wardle et al. (2001), Akhtar et al. (2007) investigated the level of awareness of a separately defined study population consisting of first degree relatives of patients with colorectal cancer on different types of lifestyle behaviours which could reduce their risk of developing colorectal cancer. The sample size for this particular study was 137 subjects however data from only 76% of the population was obtained. A questionnaire was also implemented in this study examining the subject's current knowledge of the profound link between colorectal cancer, genetics and lifestyle behavioural risk factors. Responses from the questionnaire were scored as one point for each response given for

awareness of lifestyle and dietary risk factors. It was discovered that the data collected was continuous nonparametric, therefore the Mann-Whitney U-test was used to analyse such data. Additionally categorical variables were analysed using the chi-squared test. The greater majority of the population were aware that diet and smoking are strongly associated with increasing one's risk of developing colorectal cancer, however for the risk factors of alcohol and exercise the greater majority were against the fact that these factors were correlated with increasing one's risk. The awareness of low fiber, vegetable and fruit and high fat diets (44%, 41% & 43% respectively) correlated positively with the findings of Wardle et al. It was also seen that there were no gender differences when it came to the level of knowledge of these risk factors as evidence with p= 0.74. There is still a poor knowledge of colorectal cancer risk factors within this demographical population. (Akhtar 2007, 887-890)

In another study organized by Byurgri et al. (2008), the awareness of cancer risk factors in patients and attendants of an outpatient clinic at a university hospital in Karachi, Pakistan was determined. Data was collected using a cross-sectional survey to a sample size of 315 respondents who resided in Karachi using convenience sampling method in the waiting areas of the hospital. The survey focused on demographical variables, family history of cancer, awareness of too different type of cancer and the risk factors for cancer were incorporated into questions for the survey. These risk factors comprised of tobacco smoking, lifestyle risks such as age, alcohol, diet and obesity. Findings showed that there 34.9% of the sample population reported a family history of cancer and of this segmented amount 48.9% were aware of the risks which are associated with this family history of cancer. Most of the respondents (92.6%) were aware of the risk which posed to one's health in terms of developing cancer however; obesity was seen to have the least awareness as a risk factor. Upon conducting further analysis using chi-squared

tests there were no significant associations ($p > 0.05$) exposure to these risk factors and their awareness of these factors in increasing one's risk for developing cancer. One significant limitation to this study was that due to the small sample size, it is not a true representation of the target population and therefor can't be used to make general assumptions for the population of Pakistan. (Bhurgri 2008, 263-278)

Research conducted by Sessa et al. (2008), found similarly in a random sample of 1165 adults that there was a poor level of knowledge of colorectal cancer. Only 30.1% of the population were able to give an accurate definition to what is colorectal cancer. Additionally only 18.5% of the population was able to identify physical inactivity and high fat diets as the main modifiable risk factors for the development of colorectal cancer. Adding to this, analysis from multiple logistic regression showed that the knowledge of these two main modifiable risk factors were associated with a higher education level (OR= 1.08, 95% CI 1.03-1.15, p= 0.004), performing physical activity (OR= 1.79, 95% CI 1.14-2.83, p= 0.012), modification of dietary habits (OR= 1.92, 95% CI 1.07-3.46, p= 0.029), physical activity for fear of contracting colorectal cancer (OR= 2.22, 95% CI 1.10-4.49, p= 0.027) and lower risk perception of contracting colorectal cancer (OR= 0.91, 95% CI 0.83-0.99, p= 0.028). (Sessa 2008, 171) Furthermore Key et al. (2009) found that there was a higher incidence of colorectal cancer cases among vegetarians 102% (95% CI: 80%, 129%) as opposed to non-vegetarians 84% (95% CI. 73%, 95%). (Key 2009, 1620S-1626S)

Furthermore Tseng et al. (2009) investigated the level knowledge of colorectal cancer and its relationship with risk factors present among African Americans and White men and women in the Deep South of USA. From the study it was found that mean knowledge score for individuals with a higher education level p= 0.003. Also the statement "Risk of colorectal cancer

becomes greater as a person gets older" and "Both men and women are at risk for colorectal cancer" showed that 85.37% and 93.5% respectively were able give a correct answer. (Tseng 2009, 90-97) Cullinen et al. (2009) surveyed a total of 160 subjects to determine their knowledge and behaviours related to colorectal cancer. A vast majority of the participants heard or knew of colorectal cancer. It was found that the following risk factors were thought to increase one's risk of developing colorectal cancer: Being overweight (35.0%), Eating a high fat diet (28.8%), Not being physically active (22.5%), Smoking (26.3%), Drinking alcohol (33.1%), Family history (61.3%) and Increasing age (35.6%). (Cullinen 2009, 219-221) As well Agho et al. (2012) determined if there was any significant correlation between health literacy and self-reported knowledge and awareness of colorectal cancer. Similarly to the findings found by Tseng et al. for the questions asked such as: "The risk of colorectal cancer is higher in men than women", "Colorectal cancer risk increases after age 50" and "A family history of colorectal cancer does not increase your risk" the percentage of correct response were 14, 94 and 70 respectively. There were no correlations between knowledge and awareness level for colorectal cancer. (Agho 2012, 10-19)

Colorectal Cancer Risk Factors

There is has been a vast multitude amount of research conducted worldwide focusing on various lifestyle factors such as smoking, physical activity, alcohol consumption and, dietary factors which have been determined to increase one's risk of developing colorectal cancer. Kendozor et al. (2008) cited the need to describe the prevalence, patterns and predictors of coccurring modifiable cancer risk factors among 399 African-Americans. It was found that the mean number of modifiable cancer risk factors (cigarette smoking, physical inactivity, frequent alcohol consumption and being overweight/ obese) was 2.59 (± 0.73), with a significant

difference between gender (p= 0.02) whereby females had a greater number of risk factors than males (2.6 and 2.42 respectively). There was a significant difference in the distribution of the total number risk factors (p= 0.03) where males were more likely to have only one risk factor as opposed to females who were more likely to have all of these risk factors. This result was supported by univariate and multivariate ordinal logistic regression analysis (univariate- OR= 0.67, CI (0.45-0.99; p= 0.04 and multivariate- OR= 0.66 (0.44-0.98); p= 0.04). (Kendozor 2008, 2546-2554) In a conducted on Australian population looking at the prevalence and correlates of behavioural risk factors for cancer, Hausdorf et al. (2008) found that approximately 74% of the population had a prevalence of at least 4 cancer related risk behaviours among younger male adults. (Hausdorf 2008, 1339-1347)

Satia et al. (2009) analysed associations of dietary patterns with colon cancer risk distinguished by race in a southern population of USA. There was a significant association among White-Americans with fruit-vegetable dietary patterns and risk of colon cancer (OR= 0.4, 95% CI= 0.3-0.6; $P\text{-}_{trend} = 0.0001$) however, there wasn't any significant associations between the Western-Southern pattern (red meat, fried chicken, fish, eggs, french fries, cheese dishes) and colon cancer risk (OR= 1.2, 95% CI= 0.8-1.8; $P\text{-}_{trend} = 0.39$). In terms of African-Americans there were no significant associations with Western-Southern and fruit-vegetable patterns (OR= 0.78, 95% CI= 0.6-1.8; $P\text{-}_{trend} = 0.78$) and (OR= 0.78, 95% CI= 0.7-1.6; $P\text{-}_{trend} = 0.78$) respectively. (Satia 2009, 179-193)

In a study conducted on a Korean population Shin et al. (2011) assessed the association between particular risk factors of colorectal cancer and the various subsites of colorectal cancer. A higher risk for colorectal cancer was seen in older individuals as opposed to younger individuals (p <0.001). In this same study males and females with a high and frequent

consumption of meat ($P\text{-}_{trend}$ = 0.005, 0.02 respectively) and frequent alcohol consumption ($P\text{-}_{trend}$ = < 0.001, < 0.001 respectively) were associated with an increased risk of colorectal cancer. (Shin 2011) In a recent study Murphy et al. (2012) found no significant relationships with the associations of total dietary fiber and colorectal cancer risk with BMI (p= 0.75), physical activity (p= 0.74), smoking (p= 0.20), dietary intakes of alcohol (p= 0.20) and processed meat (p= 0.40). (Murphy 2012, e39361) Rosato et al. (2012) investigated the risk factors for colorectal cancer in early-onset cancers utilizing three case-control studies on colorectal cancer during the time period of 1985-2009. Results showed an OR of 1.56, 1.56, 0.40 and 0.75 for ≥ 14 drinks/ week of alcohol, the largest tertile of processed meat, vegetable and fruit intakes. (Rosato 2012, 335-341) In addition Fu et al. (2012) explored the subject of the combined impact of particular risk factors specifically cigarette smoking, obesity, high intake of red meat and low fiber. It was found that high red meat intake was significantly associated with an increased risk of colorectal cancer (P_{trend} = ≤ 0.05). (Fu 2012, 766-776)

Joshu et al. (2012) identified the opportunities for the primary prevention of colorectal cancer and assessed the prevalence of modifiable lifestyle risk factors in the United States. Risk factors of concern in this particular study were obesity, physical inactivity, red and processed meat consumption, alcohol intake and cigarette smoking. From the results ever smoking was most common risk factor during the time period of 2007-2008 with a significant difference in percentages for gender (males= 55.75, females= 42.73; p= <0.01) and age (20-34= 46.02, 35-49= 46.06, 50-69= 55.28; p= 0.03) Also obesity, physical inactivity, red meat, processed meat and alcohol results also showed significant differences with age and gender (Obesity, Physical Inactivity, Red Meat Intake, Processed Meat Intake and Alcohol consumption (gender)= <0.01, Obesity & Physical Inactivity (age)= <0.01, Red Meat Intake (age)= 0.01). However there were

no significant associations between various age groups and the prevalence of processed meat intake and alcohol consumption (p= 0.47, p= 0.37 respectively). Among dietary risk factors red meat intake was the most prevalent risk factor (30.67%). The risk factors were combined to determine the number of risk factors the entire population and gender differences which were present. Three or more risk factors were observed with 17%, 1-2 risk factors observed with 64% and 19% observed with individuals with no risk factors. Gender differences observed showed that females had a lower prevalence of 3 or more risk factors (15%) and males (20%) with a p value of 0.07. (Joshu 2012, 138-145)

Theoretical Framework

The student population of the University of the West Indies, St. Augustine Campus has been observed to be a relatively healthy as compared to other segmented micro-populations in developed countries such as in USA and Europe. Upon observation of the study population it was likely that there were various modifiable lifestyle risk factors which increases their risk for developing colorectal cancer present in this particular group. These risk factors were identified as smoking, frequent alcohol consumption, low fiber, fruit and vegetable intake, physical inactivity, overweight/ obesity and high intakes of red meat, processed meat and fat in the diet. Although these assumptions were based solely on observations from the researcher and has yet not been determined, the awareness and knowledge level of these risk factors may place them at a potential risk of developing colorectal cancer in the future. If this were to occur it will further add to epidemic of cancer related cases worldwide and in Trinidad and Tobago. Due to study population consisting of younger generation the theory of the Health Belief Model is applicable to this situation. It utilizes the assumption within the model that if a threat is posed to an individual's health or well-being that affects their quality of life, one shall take steps in

instituting modifications to their lifestyle behaviours to better their own health and well-being. This threat is usually observed in the form of a disease or illness such as cancer.

The model is also comprised of six concepts which are the basis for behaviour change within this study group. Perceived Susceptibility: The student population believes that they can develop ≥ 3 modifiable lifestyle risk factors which increase their risk for developing colorectal cancer. Perceived Severity: The student population believes that a possible outcome for having ≥ 3 modifiable lifestyle risk factors is significantly enough to attempt to avoid. Perceived Benefits: The student population believes that adopting healthier lifestyles would significantly reduce their risk of developing colorectal cancer. Perceived Barriers: The student population identified the barriers which prevent them from adopting healthier lifestyles and educate the population in implementing measures to remove or reduce these barriers. Cues to Action: The student population are exposed to print and broadcast media encouraging healthier lifestyles. Self-Efficacy: The student population are comfortable in adopting healthier behaviours and are willing to incorporate these practises into their everyday activities.

Due to the rise in the prevalence of colorectal cancer cases in Trinidad and Tobago, increasing the awareness and knowledge of the risk factors which increases one's risk for developing colorectal cancer to the student population in terms of what are these risk factors, what increases one's risk for developing colorectal cancer and how to reduce the prevalence of these risk factors.

CHAPTER III

METHODOLOGY

Research Design

The research design which was implemented for this study was of cross-sectional design. The student population of the University of the West Indies, St. Augustine Campus was the target population for this study. This consisted of both levels of study: undergraduate and postgraduate students. An inclusion criterion for the study was that all participants of the study were required to be currently registered pursuing an undergraduate or post graduate degree or programme at the University of the West Indies, St. Augustine Campus. The exclusion criterion which was implemented was subjects who were not students or presently registered and subjects who were pursuing certificate, undergraduate diplomas and associate degree programmes with the university.

The sample size was estimated by utilizing a sample size formula based on the precision of a study. ($n = \frac{Z\propto/_2\, \hat{p}\, \hat{q}}{d^2}$) The predictive prevalence and knowledge level of the risk factors associated with the development of colon cancer was the foundation utilized for this formula. These risk factors included: smoking, chronic alcohol consumption, high fat, red meat and processed meat consumption, low fiber, fruit and vegetable consumption, increasing age and physical inactivity. The calculated sample size utilized a 97% confidence interval and it was determined the sample size was 384 registered students. The Slovin's Formula [n= N/ $(1+Ne^2)$] was then used to determine the number of obtained responses needed from the target population and not only just the number subjects. This was calculated using a margin of error of 3%, it was determined that the number of responses needed from the study population was 1,084 responses.

An increase in the sample size of study population was needed to compensate for non-responses; hence the initial sample size which was used for this study was 1,100 students. Additionally a sub sample of 200 students was recruited for the study to measure a variable which was not measured in from the entire initial sample. Therefore; the final sample size for the study was 1,300 students

Data was collected over a six (6) week period in an effort to meet the required sample size previously mentioned. Students were informed of the purpose of the study and the method in which the data was going to be collected. Specific lecturers from each of the seven faculties of the university (Food and Agriculture, Science and Technology, Law, Medical Sciences, Engineering, Humanities and Education and Social Sciences) were contacted using convenience sampling via electronic email. The purpose of the study, the methods to be used and requested permission to administer the instrument during either the first ten minutes, last ten minutes or ten minutes before or after the break period of their class were described and explained. Meetings with the lecturers were scheduled prior to the administration of the instrument. It was ensured that each of the courses which the instrument was administered to, the students who took part in the study already were not surveyed and were excluded during the data collection session, this was done to avoid any repetition of data collected from a subject who participated in the study already. The instrument was administered by solely by the researcher. Prior to administration of the instrument each subject was informed that all of the data which was being collected was strictly anonymous and confidential. All of the research data which were collected was done using the instrument of a questionnaire. The sampling method which was implemented into this study was the non-probability technique of convenience sampling. This meant that participants from each of the faculties were selected because of their convenient accessibility and proximity

to the researcher and compliance to participate in the study. Information about the study was relayed to the subjects via word of mouth, social networking websites (Facebook and Twitter) and social networking (Whats App and Windows Messenger). All students who were willing to participate in the study were chosen to be a subject in the study until the desired sample size was achieved of 1,100 students.

Subjects

Participants for this study were recruited from the University of the West Indies, St. Augustine Campus. The study's sample population comprised of 1,300 registered students stemming from undergraduate and postgraduate students. The sampling method which was implemented was based on each of the faculties proportional to their size. Using the current student statistics for the academic year 2012/2013 Semester 2 (UWI 2013), the sample population was then sampled using the following divisions from each of the faculties from the total sample population of 1,300 students: Engineering 14%, Food and Agriculture 6%, Humanities and Education 16%, Law 2%, Medical Sciences 14%, Science and Technology 16% and Social Sciences 33%. Furthermore, a male to female ratio of 30:70 was implemented into the sampling mechanism for this study.

Instrument

A structured eight legal sized paper questionnaire was utilized to determine the prevalence and knowledge level of the student population of the risk factors associated with the development of colorectal cancer. A pre-test of the questionnaire was conducted on twenty students who were selected using the non-probability convenience sampling method to obtain feedback on the questions on the questionnaire. The questionnaire was then adjusted based on

feedback obtained. The final questionnaire comprised of five (5) sections. Section one (1) was labelled the Socio-demographic section and was developed to obtain socio-demographical data from the study population. Questions consisted of sex, age, gender, ethnicity, faculty, program of study, student classification, level of study and if the participant knew anyone who had colon cancer before.

Section two (2) was labelled the risk assessment section. This was developed to obtain information on family history of cancer, history and regularity of smoking, frequency of exposure to second hand smoke, frequency of alcohol consumption, and level of sedentary, moderate vigorous and duration of usual activity. A family history of colon cancer was seen as a risk factor and scored as response indicating "Yes" was given a score of "1" whereas a no response was scored as "0". The final score was known as the family history of colorectal cancer index. Smoking as a risk factor was computed as a score by computing the participant's smoking history with their regularity of smoking. Smoking history was score as "0" for never and "1" for all other responses, whereas smoking regularity was scored as "0" for never and "1" for the remaining responses. These two variables scores were then summed and rescored to 0 being scored as "0" which was known to be low risk and >1 being scored as "1" which was known to be high risk. The final score was known as the smoking index. Second hand smoke was treated as an environmental risk factor and was scored as response for never and seldom was scored as "0" and was known to be low risk while the remainder of responses were coded as "1" and was known to be high risk. The final score was known as the environmental second smoke risk factor index. Alcohol as a risk factor was scored as consuming more than 2 drinks daily was given a score of "1" which was known to be of high risk while all other responses were given a score of "0" which was known to be of low risk. The final score was known as the alcohol index.

Physical inactivity as a risk factor was scored by summing both the frequency of days engaged in moderate and vigorous physical activity. All summed scores below five (5) was given a score of "1"which was known to be high risk and all other scores five and greater (≥5) was given a score of "0" which was known to be low risk. The final score was known as the physical inactivity index. The lifestyle risk factor index was then computed by summing the smoking index, alcohol index and physical inactivity index together. The highest possible index score was 3 while the lowest was 0. This indicated the number of lifestyle related risk factors present.

Section three (3) was labelled the knowledge section, which was developed to gather information on the student's knowledge to colorectal cancer and its risk factors. A knowledge score was computed in order to determine the knowledge level of colorectal cancer; the participant was asked two questions and given one statement. The first question asked "how much do they know about colon cancer?" a response of none was given a score of 0, very little was given a score of 1, fair amount was given a score of 2 and very much was given a score of 3. The second question asked "Which group of individuals do you think is at greatest risk for developing colon cancer?", the correct response which was "Both Male and Female" was given a score of 1 all other incorrect responses were given a score of 0. The statement which was given was "Vegetarians are at a lesser risk than non-vegetarian individuals of developing colon cancer." the correct response was "Disagree" which was given a score of 1 while all incorrect responses were given a score of 0. A summed knowledge score of the 3 statements was computed and was known as the knowledge score of colorectal cancer. The highest possible score here was 5 while the lowest score achievable was 0. To determine the student's knowledge level of the risk factors of colorectal cancer a Likert-scale was utilized whereby 14 factors were given which could have been replied to and scored as: "strongly disagree", "disagree",

"undecided", "agree" and "strongly agree". The responses for agree and strongly agree were combined and a response of either was given a score of 1. The responses for disagree and strongly disagree were combined and a response of either was given a score of 0. A response of "undecided' was also given a score of 0. All scores for each of the 14 risk factors were computed to obtain a knowledge risk factor score and this was known as the risk factor knowledge score. The highest score attainable was 14 while the lowest attainable score was 0. The overall knowledge score was computed by summing the risk factor knowledge score with the knowledge score of colorectal cancer. The highest possible score from this section was 19 while the lowest possible score was 0. A percentage of the score was then computed and the following categories were developed to class the knowledge score: 100.00%-90.00% was classed as having an excellent knowledge level, 89.99%-80.00% was classed as having a very good knowledge level, 79.99%-70.00% was classed as having a good knowledge level, 69.99%-60.00% was classed as having a fair knowledge level, 59.99%-50.00%was classed as having a poor knowledge level and finally ≤49.99% was classed as having a very poor knowledge level.

Section four was labelled the food frequency section. This was developed to obtain information on the subject's dietary behaviour in terms of fiber intake, fruit and vegetable, red meat, processed meat and fat consumption. This section was constructed utilizing the principles of the "Block Questionnaire" (Thompson 1994) In order to determine consumption frequency and amount of the particular item consumed a food frequency table was constructed utilizing again a Likert-scale. To determine the amount of the food item consumed the following formula was used Amount (servings per week) = Frequency x Usual Serving Size. A total of 23 food items were given and the options which were given to the participant to respond were as follows: "Less than once per WEEK" given a value of 0, "About 1 time per WEEK" given a value of 1,

"2-3 times a WEEK" given a value of 2.5, "4-5 times a WEEK" given a value of 4.5 and ">5 times a WEEK" given a value of 5.5. This was known as the frequency of food consumed. For each of the food items, the participant was also asked what were their usual serving sizes of the food items consumed. The responses which were given were as follows: "1 serving" given a value of 1, "2-3 servings" given a value of 2.5 and "≥ 4 servings" given a value of 4.5.

Fruit intake was determined by computing servings per week of "fruit juice and fruit consumed". International recommendations of at least 2 servings of fruit per day was set as the cut-off point; therefore less than 14 servings of fruit per week was seen as fruit risk and was given a value of 1 which indicated high risk while greater than or equal to 14 servings per week was given a value of 0 which indicated low risk. (WHO 2013) These scores were known as the fruit index. Vegetable intake was determined by computing servings per week of "green salad" and "vegetables raw, steamed, boiled or fried". International recommendations of at least 3 servings of vegetable per day was set as the cut-off point; therefore less than 21 servings per week was seen as vegetable risk and was given a value of 1 which indicated high risk whereas greater than or equal to 21 servings per week was given a value of 0 which indicated low risk. (WHO 2013) These scores were known as the vegetable index. Fruit and vegetable index were then combined to indicate one risk factor of fruit and vegetable intake. The highest score possible was 2 while the lowest was 0. A score of greater than or equal to 1 was given a score of 1 which indicated high risk while a score of 0 was seen as low risk. The final score was known as the fruit and vegetable index.

Fiber intake was determined by computing servings per week of "fruit', "green salad", "fiber cereals", "Whole Wheat bread, pastries, crackers", "Beans or Peas" "vegetables raw, steamed, boiled or fried". International recommendations of at least 30 g per day (three servings

of vegetable and three servings of fruit, two servings of whole grain foods, one servings of legumes and one serving of fiber cereal) was set as the cut-off point; therefore less than 70 servings per week was seen as fiber risk and was given a value of 1 which indicated high risk whereas greater than or equal to 70 servings per week was given a value of 0 which indicated low risk. (The Nutrition Source 2013) These scores were known as the fiber index. Red meat intake was determined by computing servings per week of "Hamburgers or ground beef" and "Beef or Pork as included in sandwiches, stew, pies, curried or BBQ". International recommendations of at least 70g (approximately 0.78 servings) per day was set as the cut-off point; therefore greater than 5.46 servings per week was seen as red meat risk and was given a value of 1 which indicated high risk while less than or equal to 5.46 servings per week was given a value of 0 which indicated low risk. (WCRF 2013) These scores were known as the red meat index.

International recommendations for processed meat intake of at least 20g (approximately 0.5 servings) per day was set as the cut-off point; therefore greater than 3.5 servings per week was seen as processed meat risk and was given a value of 1 which indicated high risk whereas less than or equal to 3.5 servings per week was given a value of 0 which indicated low risk. (WCRF 2013) These scores were known as the processed meat index. Fat intake was determined by computing servings per week of "Fried chicken", "Salad dressing", "Margarine or butter on bread or potatoes", "Mayonnaise", "Margarine, Butter or Oil in cooking", "Cheese, cheese spread (not low fat)", "Whole milk (not low fat or reduced fat)", "French fries or fried potatoes", "Pastries, cookies, cakes" and "Fried hot appetizers". International recommendations of at least 2 servings of fat per day was set as the cut-off point; therefore greater than 14 servings per week was seen as fat risk and was given a value of 1 which indicated high risk while less than or equal

to 14 servings per week was given a value of 0 which indicated low risk. (American Heart Association 2012) These scores were known as the fat index. International recommendations for garlic or onion intake of at least 1 serving per day was set as the cut-off point; therefore less than 7 servings per week was seen as garlic or onion risk and was given a value of 1 which indicated high risk whereas greater than or equal to 7 servings per week was given a value of 0 which indicated low risk due to its protective effects in reducing one's risk of colorectal cancer (WCRF 2013) These scores were known as the garlic or onion index. Dietary risk factor index was determined by computing by summing the fruit and vegetable index, fiber index, red meat index, processed meat index and fat index. The highest possible index score was 5 while the lowest was 0. This indicated the number of dietary related risk factors present.

The final section which was section five (5) was labelled the general information section. This section was developed to obtain information on factors which affected the subjects purchasing behaviour to the foods they consumed, their perception of their own health status, the method in which they obtain information on colon cancer, any information they would like on colon cancer and their perception of their risk of developing colon cancer. Succeeding this, respondents were asked to report their current weight (pounds) and height (feet and inches). This was used to calculate the participant's BMI which was calculated by converting the current weight into kilograms and the height into metres to be implemented in the BMI formula (Weight (kg)/ Height (m^2). (CDC 2011) BMI values were then placed into BMI categories from underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI 25.0-29.9) and obese (BMI≥ 30.0). (CDC 2011) BMIs of overweight and obese were given a score 1 which indicated high risk whereas BMIs of underweight and normal were given a score of 0 which indicated a low risk. The highest possible score was 1 while the lowest score was 0. These scores were

known as the BMI risk index. However this was not included in the calculation of the overall risk factor index due to only 200 participants from the original sampled participated in this measurement. A Silhouette of varying body sizes for both males and females were given depicting various BMI classifications to determine how participants viewed their body size however, these ranges were not given on the questionnaire which was given to participants. (Appendix A) An overall risk factor index was computed by summing together the dietary risk factor index with the lifestyle risk factor index, family history of colorectal cancer index and environmental second smoke risk factor index. The highest possible score from the index was that of 10 while the lowest possible score was 0. This indicated the number of risk factors associated with the development of colorectal cancer present.

The second questionnaire which was given to the sub-sample of 200 participants consisted of demographical questions to obtain demographical data from the study population. Questions consisted of sex, age, gender, ethnicity, faculty, program of study, student classification and level of study. Additionally respondents were asked to report their current weight (pounds) and height (feet and inches). This was used to calculate the participants BMI. Further the silhouette previously mentioned was included in this questionnaire for the same purpose as stated for the first questionnaire. The questionnaire was pretested on 10 students who were selected using the non-probability convenience sampling method to obtain feedback on the questions on the questionnaire. (Appendix B) However these responses from these students were not included in the analysis of the results. Any feedback obtained was used to adjust the questionnaire. The total duration to complete the first survey was 10-12 minutes per participant and 2-3 minutes per participant for the second survey. The reliability of the two questionnaires was not determined.

Procedure

The questionnaire was self-administered by the researcher. At the beginning of the questionnaire a brief introduction and instructions were provided to the subject. This was then supplemented by the researcher whereby explanation to the subject the purpose and significance of the study. The researcher then informed each of the participants that participation to the study was strictly voluntary and all of the data collected was also strictly confidential. Verbal consent was required for participation in this study.

Statistical Analysis

All of the data collected was collated and then analysed using the Statistical Package for the Social Sciences (SPSS) version 12.0 was used. From the data, descriptive statistics were used to calculate the general frequencies, percentages of these frequencies and means of the data. Associations between demographical variables were compared using Chi-Squared Analysis. To determine whether parametric or non-parametric would be used a test for normality was performed using the Kolmogorov-Smirnov test. Means were compared using the independent t test and one way ANOVA test if the data was normally distributed however, for non-normally distributed data the non-parametric versions were used such as the Mann-Whitney U test and the Krushkal Wallis One Way ANOVA test. Post Hoc Analysis was performed to determine what the significant differences from the ANOVA tests were. Comparisons of the perceived body image BMI and calculated BMI were done using the paired sample t-test. Variables were correlated using the Spearman's Rank correlation. Significance was set at $p \leq 0.05$ for all statistical tests.

CHAPTER IV

RESULTS

Demographics

The sample comprising of 1,300 students of the University of the West Indies, St Augustine Campus with a majority of 910 being females and 390 being males which constituted 70% and 30% of the study population respectively. The age distribution within the population as distinguished by gender showed, the majority of 86.9 % of female participants (n=791), while the majority of 86.7% of male participants (n=338) were of the age range of ≤ 24 years. This was followed by 10.7% of females (n=97) and 12.3% of males (n=48) within the age ranges of 25 and 40 years. The minority of the population consisted of 2.4% females (n=22) and 1.0% males (n=4) greater than the age of forty (40) year. There was no significant association from Chi-Squared Analysis (p=0.65) (Table 1) between the distributions of participants based on their age and gender.

In terms of the distribution of ethnicity based on gender, 45.7% of females (n=416) and 46.2% males (n=180) were of the ethnic group of Indo-Trinidadian. Moreover 24.9% of females (n=227) and 20.3 % of males (n=79) were Afro-Trinidadian, while 24.4% of females (n=222) and 24.1% of males (n=94) were Mixed. The remainder of the sample 4.9% females (n=45) and 9.5% males (n=37) were other. Chi-Squared Analysis showed there were no significant associations between ethnicity and gender of the participants. With regard to Faculty distribution the majority of participants were from the Faculty of Social Sciences with 33.8% females (n=308) and 30.5% males (n=119). Following this the Faculty of Science and Technology comprised of 16.2% of females (n=147) and 15.6% males (n=61), Faculty of Humanities and Education 20.2% females (n=184) and 5.1% males (n=20), Faculty of Medical Sciences 12.0%

females (n=109) and 17.7% males (n=69), Faculty of Engineering 8.0% females (n=73) and 26.2% males (n=102) and Faculty of Food and Agriculture 7.7% females (n=70) and 3.3% males (n=13). The Faculty of Law made up the minority of the sample with 2.1% females (n=19) and 1.5% males (n=6). Chi-Squared Analysis showed there was significant association (p= <0.001) between the distribution of gender by faculty.

In relation to the distribution of gender based on student classification, the largest distribution was seen among Full-Time students with 93.6% females (n=852) and 95.1% males (n=371). Smaller distributions were observed with Evening students 1.9% females (n=17) and 0.8% (n=3), and Part-Time students 4.5% females (n=41) and 4.1% males (n=16). There were no significant associations (p=0.46) between distributions of gender by student classification from Chi-Square Analysis. With respect to the distribution of participants based on their level of study, 96.0% of females (n=874) and 98.7% males (n=385) were undergraduate students. Furthermore, 4.0% females (n=36) and 1.3% males (n=5) were postgraduate students. Chi-Squared Analysis showed that was a significant association (p=0.01) between the distributions between of males and females to their level of study. Additionally over 15.5% of participants knew of someone who has or had colorectal cancer. However from this there was one (1) no response to this question.

Table 1 and 2 summarizes all previously mentioned demographical data with chi-square analysis.

Table 1: Characteristics of Participants based on Gender

Characteristics	Females **(n= 910)**	Males **(n= 390)**	p-value
Age Groups (years)			
≤ 24	791 (86.9%)	338 (86.7%)	
25-40	97 (10.7%)	48 (12.3%)	0.65
> 40	22 (2.4%)	4 (1.0%)	
Ethnicity			
Indo-Trinidadian	416 (45.7%)	180 (46.2%)	
Afro-Trinidadian	227 (24.9%)	79 (20.3%)	0.16
Mixed	222 (24.4%)	94 (24.1%)	
Other	45 (4.9%)	37 (9.5%)	
Faculty			
Food and Agriculture	70 (7.7%)	13 (3.3%)	
Social Sciences	308 (33.8%)	119 (30.5%)	
Humanities and Education	184 (20.2%)	20 (5.1%)	
Law	19 (2.1%)	6 (1.5%)	< 0.001*
Science and Technology	147 (16.2%)	61 (15.6%)	
Engineering	73 (8.0%)	102 (26.2%)	
Medical Sciences	109 (12.0%)	69 (17.7%)	
Student Classification			
Full-Time	852 (93.6%)	371 (95.1%)	
Evening	17 (1.9%)	3 (0.8%)	0.46
Part-Time	41 (4.5%)	16 (4.1%)	

Table 1 (continued): Characteristics of Participants based on Gender

Characteristics	Females **(n= 910)**	Males **(n= 390)**	p-value
Level of Study			
Undergraduate	874 (96.0%)	385 (98.7%)	0.01*
Postgraduate	36 (4.0%)	5 (1.3%)	

* Significant ($p < 0.05$)

Table 2: Frequency and Percentage of Participants with Whom Have Knowledge Of Someone Who Has or Had Colorectal Cancer.

Variable	Category	Frequency	Percentage (%)
Knowledge of Someone Who Has or Had Colorectal Cancer	No	929	84.5
	Yes	170	15.5
	Missing	1	

Source of Colorectal Cancer Information

From the questionnaire the most utilized source of information was that of the Internet (40%, n=440) which consisted of websites such as WHO, WCRF, Wikipedia etc. Following this participants indicated that Word of Mouth from friends, family etc. was the second major source of information (35.8%, n=393). This was then followed by broadcast media (23.4%, n= 257) which consisted of videos, television, talk shows etc., print media (19.6%, n=215) comprising of newspaper, magazines, brouchers, flyers etc. and research articles (7.5%, n=82). The least used source of information was indicated as other (4.7%, n=52) which comprised of lectures, and information from the researcher and medical professionals.

Table 3 summarizes source of colorectal cancer utilized by university students.

Table 3: Sources of Information on Colorectal Cancer utilized by University Students

Source	Frequency (n= 1100)	Percentage (%)
Internet	440	40
Research Articles	82	7.5
Word of Mouth	393	35.8
Print Media	215	19.6
Broadcast Media	257	23.4
Other	52	4.7

Colorectal Cancer and Risk Factor Knowledge

The questionnaire consisted of a section examining the participant's knowledge of colorectal cancer and the risk factors which are associated with the development of the disease with 17 questions. The highest and lowest possible attainable scores were 19 and 0 respectively. The mean score obtained by the sample population was 10.36 ± 3.765 (54.55 ± 19.818%). The lowest score from the population was 0 (0%) while the highest score was 18 (94.74%). Females had a larger mean score of 10.62 ± 3.695 (55.93 ± 19.444%) as opposed to males who had a mean score of 9.75 ± 3.863 (51.32 ± 20.329%). Contrary to this, the bulk of the participants (36.6%) from the population had a very poor knowledge of colorectal cancer and its risk factors based on their knowledge scores. This was followed by 23.1% had a fair knowledge level, 19.4% had a poor knowledge level, 14.9% had a good knowledge level and 5.2% had a very good knowledge level. The remaining participants (0.6%) were found to an excellent knowledge as depicted by the highest knowledge scores from the population. With reference to the mean score based on faculty, participants from the faculty of Food and Agriculture had the largest score of 11.72 ± 3.869 (61.71 ± 20.361%). Following this the faculty of participants who scored the second highest was the faculty of Science and Technology with a mean score of 10.68 ± 3.66 (56.22 ± 19.263%), followed by the faculty Humanities and Education with a mean score of 10.43 ± 3.577 (54.92 ± 18.829%), next was the faculty of Medical Sciences with a mean score of 10.36 ± 3.765 (54.55 ± 21.274%) and the faculty of Engineering with a mean score of 10.01 ± 4.019 (54.55 ± 21.274%). The faculty with the lowest mean score was the faculty of Law with a mean score of 9.19 ± 4.411 (48.37 ± 23.219%).

Over 54.0% of the population perceived themselves to have very little knowledge of colorectal cancer while 22.5, 2.2 and 21.3 % of participants perceived themselves to have a fair

amount, very much and no knowledge of colorectal cancer respectively. More than 55% of participants gave the correct response to which group was at highest risk of developing colorectal cancer which was “Both men and women”. Furthermore only 22.4% of the participants gave the correct response which was “Disagree” to whether or not they believe vegetarians are at a lesser risk than non-vegetarians for developing colorectal cancer.

In terms of knowledge of risk factors associated with the development of colorectal cancer 74.5% of population agreed that a family history of colorectal is strongly associated with developing colorectal cancer. Only 59.5%, 33.9%, 58.5% and 67.1% of the participants agreed that Physical Inactivity, Diabetes, Frequent Alcohol Consumption and High Fat Intake were associated with colorectal cancer. In addition 64.2%, 68.5%, 59.7%, 54.5% and 60.3% agreed that Increasing age, Low Fiber Intake, Overweight/ Obesity, Chronic Smoking and High Red Meat Intake respectively were associated with the disease’s development. Subsequently the remaining four (4) risk factors which were High Processed Meat Intake, Low Vegetable Intake, Low Fruit Intake and Frequent Levels of Stress showed that 68.3%, 67.9%, 50.8% and 63.6% of the participant were in agreement of their potential to increase one’s risk for developing colorectal cancer.

A test for normality was done for good fit using the Kolmogorov-Smirnov test which found the data for the colorectal cancer and risk factor knowledge score to be not normally distributed ($p = <0.001$), therefore the Kruskal-Wallis One-Way Analysis of Variance was used to test for differences between the mean ranks for gender, age, faculty and knowledge of someone whom has or had colorectal cancer. The mean ranks for age were not statistically different. On the other hand, the mean ranks for gender ($p = 0.001$), faculty ($p = 0.005$) and knowledge of someone whom has or had colorectal cancer ($p = 0.034$) were statistically different.

Women were more knowledgeable than men; the participants of the faculty of food and agriculture were more knowledgeable than all other faculties on the St. Augustine campus and participants who knew someone who has or had colorectal cancer were more knowledgeable than those who did not. The mean rank scores for participants perception of colorectal cancer risk were significantly different ($p = <0.001$) based on knowledge scores. Participants who perceived themselves as not being at risk had a lower knowledge score as opposed who perceived themselves at risk. Also there was a difference between the knowledge scores between participants who believed they were at low risk as compared to those who were at high risk. Tables 4-9 and Figure 1 summarize the results previously mentioned.

Table 4: Means and Standard Deviations of Colorectal Cancer Knowledge Scores by Gender and Faculty.

Variable	Category	Group	Mean and Standard Deviations
Colorectal Cancer Knowledge Score	Sample	Total (n= 1086)	10.36 ± 3.765
	Gender	Female (n=760)	10.62 ± 3.695
		Male (n= 326)	9.75 ± 3.863
	Faculty	Food and Agriculture (n=69)	11.72 ± 3.869
		Social Sciences (n=352)	10.14 ± 3.557
		Humanities and Education (n=168)	10.43 ± 3.577
		Law (n=21)	9.19 ± 4.411
		Science and Technology (n= 176)	10.68 ± 3.66
		Engineering (n=149)	10.01 ± 4.019
		Medical Sciences (n=151)	10.36 ± 3.765

Colorectal Cancer Knowledge Score Percentage	Sample	Total (n= 1086)	54.55 ± 19.818%
	Gender	Female (n=760)	55.93 ± 19.444%
		Male (n= 326)	51.32 ± 20.329%
	Faculty	Food and Agriculture (n=69)	61.71 ± 20.361%
		Social Sciences (n=352)	53.39 ± 18.722%
		Humanities and Education (n=168)	54.92 ± 18.829%
		Law (n=21)	48.37 ± 23.219%
		Science and Technology (n= 176)	56.22 ± 19.263%
		Engineering (n=149)	52.67 ± 21.155%
		Medical Sciences (n=151)	54.55 ± 21.274%

Missing (n) = 14

Table 5: Perceived Participants Knowledge of Colorectal Cancer based on Gender

Variable	Classification	Frequency	Percentage
Perception of personal knowledge of colorectal cancer	None	234	21.3
	Very Little	594	54.0
	Fair Amount	247	22.5
	Very much	24	2.2

Missing (n) = 1

Table 6: Participants Perception on Which Group of Individuals is at highest Risk for Developing Colorectal Cancer

Variable	Group	Frequency	Percentage
Which Group do you think is at highest risk for developing colorectal cancer	Adult Male	369	33.8
	Adult Female	86	7.9
	Both Males and Females	607	55.5
	Children	6	0.5
	None	25	2.3

Missing (n) = 7

Table 7: Participants Perception on Whether Vegetarians are at Lower Risk of Developing Colorectal Cancer as Opposed to Non-Vegetarians

Perception	Frequency (n= 1091)	Percentage
Agree	327	30.0
Disagree	244	22.4
Unsure	520	47.7

Missing (n) = 9

Table 8: Frequency and Percentage of Participants Who Agreed and Strongly Agreed of the Risk Factors Which Lead to the Development of Colorectal Cancer.

Risk Factor Variables	Females (n=770)	Males (n=330)	Total (n=1100)
Family History of Colorectal Cancer	590 (72.0%)	230 (28.0%)	820 (74.5%)
Physical Inactivity	466 (71.1%)	189 (28.9%)	655 (59.5%)
Diabetes	255 (68.4%)	118 (31.6%)	373 (33.9%)
Frequent Alcohol Consumption	466 (72.4%)	178 (27.6%)	644 (58.5%)
High Fat Intake	525 (71.1%)	213 (28.9%)	738 (67.1%)
Increasing Age	493 (69.8%)	213 (30.2%)	706 (64.2%)
Low Fiber Intake	539 (71.6%)	214 (28.4%)	753 (68.5%)
Overweight/Obesity	474 (72.1%)	183 (27.9%)	657 (59.7%)
Chronic Smoking	436 (72.7%)	164 (27.3%)	600 (54.5%)
High Red Meat Intake	473 (71.3%)	190 (28.7%)	663 (60.3%)
High Processed Meat Intake	542 (72.2%)	209 (27.8%)	751 (68.3%)
Low Vegetable Intake	541 (72.4%)	206 (27.6%)	747 (67.9%)
Low Fruit Intake	406 (72.6%)	153 (27.4%)	559 (50.8%)
Frequent High Levels of Stress	493 (70.4%)	207 (29.6%)	700 (63.6%)

Table 9: Kruskal-Wallis One-Way Analysis of Variance of Total Colorectal Cancer Knowledge Score Percentage with Specific Independent Variables.

Independent Variable	Group	H(2)	p-value
Gender	Female	11.427*	0.001*
	Male		
Age Range	≤ 24	4.456	0.108
	25-40		
	>40		
Faculty	Food and Agriculture	18.392*	0.005*
	Social Sciences		
	Humanities and Education		
	Law		
	Science and Technology		
	Engineering		
	Medical Sciences		
Knowledge Of Someone Who Has or Had Colorectal Cancer.	No	4.474*	0.034*
	Yes		
Perceived Risk of Developing Colorectal Cancer	No Risk	26.969*	<0.001*
	Low Risk		
	High Risk		

* Significant ($p < 0.05$)

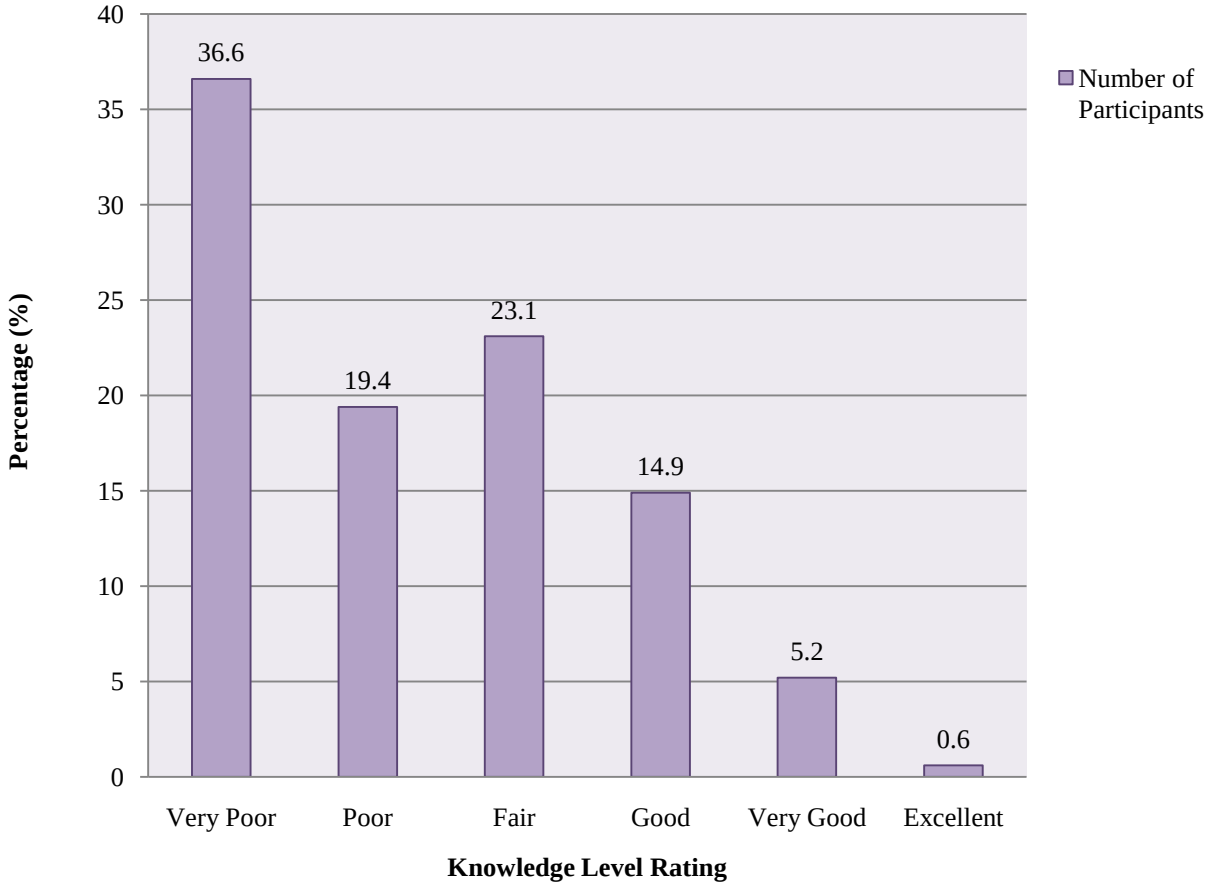

Figure 1: Percentage of Participants Knowledge Level Rating based on Knowledge of Colorectal Cancer and its Risk Factors

Post Hoc of Colorectal Cancer Knowledge Score ANOVA

From the post hoc analysis it was shown that there was a significant difference in the mean knowledge score between the faculty of food and agriculture and the faculties of social sciences and engineering (p= 0.024 and p=0.028 respectively). Additionally there was a significant difference between the mean knowledge score of participants who perceived themselves as being at no risk of developing colorectal cancer with those who were perceived their risk as being low and high (p=<0.001 and p=<0.001 respectively).

Table 10 summarizes the post hoc data previously mentioned

Table 10: Post Hoc Difference in Mean Colorectal Cancer Knowledge Score for Specific Independent Variables

Independent Variable	Category	Difference in Means	p-value
Faculty	Food and Agriculture	Social Sciences- 1.5798*	0.024
		Humanities and Education- 1.2901	0.197
		Law- 2.5342	0.096
		Science and Technology- 1.0428	0.442
		Engineering- 1.7179*	0.028
		Medical Sciences- 1.4068	0.133
	Social Sciences	Humanities and Education- -0.2896	0.983
		Law- 0.9544	0.918
		Science and Technology- -0.5369	0.714
		Engineering- 0.1382	1.000
		Medical Sciences- -0.1730	0.999
	Humanities and Education	Law- 1.2440	0.784
		Science and Technology- -0.2473	0.996
		Engineering- 0.4278	0.951
		Medical Sciences- -0.1166	1.000
	Law	Science and Technology- -1.4913	0.601
		Engineering- -0.8162	0.967
		Medical Sciences- -1.1274	0.856
	Science and Technology	Engineering- 0.6751	0.671
		Medical Sciences- 0.3639	0.976
	Engineering	Medical Sciences- 0.3112	0.991

Perceived Risk of Colorectal Cancer	No Risk	Low Risk- -1.6150* High Risk- -2.4392*	<0.001 <0.001
	Low Risk	High Risk- -0.8243	0.081

Perceived Health Status and Risk of Colorectal Cancer

The majority of participants (41.1%) rated their health status as good, followed by 31.3% reporting it as fair, 17.9% as very good, 4.7% as poor and 3.9% as excellent. The remainder (1.1%) rated their health status as very poor. With reference to participants' perceived risk of developing colorectal cancer, 72.8% (females= 552, males=242) believed they were at low risk and 17.4% (females= 132, males=58) believed they were at no risk. However, 9.7% (females= 79, males=27) of the population believed they were at high risk for developing colorectal cancer. A test for normality was done for good fit using the Kolmogorov-Smirnov test which found the data for the colorectal cancer and risk factor knowledge score to be not normally distributed (p= <0.001), therefore the Spearman's Rho was used to run the statistical test for correlations between the variables. Spearman's Rho showed a strong negative correlation (r=-0.211) which was statistically significant (p=<0.001) between perceived health status and perceived risk of colorectal cancer.

Table 11-13 summarizes the data previously mentioned.

Table 11: Frequency and Perception of Perceived Health Status among Study Population

Variable	Category	Frequency (n=1097)	Percentage (%)
Perceived Health Status	Very Poor	12	1.1
	Poor	52	4.7
	Fair	343	31.3
	Good	451	41.1
	Very Good	196	17.9
	Excellent	43	3.9

Missing (n) = 3

Table 12: Frequency and Perception of Perceived Risk of Developing Colorectal Cancer among Study Population

Variable	Category	Group		Total (n=1090)
		Females (n=763)	Males (n=327)	
Perceived Risk of Colorectal Cancer	No Risk	132 (17.3%)	58 (17.7%)	190 (17.4%)
	Low Risk	552 (72.3%)	242 (74.0%)	794 (72.8%)
	High Risk	79 (10.4%)	27 (8.3%)	106 (9.7%)

Missing (n) = 10

Table 13: Spearman Rank Correlation for Perceived Health Status and Risk of Developing Colorectal Cancer among Study Population

Variables	r	p-value
Perceived Health Status	-0.208	<0.001
Perceived Risk of Colorectal Cancer		

* Significant ($p < 0.05$)

Family History of Cancer

From the sample population, 23.1% (n= 254) reported having a family history of breast cancer, this was followed by 13.8% (n= 152) for prostate cancer, 6.9% (n= 76) for colorectal cancer, 5.6% (n= 62) for cervical cancer and10.2% (n= 112) for lung cancer.

Figure 2 summarizes the reported family history of cancer by the participants.

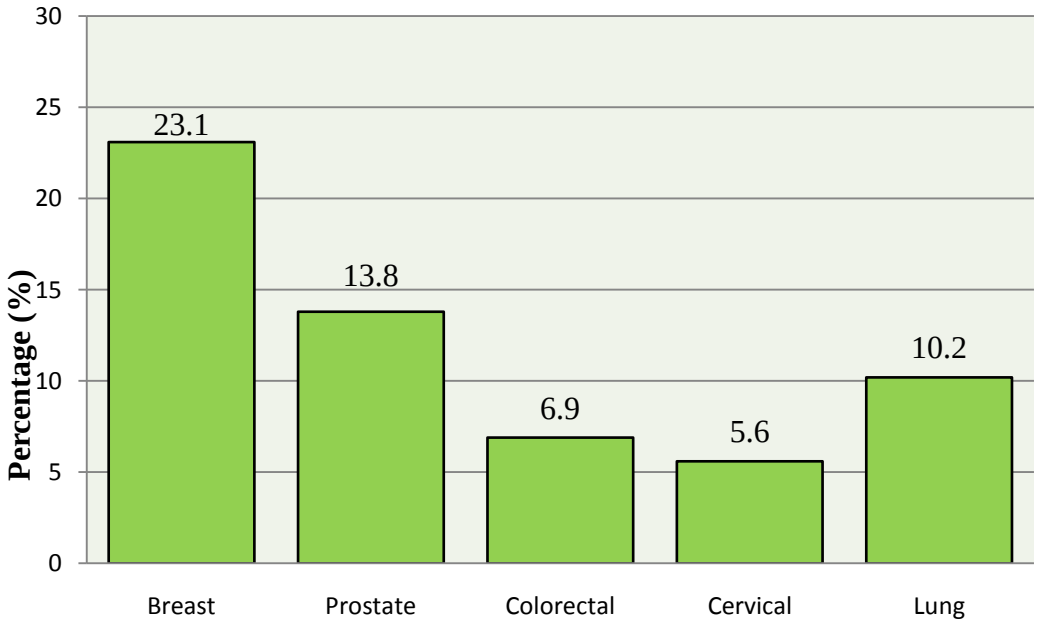

Figure 2. Percentage of particpants reporting a Family History of Caner

Lifestyle and Environmental Risk Factors

The questionnaire consisted of seven (7) lifestyle risk questions and 1 environmental risk factor question, the majority of participants (90.4%, n=993) reported to never having a history of smoking. The remaining participants reported smoking ≤ 1 year (4.5%, n=49), 1-5 years (3.5%, n=39) and > 5 years (1.6%, n=18). Over 86% of the population reported to have never smoked while 9.4% reported that they were irregular or social smokers. This was followed by 0.8% (n=9) reporting to smoke 1-2 times weekly, 0.6% (n=7) reporting to smoke greater than 3 times weekly, 1.0% (n=11) reporting to smoke 1-2 times daily and 1.4% (n=15) reporting to smoke more than 3 times daily. Most of the participants (40.5%, n=446) reported that they were exposed to second hand smoke 'Sometimes', this was followed by 29.9% (n=329) reporting to be exposed 'Seldom', 12.5% (n=138) reporting to be exposed 'Often' and 11.2% (n=123) reporting to be exposed 'Very Often'. The remaining number of participant (5.8%, n=64) reported to never being exposed to second hand smoke. It was found that 86.6% were at low smoking risk (females=698, males=254) whereas 13.4% of the population were at smoking risk (females=72, males=73). The majority of the population (64.3%, females=491, males=216) were at environmental risk, however 35.7% (females= 279, males=114) of participants were at low environmental risk.

With reference to the frequency of alcohol consumption 50.2 % of the respondents reported to have consumed alcohol irregularly or socially, followed by 25.7% never consuming alcohol, 4.5% consuming 1-2 drinks per week, 2.0% consuming 3-4 drinks per week, 1.5% consuming greater than 4 drinks per week. The lowest percentages 0.8 and 0.5% of respondents reported consuming more than two drinks and 1-2 drinks daily. Majority of the population

(95.0%, females=736, males= 308) were not at alcohol risk while only 5.0% (females=33, males=22) were at risk.

In terms of sedentary activity 41.6% (n= 457) of the participants reported to be engaging in sedentary activity between 4-8 hours per day followed by 34.5% (n=379) reporting <4 hours. However 23.6% of the respondents reported to be engaging in over 8 hours of sedentary activity per day. Of the entire population 66.5% of participants were engaging in moderate physical activity for at least 1-4 days and 18.0% reporting to have engaged in ≥ 5 days. The lowest distribution was seen with not engaging in moderate activity with 15.5% of participants. For vigorous activity 48.7% of participants reported as engaging in 1-4 days of exercise while 45.3% reported to not engaging with vigorous activity. The lower amount (6.0%) was seen with respondents who reported to have engaged in ≥ 5 days for the week. Of these amounts 39.5% of the participants reported to exercise for ≥ 45 minutes per session of exercise while 27.9% reported to have spent < 45minutes of exercise per session of activity. The remaining amount (39.5%) responded as the question not being applicable. The majority of participants (61.8%, females=514, males=166) were at physical activity risk while 38.2% (females=256, males=164). The highest attainable lifestyle and environmental risk was computed as a score of 3 and the lowest score was 0.

Tables 14-16 and figures 3-6 summarizes the lifestyle and environmental risk factors previously mentioned.

Table 14: Frequency and Percentage of Smoking Variables among Participants

Variable	Category	Frequency	Percentage
History of Smoking Missing (n)= 1	Never	993	90.4
	≤ 1 year	49	4.5
	1-5 years	39	3.5
	>5 years	18	1.6
Smoking Regularity Missing (n)= 4	Never	951	86.8
	Irregular/ Socially	103	9.4
	1-2 Times Weekly	9	0.8
	≥3 Times Weekly	7	0.6
	1-2 Times Daily	11	1.0
	≥ 3 Times Daily	15	1.4
Exposure to Second Hand Smoke	Never	64	5.8
	Seldom	329	29.9
	Sometimes	446	40.5
	Often	138	12.5
	Very Often	123	11.2

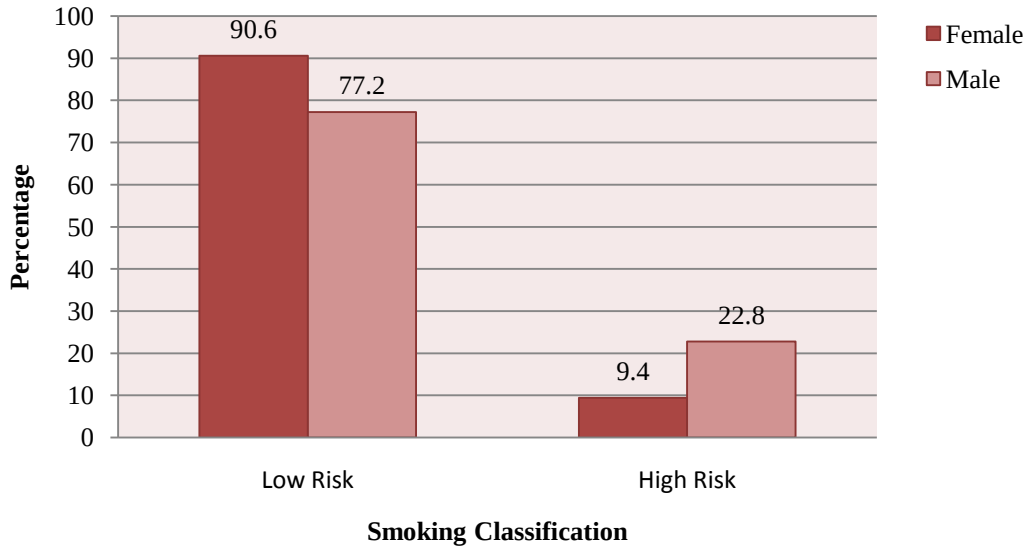

Figure 3: Percentage of Participants within each Smoking Classification

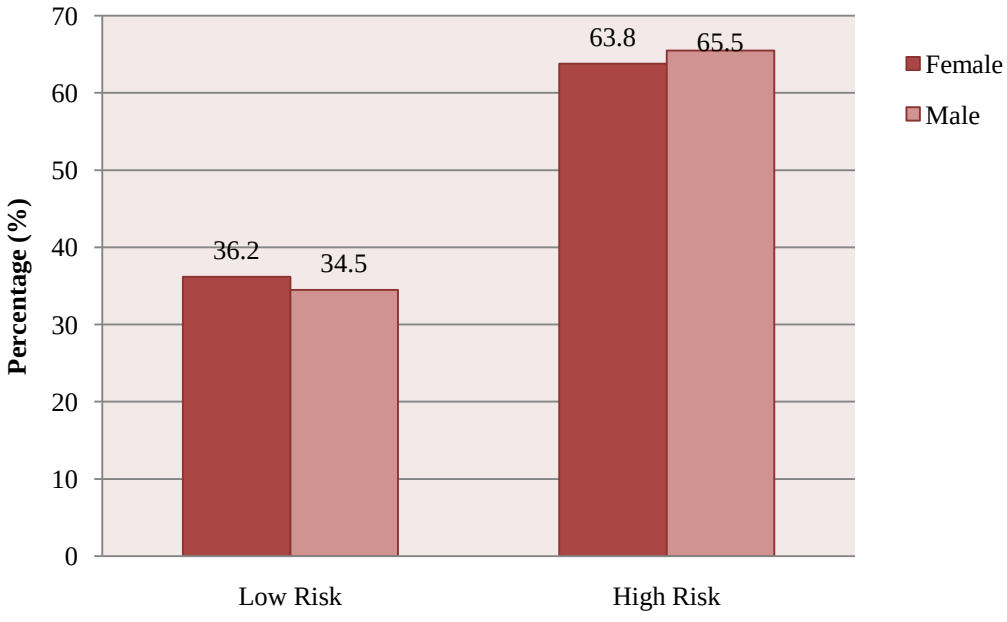

Figure 4: Percentage of Particpants within Exposure to Second Hand Smoke Classification

Table 15: Frequency and Percentage of Participants Drinking Habits

Variable	Category	Frequency (n=1099)	Percentage
Frequency of Alcohol Consumption Missing (n)= 1	Never	334	25.7
	Irregularly/ Socially	652	50.2
	1-2 Drinks Weekly	58	4.5
	3-4 Drinks Weekly	26	2.0
	>4 Drinks Weekly	19	1.5
	1-2 Drinks Daily	6	0.5
	>2 Drinks Daily	4	0.3

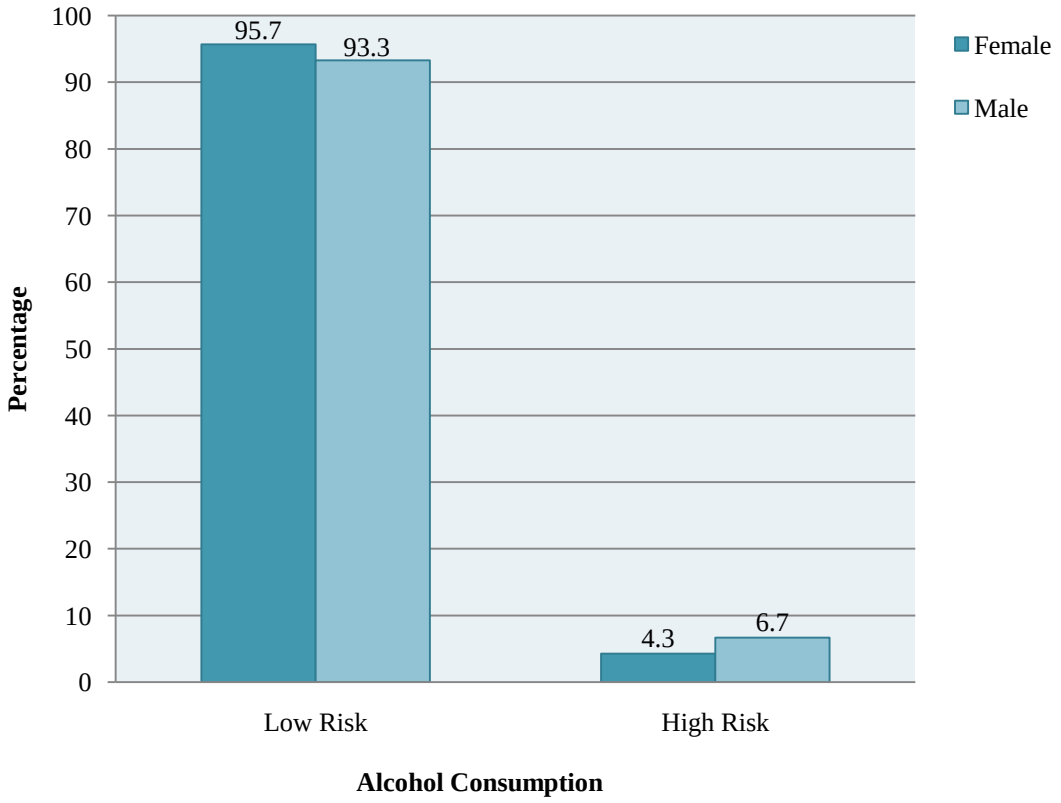

Figure 5: Percentage of Participants within each Alcohol Consumption Classification

Table 16: Frequency and Percentage of Selected Physical Activity Variables among the Study Population

Variable	Category	Frequency (n=1098)	Percentage
Duration of Sedentary Activity Missing (n)= 2	< 4 hours/ day	379	34.5
	4-8 hours/ day	457	41.6
	>8 hours/ day	262	23.6
Moderate Activity	0 days	171	15.5
	1-4 days	731	66.5
	≥ 5 days	198	18.0
Vigorous Activity Missing (n)= 1	0 days	498	45.3
	1-4 days	535	48.7
	≥ 5 days	66	6.0
Duration of Physical Activity Missing (n)= 5	<45 minutes	356	27.9
	≥45 minutes	433	32.5
	Not Applicable	306	39.5

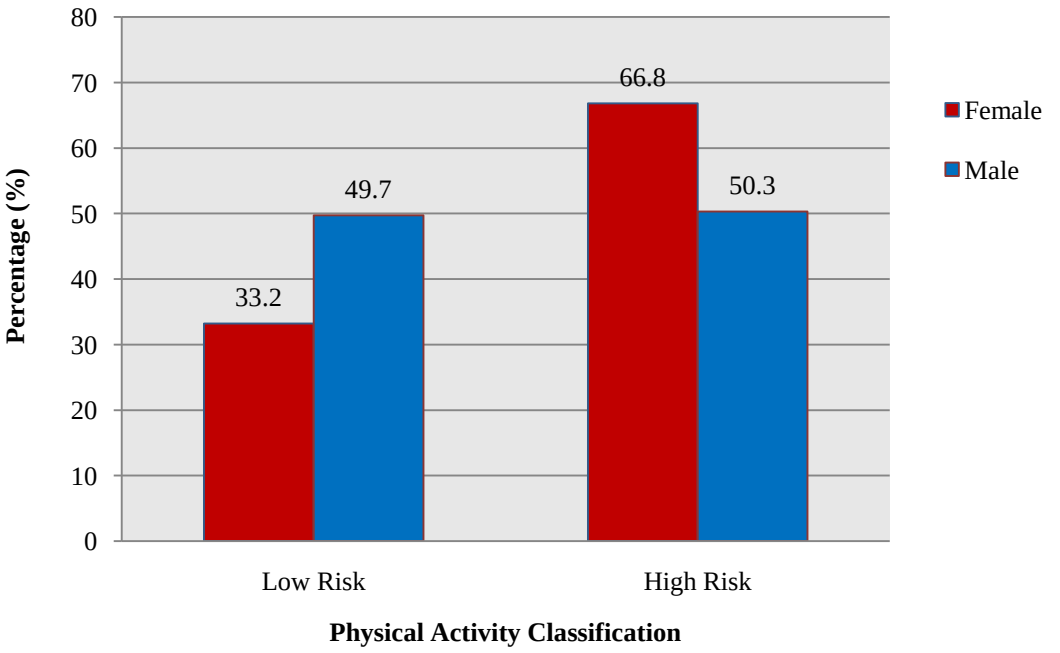

Figure 6: Percentage of Participants within each Physical Activity Classification

From the sample of 1300 students, 400 (200 from the original sample; 200 from the sub sample) from this sample were asked to report their weight, height and perceived body image via silhouette. The reported mean height was 1.66 ± 0.082 metres and weight was 64.07 ± 13.529 kg from the study population. The mean calculated BMI was 23.12 ± 3.517. Males had a higher height, weight and BMI (1.76 ± 0.056 m, 76.72 ± 12.657 kg and 24.77 ± 3.381 respectively) as opposed to females (1.62 ± 0.057 m, 59.51 ± 10.631 kg and 22.53 ± 10.631 respectively). The largest BMI was 43.0 while the lowest BMI was 15.5. The mean perceived body image BMI from the silhouette for the population was 22.77 ± 4.110. The mean perceived body image for males (26.32 ± 3.840) was greater than that of females (21.49 ± 3.394). From the study population it was found that 71.0% (female=229, male=55) of the participants had a normal BMI while 5.3% (female=15, male=6) were underweight. The remaining amounts of participants were overweight and obese (19.8%, females=42, males=37 and 4.0%, females=8, males=8 respectively). Of the 400 participants 16 %(females= 13; males=51) perceived their body size to be overweight while 84% (females=281; males=55) perceived their body size to be of normal weight. Over 76% (females=244, males=61) of the population were at no overweight risk whereas 23.8% (females=50, males=45) were at risk.

From the ANOVA it was found that there was a significant difference (p=0.002) between the mean BMI by females and males. However there was not any significant relationships between BMI and ethnicity and age (p=0.961 and p=0.150 respectively). Furthermore there were no significant differences of the mean perceived body image BMI between ethnic and age groups (p= 0.718; p=0.105 respectively). From the paired sample t-test which was used to compare the mean of the calculated BMI and perceived BMI. There was a significant difference between the participants mean BMI and perceived BMI.

Table 17-20 and figures 7-9 summarizes the above information.

Table 17: Means and Standard Deviations for Males and Females Participants of their Weight, Height and BMI

Variable	Female Mean ± Standard Deviation (n=294)	Male Mean ± Standard Deviation (n=106)	Sample Mean ± Standard Deviation (n=400)
Height (m)	1.62 ± 0.057	1.76 ± 0.056	1.66 ± 0.082
Weight (kg)	59.51 ± 10.631	76.72 ± 12.657	64.07 ± 13.529
Calculated BMI (kg/m^2)	22.53 ± 10.631	24.77 ± 3.381	23.12 ± 3.517
Perceived Body Image BMI	21.49 ± 3.394	26.32 ± 3.840	22.77 ± 4.110

Table 18: ANOVA of Dependent Calculated BMI of Participants with Demographical Independent Variables

Dependent Variable	Independent Variables	F-value	p-value
Calculated BMI	Gender	9.663	0.002*
	Ethnicity	0.098	0.961
	Age	1.905	0.150

* Significant ($p < 0.05$)

Table 19: ANOVA of Dependent Perceived Body Image BMI of Participants with Demographical Independent Variables

Dependent Variable	Independent Variables	F-value	p-value
Perceived Body Image BMI	Gender	146.693	<0.001*
	Ethnicity	0.449	0.718
	Age	2.263	0.105

* Significant ($p < 0.05$)

Table 20: Paired Sample t-test of Calculated BMI and Perceived BMI among Study Population

Dependant Variable	t-value	T(df)	p-value
Calculated BMI-Perceived BMI	2.617	399	0.009

* Significant ($p < 0.05$)

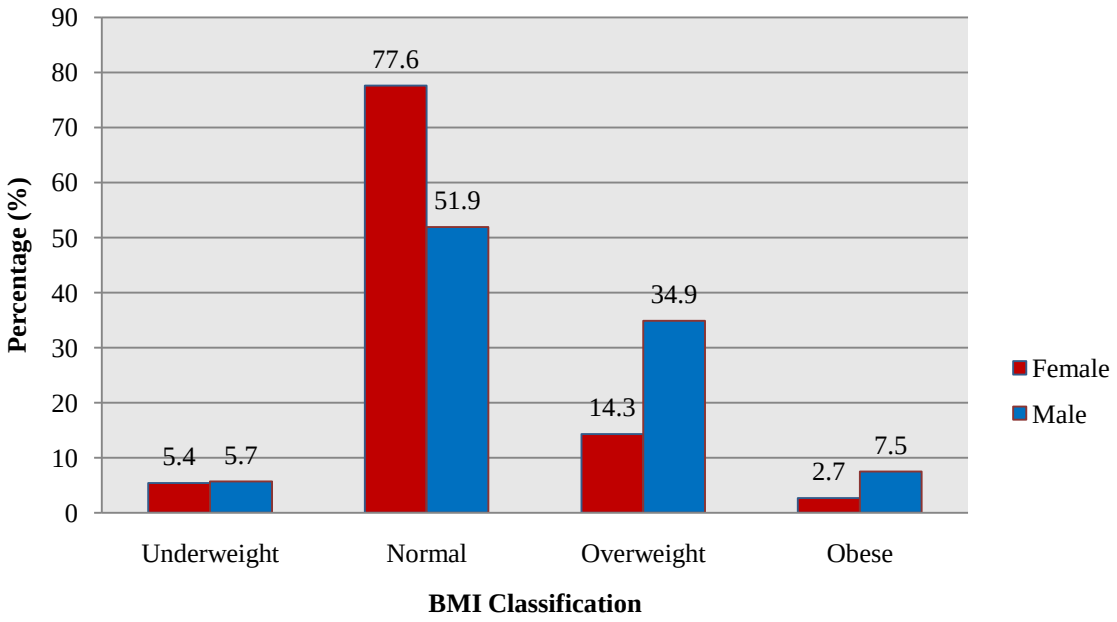

Figure 7: Percentage of Particpants in each Standardized BMI Classification

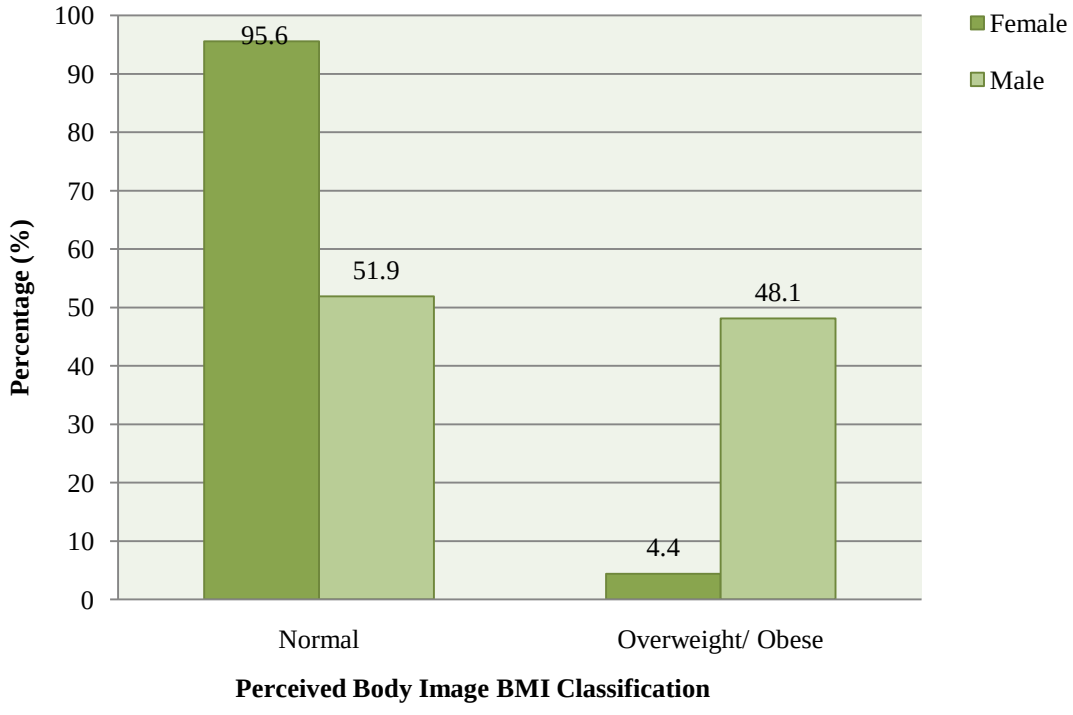

Figure 8: Percentage of Participants Perceived Body Image

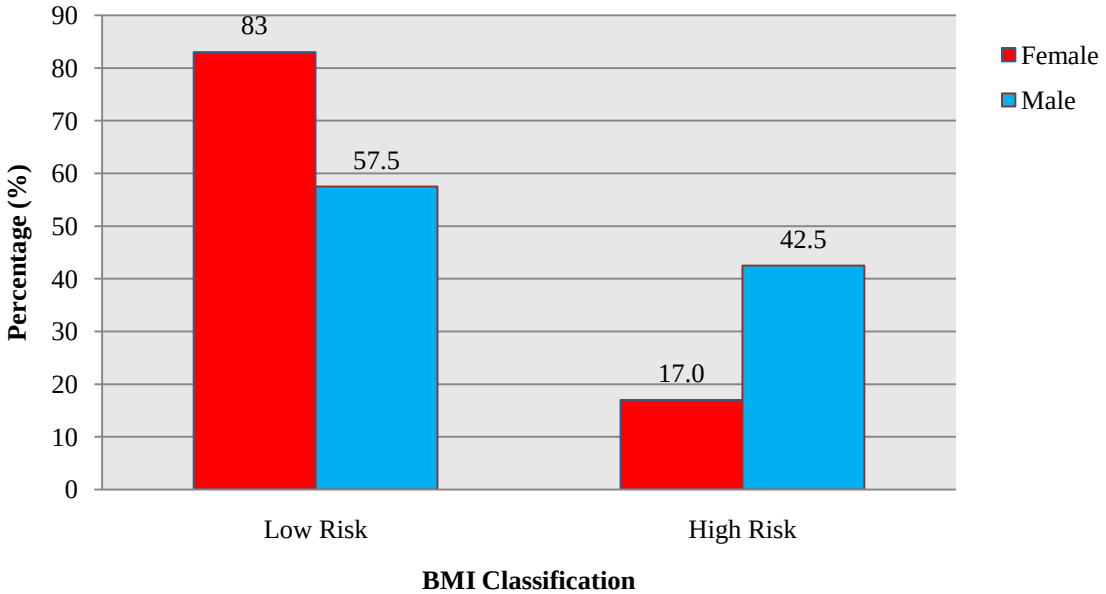

Figure 9: Percentage of Participants within each Low and High Risk BMI Classification

The overall lifestyle and environmental risk factor score was computed and the mean score was 1.44 ± 0.825 (females= 1.44 ± 0.78; males= 1.45 ± 0.905). The mean score based on age showed that participants 25-40 years of age had the highest mean score of 1.46 ± 0.073. This was then followed by participants aged ≤ 24 years with a mean score of 1.45 ± 0.027. Participant aged >40 years of age had the lowest mean score of 1.29 ± 0.168. The mean score based by faculty showed that the faculty of science and technology had the highest score of 1.63 ± 0.775, followed by the following faculties: medical sciences, engineering, humanities and education, social sciences and law (1.45 ± 0.838, 1.44 ± 0.925, 1.43 ± 0.884, 1.42 ± 0.782 and 1.29 ± 0.784). The faculty of food and agriculture had the lowest score of 1.20 ± 0.694. The mean score based on participant perceived risk of developing colorectal cancer showed that participants who perceived themselves at being at high risk of developing colorectal cancer had the highest mean score of 1.55 ± 0.864. This was followed by participants who perceived themselves as being at

low risk had a mean score of 1.44 ± 0.806. The lowest mean score of 1.41± 0.873 was seen by participants who perceived themselves at being at no risk.

The Krushkal-Wallis One Way ANOVA was performed because the data was skewed and was not normally distributed as indicated by Kolmogorov-Smirnov test (p= <0.001) hence the parametric version of One Way ANOVA was not used solely to give the mean differences between the independent variables for the analysis. There were no significant statistical difference between the mean scores for gender groups, age group and perceived risk of developing colorectal cancer. However there was a significant different between faculties as indicated by p= 0.004. Post Hoc Analysis was then performed to determine what were the significant differences between the mean scores between the various faculties. It was seen that the only significant difference (p=0.004) was seen been the mean scores between the faculty of food and agriculture and the faculty of science and technology. All other comparisons were not statistically significant (p= >0.05).

It was found that 80.5% of the population had 1-2 of had risk factors, 11.8% had none of these risk factors and the remaining 7.6% had greater than 3 risk factors.

Tables 21-23 and figure 10 summarizes the above data previously mentioned.

Table 21: Means and Standard Deviations of Lifestyle and Environmental Colorectal Cancer Risk Factor Scores by Specific Independent Variables

Variable	Category	Group	Mean and Standard Deviations
Lifestyle and Environmental Colorectal Cancer Risk Factor Score	Sample	Total	1.44 ± 0.825
	Gender	Female	1.44 ± 0.788
		Male	1.45 ± 0.905
	Age	≤ 24	1.45 ± 0.027
		25-40	1.46 ± 0.073
		>40	1.29 ± 0.168
	Faculty	Food and Agriculture	1.20 ± 0.694
		Social Sciences	1.42 ± 0.782
		Humanities and Education	1.43 ± 0.884
		Law	1.29 ± 0.784
		Science and Technology	1.63 ± 0.775
		Engineering	1.44 ± 0.925
		Medical Sciences	1.45 ± 0.838
	Perceived Risk of Developing Colorectal Cancer	No Risk	1.41± 0.873
		Low Risk	1.44 ± 0.806
		High Risk	1.55 ± 0.864

Table 22: Krushkal- Wallis One Way ANOVA of Dependent Lifestyle and Environmental Colorectal Cancer Risk Factor Scores and Specific Variables.

Dependent Variable	Independent Variables	H(2)-value	p-value
Lifestyle and Environmental Colorectal Cancer Risk Factor Score	Gender	0.003	0.959
	Age	1.957	0.376
	Faculty	19.018	0.004*
	Perceived Risk of Developing Colorectal Cancer	2.519	0.284

Table 23: Post Hoc Difference in Mean Lifestyle and Environmental Colorectal Cancer Risk Factor Scores for Faculty

Independent Variable	Category	Difference in Means	p-value
Faculty	Food and Agriculture	Social Sciences- -0.2167	0.402
		Humanities and Education- -0.2335	0.410
		Law- -0.0857	1.00
		Science and Technology- -0.4307*	0.004*
		Engineering- -0.2362	0.424
		Medical Sciences- -0.2503	0.348
	Social Sciences	Humanities and Education- -0.0167	1.000
		Law- 0.1310	0.992
		Science and Technology- -0.2140	0.070
		Engineering- -0.0196	1.000
		Medical Sciences- -0.0337	1.000
	Humanities and Education	Law- 0.1478	0.987
		Science and Technology- -0.1972	0.273
		Engineering- -0.0027	1.000
		Medical Sciences- -0.0168	1.000
	Law	Science and Technology- -0.3450	0.535
		Engineering- -0.1505	0.986
		Medical Sciences- -0.1646	0.978
	Science and Technology	Engineering- 0.1944	0.337
		Medical Sciences- 0.1804	0.428
	Engineering	Medical Sciences- -0.0141	1.000

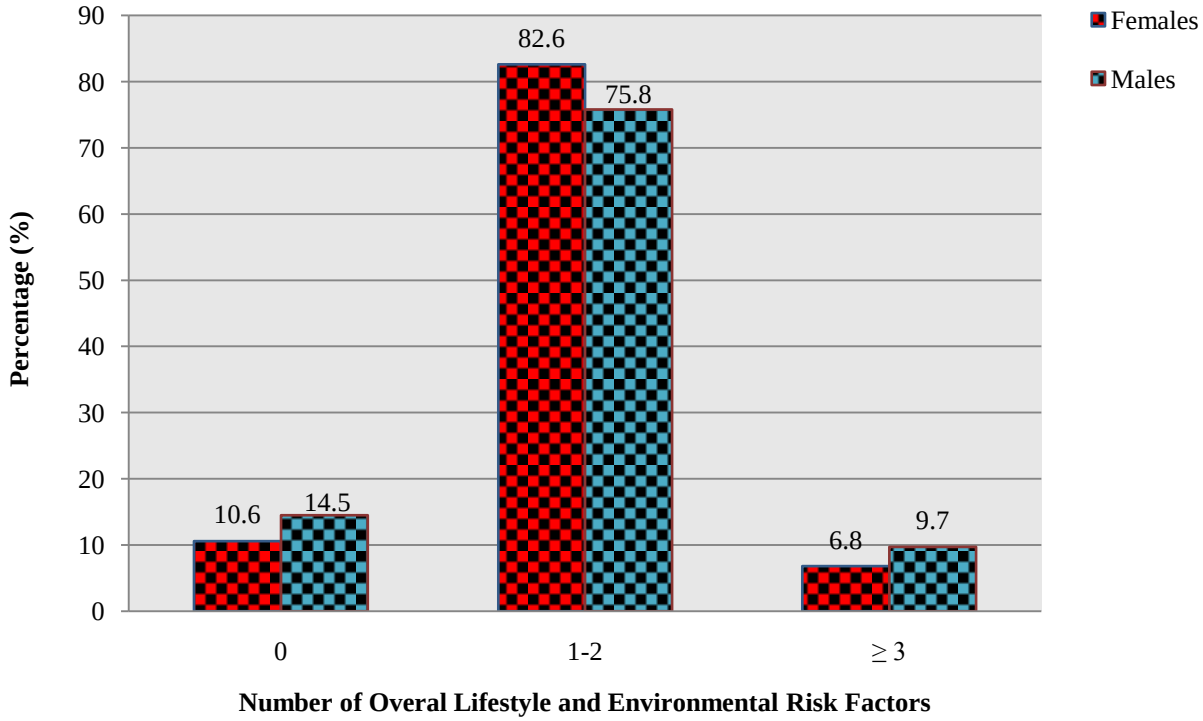

Figure 10: Percentage of Overall Lifestyle and Environmental Risk Factor Index for Colorectal Cancer Among The Study Population

Dietary Risk Factors

The dietary factors which were collected were fruit, vegetable, fiber, fat, red meat and processed meat intake. The mean fruit intake was 10.21 ± 9.240 servings per week, the mean vegetable intake was 7.50 ± 8.890 servings per week and the mean fiber intake was 24.34 ± 16.919 servings per week for the study population. Additionally, the mean intake for fat was 26.25 ± 21.664 servings per week, mean red meat intake was 2.68 servings per week and the mean intake for processed meat was 1.96 ± 3.222 servings per week. The mean number of servings per week of garlic or onions among the study population was 6.50 ± 6.968

The mean fruit intake for females was 10.28 ± 9.098 while males had a lower a mean 10.06 ± 9.575 servings per week. Over 77% (females=603, males=249) were at fruit risk while 22.5% (females=166, males=81) were not at fruit risk. The mean vegetable intake for females was 7.77 ± 9.229 whereas males had a lower intake of 6.87 ± 7.977 servings per week. Over 91% (females=695, males=307) were at vegetable risk while 8.8% (females=74, males=23) were not at vegetable risk. The risk for fruit and vegetable were computed to obtain a fruit and vegetable risk, 73.2% (females= 563; males=241) were at high risk while 26.8% (females= 206; males=89) were at low risk. The mean fiber consumption for females was 29.26 ± 20.728 as opposed to the mean consumption for males which was 26.69 ± 19.399 servings per week. Over 95% (females=726, males=320) were at fiber risk while 4.8% (females=43, males=10) were not at fiber risk. Females had a lower intake (26.07 ± 21.930) of fat servings than males (26.67 ± 21.062). Over 67% (females=506, males=237) were at fat risk while 32.5% (females=264, males=93) were not at fat risk. The mean red meat intake for males (3.66 ± 5.502) was greater than that of females (2.26 ± 4.110) servings per week. Over 14% (females=89, males=68) were at red meat risk while 85.7% (females=679, males=507) were not at red meat risk. The mean

processed meat intake for males was 2.47 ± 3.972 while the mean intake for females was 1.74 ± 2.816 servings per week. Over 35% (females=257, males=132) were at processed meat risk while 64.3% (females=507, males=195) were not at processed meat risk. The mean garlic or onion intake for females was 6.94 ± 7.134 while males had a lower a mean 5.48 ± 6.456 servings per week.

It was found that 52.3% (females= 429; males=146) of the population had 1-2 of had risk factors, 38.7% (females=267; males=159) had greater than 3 risk factors and 11.8% (females= 74; males=25) had none of these risk factors.

Table 24 and Figures 11-19 summarizes all data previously mentioned.

Table 24: Means and Standard Deviations of Dietary Consumption Variables by Participants based on Gender

Variable	Group	Mean ± Standard Deviation
Fruit Consumption	Total	10.21 ± 9.240
	Female	10.28 ± 9.098
	Male	10.06 ± 9.575
Vegetable Consumption	Total	7.50 ± 8.890
	Female	7.77 ± 9.229
	Male	6.87 ± 7.977
Fiber Consumption	Total	24.34 ± 16.919
	Female	29.26 ± 20.728
	Male	26.69 ± 19.399
Fat Consumption	Total	26.25 ± 21.664
	Female	26.07 ± 21.930
	Male	26.67 ± 21.062
Red Meat Consumption	Total	2.68 ± 4.611
	Female	2.26 ± 4.110
	Male	3.66 ± 5.502
Processed Meat Consumption	Total	1.96 ± 3.222
	Female	1.74 ± 2.816
	Male	2.47 ± 3.972
Garlic or Onion Consumption	Total	6.50 ± 6.968
	Female	6.94 ± 7.134
	Male	5.48 ± 6.456

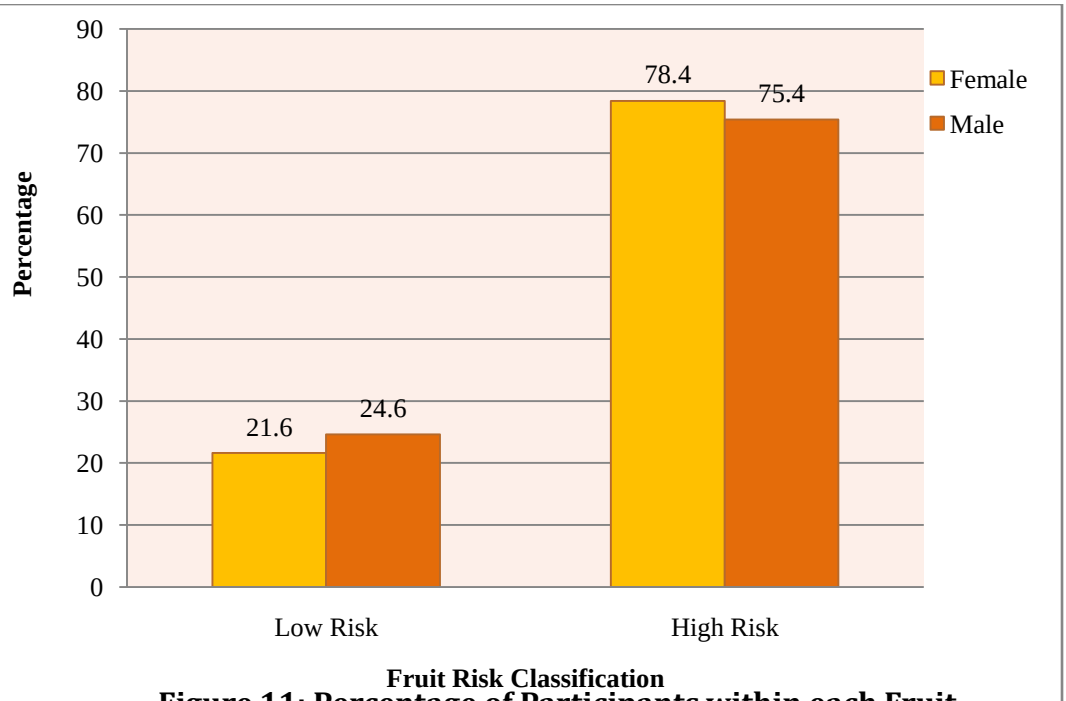

Figure 11: Percentage of Participants within each Fruit Risk Classification

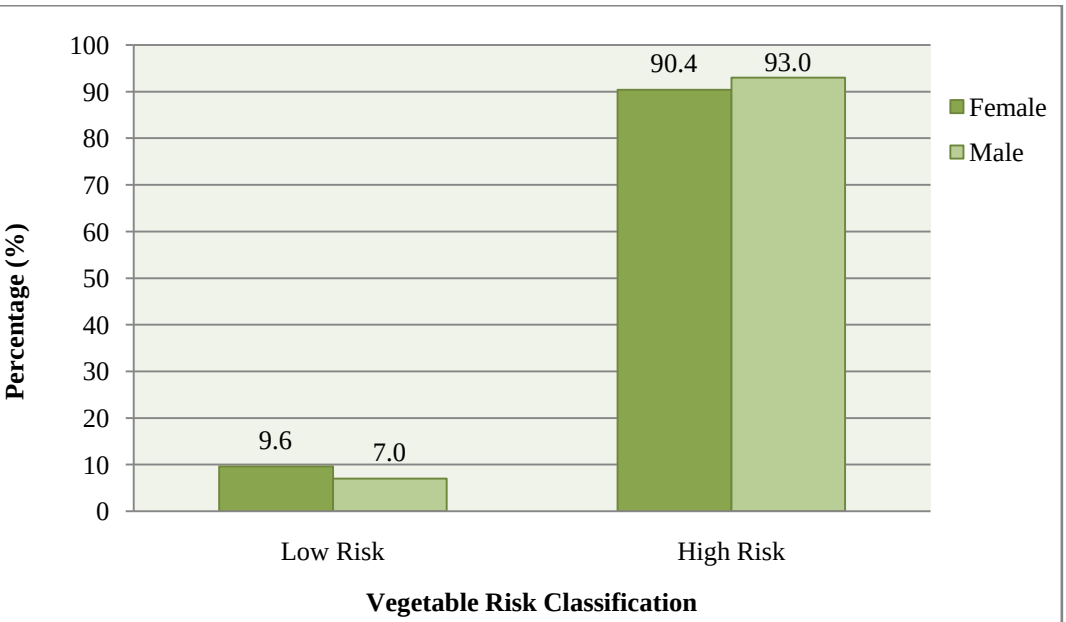

Figure 12: Percentage of Participants within each Vegetable Risk Classification

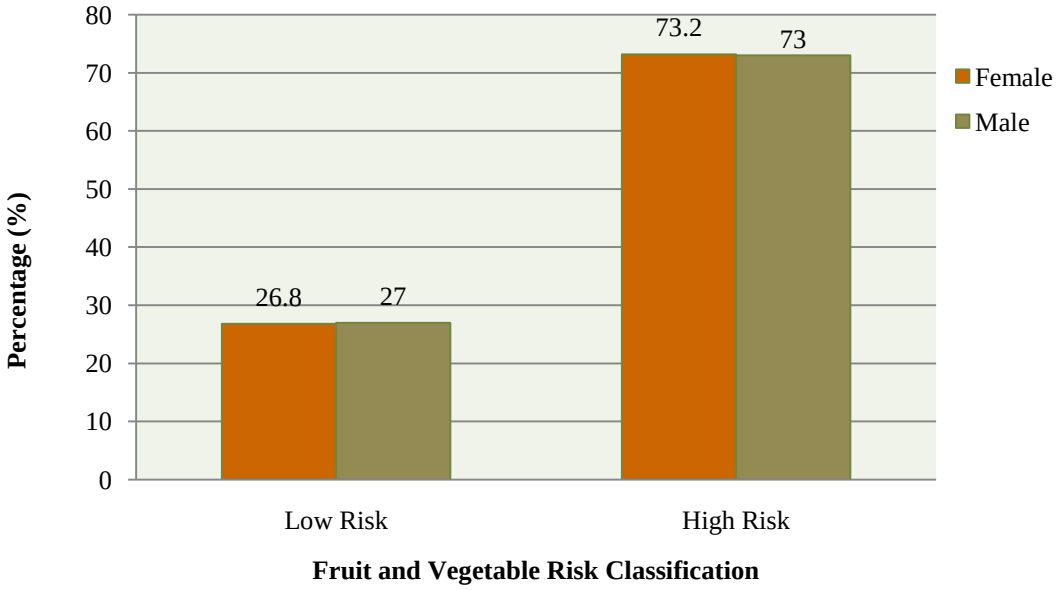

Figure 13: Percentage of Participants within each Fruit and Vegetable Risk Classification

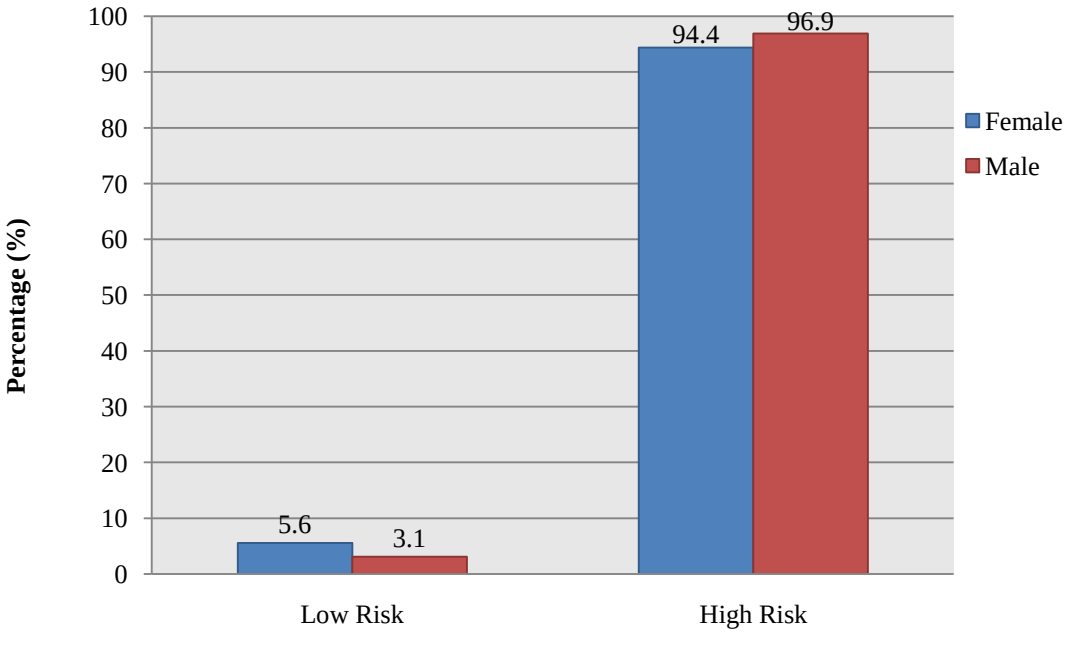

Figure 14: Percentage of Participants within each Fiber Risk Classification

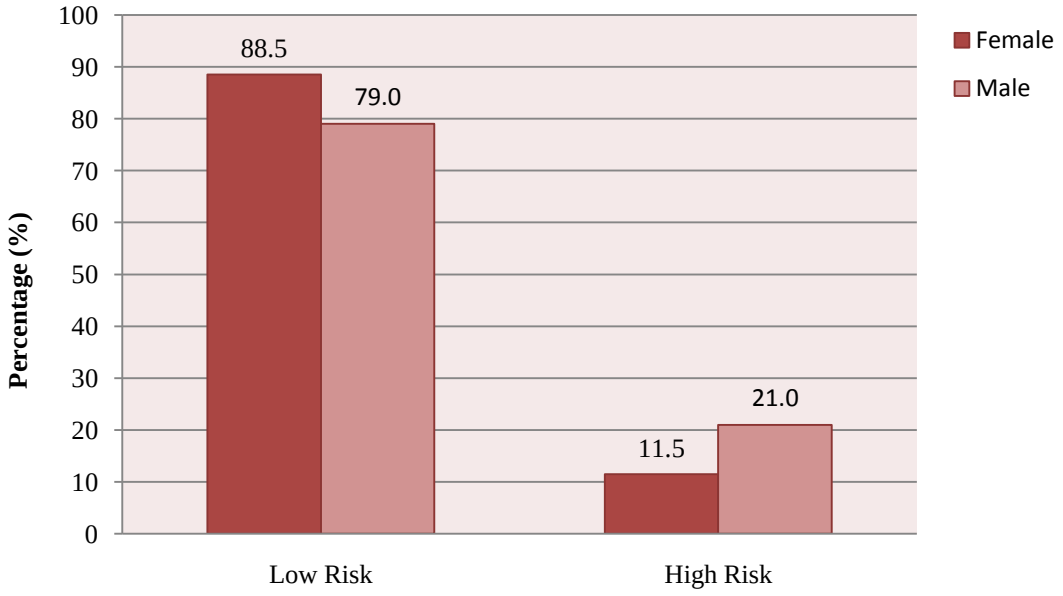

Figure 15: Percentage of Participants within each Red Meat Classification

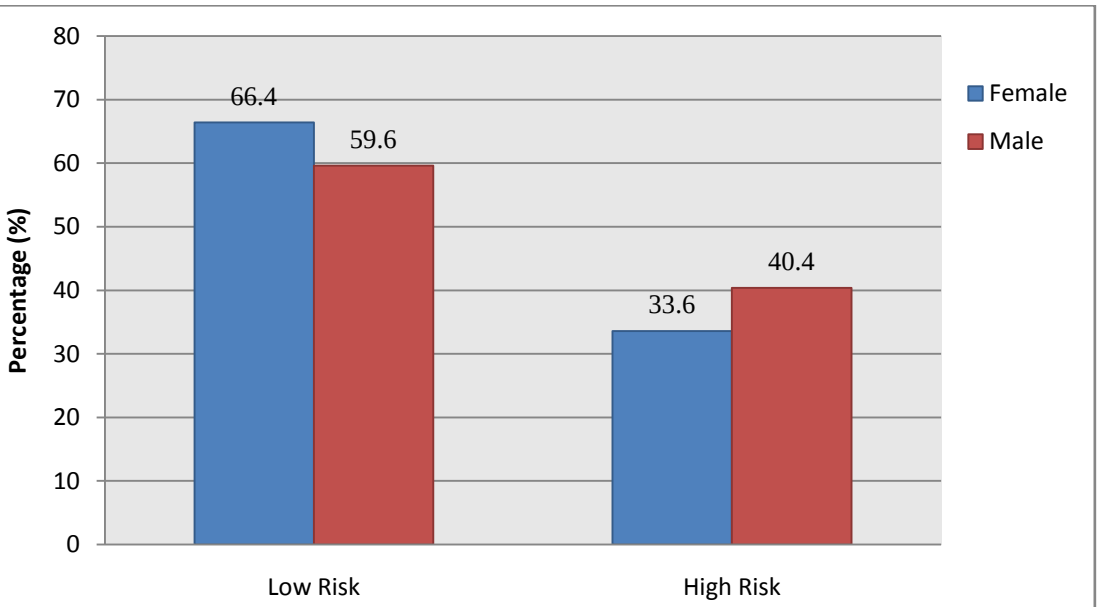

Figure 16: Percentage of Participants within each Processed Meat Classification

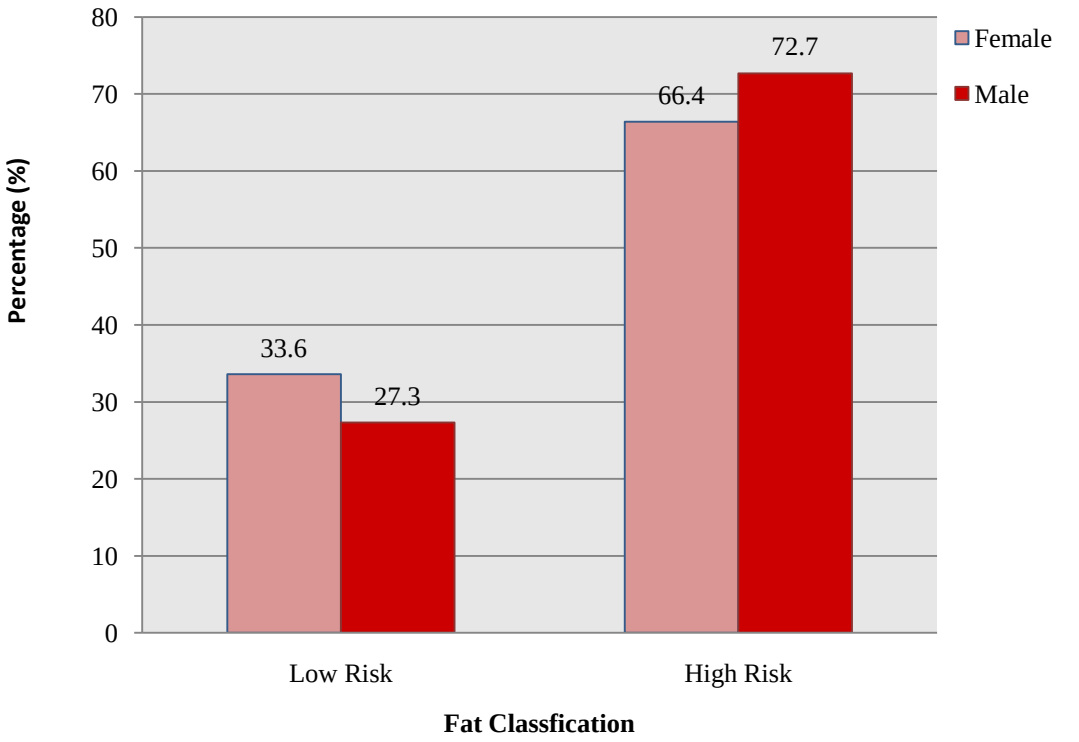

Figure 17: Percentage of Participants within each Fat Classification

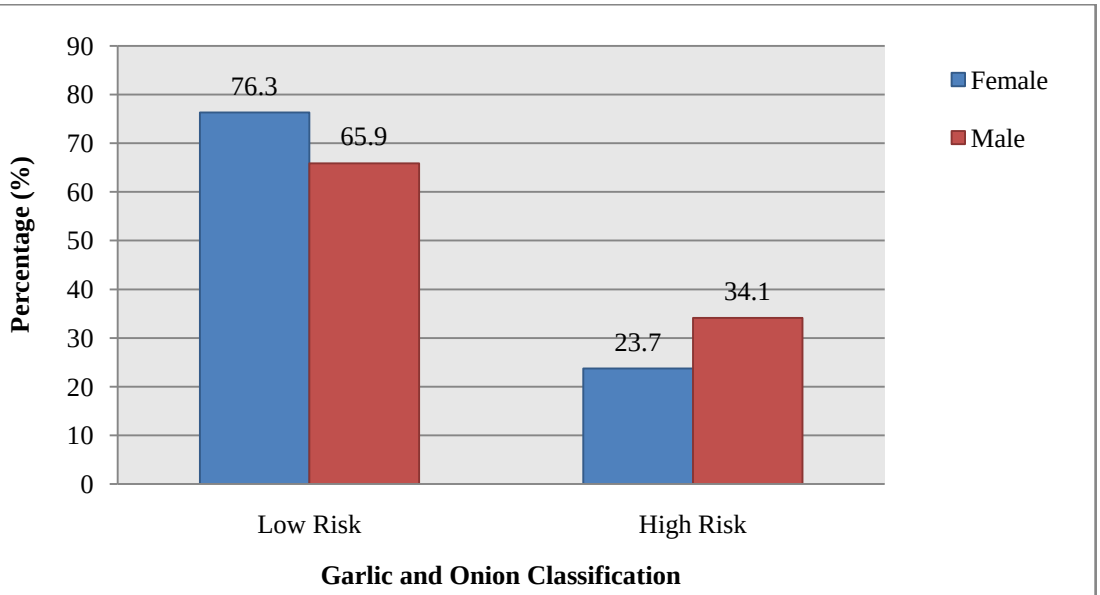

Figure 18: Percentage of Participants within each Garlic and Onion Classification

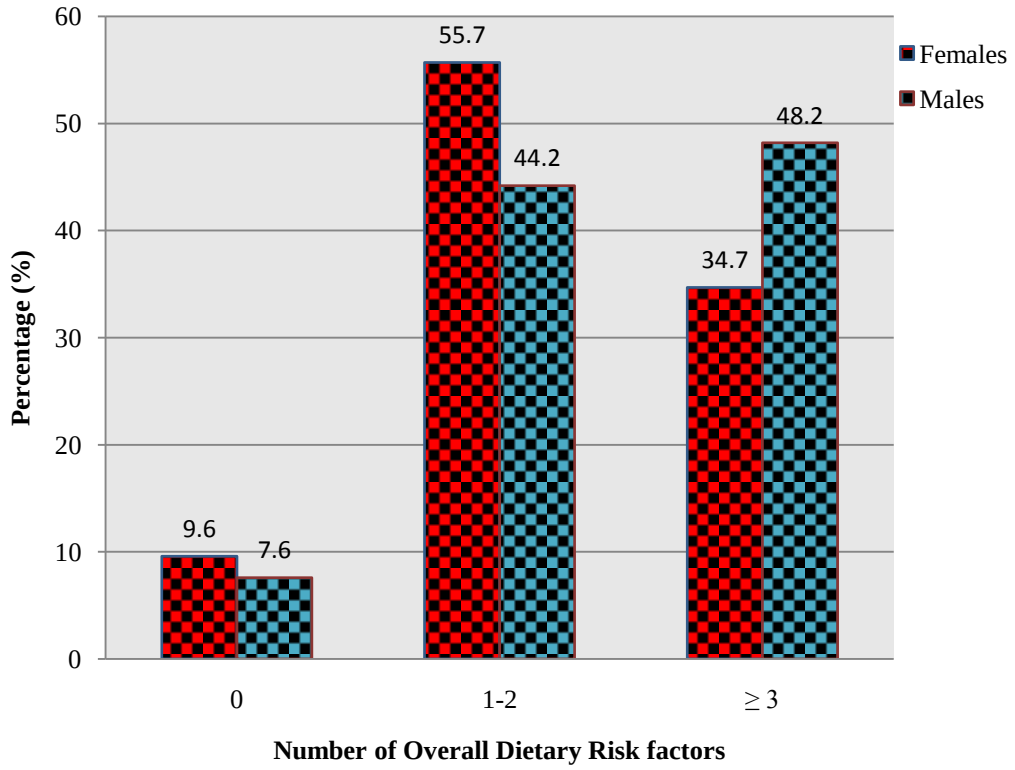

Figure 19: Percentage of Overall Dietary Risk Factors Index for Colorectal Cancer Amon The Study Population

A test for normality was done for good fit using the Kolmogorov-Smirnov test which found the data for the colorectal cancer and risk factor knowledge score to be not normally distributed (p= <0.001), the Mann-Whitney U test was used to test the difference between the mean ranks of independent dietary variables for gender. There was no significant difference between the mean servings per week of fruit intake (p=0.32), vegetable intake (p=0.34) and fat intake (p=0.24) between females and males from the study population. On the other hand, there were significant differences between the means of servings per week of fiber, red meat, processed meat and garlic or onions intake (p= 0.04, p=<0.001, p=0.003 and p=<0.001 respectively) between female and male participants.

Table 25 summarizes the above information.

Table 25: Mann Whitney U Test Dietary Consumption Variables based on Gender

Independent Variable	**U value**	**p-value**
Fruit Consumption	121516	0.32
Vegetable Consumption	121935	0.34
Fiber Consumption	115294	0.04*
Fat Consumption	117550	0.24
Red Meat Consumption	100977	<0.001*
Processed Meat Consumption	111474	0.003*
Garlic or Onion Consumption	107481.5	<0.001*

* Significant (p < 0.05)

From the study population it was found that the majority (68.7%, n=753) indicated that cost of the items consumed was the main factor which influenced their purchasing behaviour. This was followed by the location (62.4%, n=684), the perceived health benefits (39.6%, n=434), food safety (29.2%, n= 320) and culture (25.3%, n=281). The factor which least influenced the participants purchasing behaviour was peer pressure (8.3%, n=91).

Table 26 summarizes the above information.

Table 26: Factors Influencing Participants Purchasing Behaviour of Foods Consumed

Factor	Frequency (n=1096)	Percentage
Cost	753	68.7
Location	684	62.4
Culture	281	25.3
Peer Pressure	91	8.3
Perceived Health Benefits	434	39.6
Food Safety	320	29.2

Overall Risk

With reference to the overall number of risk factors presents in the study the mean overall score of risk factors was 4.36 ± 1.496. The highest score of risk factors was 10 while the least was 0. The mean score of risk factors for males was 4.53 ± 1.556 as opposed to females who had 4.30 ± 1.465. The mean score for participants aged ≤24 years was 4.41 ± 1.455 followed by those aged 25-40 had a score of 4.18 ± 1.654 and those aged > 40 years had a score of 3.63 ± 1.974. The faculty of science and technology had the highest score (4.53 ± 1.360), this was followed by the faculty of social sciences (4.40 ± 1.552), the faculty of medical sciences (4.40 ± 1.328), the faculty of engineering (4.39 ± 1.550), the faculty of humanities and education (4.28 ± 1.539) and the faculty of law (4.10 ± 1.868). The faculty of food and agriculture had the lowest score of 3.96 ± 1.498.

A test for normality was done for good fit using the Kolmogorov-Smirnov test which found the data for the colorectal cancer and risk factor knowledge score to be not normally distributed (p= <0.001), therefore the Spearman's Rho was used to run the statistical test for correlations between the variables. From the Spearman's Rho it was found that there was no significant relationship (p=0.052) between the overall colorectal cancer risk and perceived risk of the disease. On the other hand, there was a significant relationship (p=0.001) between the overall number of risk factors with the knowledge of colorectal cancer and its risk factors. ANOVA was used to determine the difference between the overall colorectal cancer score and independent variables such as gender, age, ethnicity and faculty. There were no significant differences between the mean score between ethnicity and faculty (p=0.176 and 0.125 respectively). However there were significant differences among the mean score between gender groups and age groups (p= 0.018 and p=0.013 respectively). The difference in age groups was statistically

significant with the mean scores between participants who were ≤ 24 years and those who were >40 years (p=0.029). There was no statistical difference between the age groups of ≤ 24 years and 25-40 years (p=0.233), and 25-40 years and > 40 years (p=0.215). The majority of the population (47.0%; females=45.3%; males=50.9%) had ≥5 risk factors associated with the development of colorectal cancer. This was followed by 3-4 risk factors (42.7%; females=43.8%; males=40.3%) and 1-2 risk factors (10.1%; females=10.6; males=8.8%) Only 0.2% of the population (females=0.3%; males=0%) had none of these risk factors.

Tables 27-30 and figure 20 summarizes all data previously mentioned.

Table 27: Means and Standard Deviations of Overall Colorectal Cancer Risk Factor Index by Specific Independent Variables

Variable	Category	Group	Mean and Standard Deviations
Overall Colorectal Cancer Risk Factor Index	Sample	Total	4.36 ± 1.496
	Gender	Female	4.30 ± 1.465
		Male	4.53 ± 1.556
	Age	≤ 24 years	4.41 ± 1.455
		25-40 years	4.18 ± 1.654
		>40 years	3.63 ± 1.974
	Faculty	Food and Agriculture	3.96 ± 1.498
		Social Sciences	4.40 ± 1.552
		Humanities and Education	4.28 ± 1.539
		Law	4.10 ± 1.868
		Science and Technology	4.53 ± 1.360
		Engineering	4.39 ± 1.550
		Medical Sciences	4.40 ± 1.328

Table 28: Spearman's Rho Correlation for Overall Colorectal Cancer Risk Factor Index and Risk of Developing Colorectal Cancer among Study Population

Variables	r_2	p-value
Overall Colorectal Cancer Risk Factor Index & Perceived Risk of Developing Colorectal Cancer	0.059	0.052
Overall Colorectal Cancer Risk Factor Index & Colorectal Cancer Knowledge Score	-0.090*	0.003*

* Significant ($p < 0.05$)

Table 29: One Way ANOVA of Dependent Overall Colorectal Cancer Risk Factor Index and Specific Variables.

Dependent Variable	Independent Variables	F-value	p-value
Overall Colorectal Cancer Risk Factor Index	Gender	5.622*	0.018*
	Age	4.369*	0.013*
	Ethnicity	1.917	0.125
	Faculty	1.497	0.176

* Significant ($p < 0.05$)

Table 30: Post Hoc Difference in Mean Overall Colorectal Cancer Risk Factor Scores for Age

Independent Variable	Category	Difference in Means	p-value
Age	≤ 24 years	25-40 years-0.2299 >40 years- 0.7860*	0.233 0.029*
	25-30 years	>40 years- 0.5561	0.215

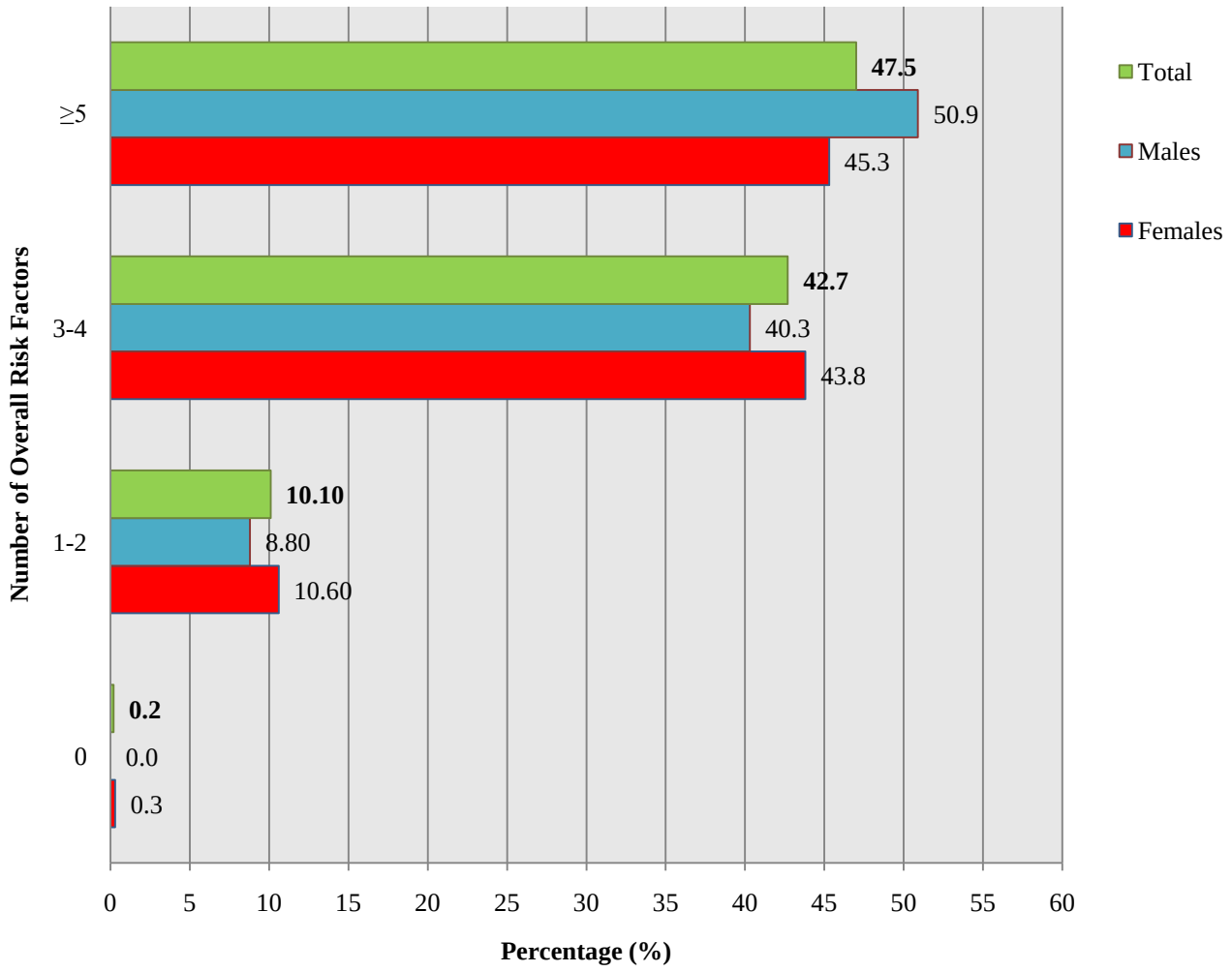

Figure 20: Percentage of Number of Risk Factors Assoicated with the Development Colorectal Cancer Among The Study Population

CHAPTER V

DISCUSSION

The rise in the incidence colorectal cancer cases worldwide and the lack of research in the Caribbean gives a fitting rationale for the relevance of this research. A vast multitude of research has all identified a highly significant link between the prevalence of non-modifiable and modifiable risk factors with increasing incidence of colorectal cancer cases. As the number of risk factors increases per individual, the colorectal cancer risk increases in the individual. The student population of UWI has been observed to have a high prevalence of these risk factors for example physical inactivity, smoking, frequent alcohol consumption, low fruit, vegetable and fiber intake, high intakes of fat, red meat and processed meat, and overweight/ obesity. Therefore, prompting the need for research on the prevalence and knowledge level among the student population of the University of the West Indies, St. Augustine of the risk factors which are associated with the development of colorectal cancer.

The study was comprised of 1300 undergraduate and postgraduate students which consisted of 910 females and 390 males. Most of the participants were of the age range of ≤ 24 years of age and were full time students of the university. The distribution of participants based on the sample was consistent with the current proportional sizes of the faculties. From the population only 15.5% had knowledge of someone who has or had colorectal cancer. Students' main sources of obtaining information on colorectal cancer were from the internet through websites such as the World Health Organization, World Cancer Research Fund, Wikipedia, etc. and from word of mouth from friends and family.

Perceived Health Status and Risk of Colorectal Cancer:

From the study population 41.1% of the participants rated their health status as being good, this was followed by those indicated their health status was fair, very good, poor, excellent and very poor (31.3%, 17.9%, 4.7%, 3.9% and 1.1% respectively). Furthermore, 72.8% of the participants perceived themselves as being of low risk for developing colorectal cancer. This was followed by 17.4 reporting no risk and 9.7% reporting that they believe they were at high risk. Females reported a higher perceived risk of colorectal cancer as opposed to males. This finding was slightly different to the findings of Veron et al (2009) who found males to report a higher perceived risk of colorectal cancer as compared to females. (Veron 2009, 101-119) From the present study there was a significant negative correlation ($r=-0.211$, $p= <0.001$) between the reported health status and the participants perceived risk of developing colorectal cancer. As participants rated their health status higher the lower they believed their risk was for developing colorectal cancer. These findings were similar to those found by Stark et al. (2006) and Hay et al. (2006) which found that a poorer health status report was significantly correlated with a higher perceived risk of colorectal cancer. (Stark 2006, 740-749 and Hay 2006, 71-92)

Colorectal Cancer Knowledge:

Over 78% of the participants perceived themselves to have some knowledge of colorectal cancer. The question was asked "Which group do you think is at highest risk for developing colorectal cancer?" only 55.5% of the population gave the correct response which was "Both Males and Females". These findings indicate that more than half of the study population knew which group was at greatest risk, this differed slightly from the qualitative findings found by Beeker et al. (2001) which indicated that the majority of respondents were uncertain to which

gender was at greatest risk. (Beeker 2001, 263-278) However as compared to the findings of Tseng et al (2009), 93.5% of the population were aware that both men and women were at risk for colorectal cancer. (Tseng 2009, 90-97)This type of cancer affects both men and women equally as supported from research studies conducted by Boyle et al (2005), Ferlay et al (2002). and Parklin et al. (2004). (Boyle 2005, 424-425; Ferlay 2002 and Parklin 2004, 74-108) The statement "Vegetarians are at lower risk of developing colorectal cancer than non-vegetarians", 22.4% of the population gave the correct response which was "Disagree" which was supported by the findings of Key et al. (Key 2009, 1620S-1626S). However the majority of participants were unsure whether this statement was true or false.

There were a total of 14 risk factors which were all associated with the development of colorectal cancer. Over 74% of the sample population agreed that a family history of colorectal cancer leads to the development of the disease. These finding was consistent with the findings of Cullinen et al. (2009) where subjects cited a family history of colorectal as the main contributing factor to the development of the disease. (Cullinen 2009, 219-221) Additionally, the research conducted by Agho et al (2012) found that 86% of the population identified a family history of colorectal cancer as one of the main risk factors for developing colorectal cancer. (Agho 2012, 10-19) Among the modifiable risk factors, low fiber intake was the highest reported risk factor which respondents felt increases one's risk. This was followed by high processed meat intake, low vegetable intake, high fat intake, increasing age, frequent high levels of stress, high red meat intake, physical inactivity, frequent alcohol consumption, chronic smoking, and low fruit intake (68.3%, 67.9%, 67.1%, 64.2%, 63.6%, 60.3%, 59.5%. 58.5%, 54.5% and 50.8% respectively) The least agreed risk factor was that of diabetes where only 33.9% of the population were able to correctly identify this risk factor. These findings were vastly different to the finding of Robb et al

where the majority of respondents identified smoking and physical inactivity as the main risk factors for the development of colorectal cancer. (Robb 2006) However these results were similar to that found by Akhtar et al (2007) and Shokar et al (2005), whereby participants identified smoking and diet as the main risk factors for colorectal cancer the top four modifiable risk factors identified by participants in this present study were all diet related. (Akhtar 2007, 887-890; Shokar 2005, 341-347) From the findings of Sessa et al. (2008), the results of this study differed from the current study where physical inactivity and high fat diets as the main contributing risk factors for the development colorectal cancer as opposed to the current study which identified family history and low fiber diets were the main factors students believed were the main risk factors of colorectal cancer. (Sessa 2008, 171)

In the present study, the overall colorectal cancer knowledge level of the study population was found to be generally poor as depicted from the percentage mean knowledge score of 54.55 ± 19.818%. From the computed scores the lowest score obtained by a participant was 0 (0%) while the largest score was 18 (94.74%). This may have resulted due to the fact there are not much awareness programs and educational material focusing on colorectal cancer and its risk factors which are implemented in Trinidad and Tobago and in the University of the West Indies. Although Wardle et al. (2001) used a different method for computing the corrected score for bowel cancer where the maximum score was 15, the average score was that if 5 (33.%). However only five of the risk factors were used in Wardle et al. (2001) were used in this study. From the present study it was observed that the mean percentage score was greater than that found by Wardle et al (2001). (Wardle 2001, 173-174) Females obtained a mean score of 10.62 ± 3.695 (55.93 ± 19.444%) while males obtained a mean score of 9.75 ± 3.863 (51.32 ± 20.329%). Overall, there was a significant difference which showed that females had a greater knowledge

than males of colorectal cancer and its risk factors (p=<0.001). This finding was consistent with the finding found by Wardle et al. (2001) which found that females were able to identify more risk factors than males. (Wardle 2001, 173-174) However, the findings from this study were different from the findings from Akhtar et al. (2007) which found that there were no gender differences with respect to the knowledge of the risk factors for colorectal cancer. (Akhtar 2007, 887-890) There wasn't any significant difference between the mean score between the various age groups of the population. On the other hand there was significant differences between the mean scores between the various faculties of the university (p=0.005), knowledge of someone who has or had colorectal cancer (p=0.034). There has not been any research which has been published on the relationship of these independent variables on knowledge of colorectal cancer. However, the faculty of food and agriculture was seen to have the greatest mean colorectal cancer score 11.72 ± 3.869 (61.71 ± 20.361%) whereas the faculty of law had the lowest mean score of 9.19 ± 4.411(48.37 ± 23.219%). Additionally, participants who had knew someone with colorectal cancer had a higher knowledge score than those who did not. Furthermore, there was a significant difference (p=<0.001) between the mean knowledge score between participants perception of their risk of colorectal cancer. Participants' knowledge score was significantly increased as they perceived their risk of colorectal cancer higher.

Lifestyle and Environmental Risk Factors:

From the findings of the study it was seen that 13.4%, 64.3%, 5.0% and 61.8%of the population were at smoking, environmental, alcohol and physical activity risk respectively. This was attributed to the following international standards: having a history of smoking and currently smoking, being exposed to second hand smoke sometimes and greater, consuming greater than 2 drinks of alcohol per day and engaging in physical activity less than 5 days per week of moderate

and vigorous activity. From the 400 participants sampled the mean BMI found in the study population was 23.12 ± 3.517, whereby males reported having mean of BMI (24.77 ± 3.381) as opposed to females (22.53 ± 10.631). There was a statistically significant difference (p=0.002) between the mean BMI between gender groups. This finding was very similar to the findings of Joshu et al. (2012) which found a significant difference between BMI and gender. (Joshu 2012, 138-145) However, there were no significant statistical differences (p=0.961; p=0.150) of BMI between ethnic and age groups respectively. This result differed from the findings from Joshu et al. (2012) where there were differences between BMI and age. (Joshu 2012, 138-145) This difference from the current study may be as a result that they were not even distributions between age groups and the sample sizes for each of the group differed largely from each other.

From the population 19.8% were found to be overweight based on their reported height, weight and calculated BMI. Furthermore from the silhouette chart 16% of the participants perceived their body size as overweight. There was a statistically significant difference (p=<0.001) between the reported calculated BMI and the perceived body size BMI. However this may be attributed to the fact that participants may have overestimated or underestimated their height, weight and body size when reporting. The mean lifestyle and environmental risk score was 1.44 ± 0.825 (females= 1.44 ± 0.78; males= 1.45 ± 0.905). Upon further analysis it was found that 11.8% had none of these lifestyle and environmental risk factors, 80.5% had at least 1-2 lifestyle risk factors and 7.6% had greater than 3 lifestyle and environmental risk factors. There were no statistical differences for the mean lifestyle and environmental colorectal cancer risk factor score between gender groups (p=0.959). This result differed from the findings of Kendozor et al. (2008) who found gender differences (p=0.02) whereby females had more risk factors than males. (Kendozor 2008, 2546-2554)

Dietary Risk Factors:

The results showed that 77.5% of the population consumed less than 14 servings of fruit per week, 91.2% consumed less than 21 servings of vegetables per week, 95.2% consumed less than 210 g of fiber for the week, 14.3% consumed ≥ 5 servings of red meat per week, 35.7% consumed >5 servings of processed meat per week and 67.5% consumed >14 servings of fat per week from the diet. Contrary to the findings previously stated Joshu et al (2012) found that the most prevalent dietary risk factor was that of red meat consumption which differs from this study which found that low fiber intake was most prevalent. (Joshu 2012, 138-145)All ranges were adopted from the international recommendations indicated by the Continuous Update Project Colorectal Cancer Report. (WCRF 2010) Over 73% of the population reported consumed greater than 1serving of garlic or onions per week. Research has shown that garlic and or onions has protective effects against colorectal cancer by reducing one's risk (WCRF 2010) Gender differences with reference to fruit, vegetable and fat intake were not statistically different, however for fiber, red meat, processed meat and garlic intake were statistically different ($p=0.04$; $p=<0.001$; $p=0.003$; $p=<0.001$ respectively). These findings were consistent with the findings of Joshu et al. (2012) who also found gender differences (p (gender) = <0.01) in individuals in the United States of America with similar exposure to these risk factors. (Joshu 2012, 138-145) It was suggested that the price of the items consumed were the main reason why participants consumed the food they ate. This result differed from the findings of Hyun-Joo et al 2010 which found that convenience was the main determinant in choosing foods to consume by the young adult. (Hyun-Joo 2010, 332-338) However the findings of the present study was similar to that found by Radder et al. (2005) who found that South African consumers were most affected by price. (Radder 2005, 583-589)

Overall Risk:

It was found that the mean overall number of risk factor score of the population was 4.36 ± 1.496, additionally a significant difference between gender groups (p=0.018) and age groups (p=0.013). Whereby there was greater probability that females would have a lower number of risk factors as opposed to males. This finding was consistent with the findings of Joshu et al. (2012) who found a significant gender difference whereby females had a lower prevalence of risk factors than males. (Joshu 2012, 138-145) The difference between age groups from the present study indicated that individuals who were of the age >40 years had a lower mean risk factor score than ≤ 24 years. This finding differed from the Shin et al. (2011) results which indicated older individuals were greater risk than younger individuals. (Shin 2011) This difference may be attributed due to the amount of individuals sampled from each of the age groups which were not equal with the ≤ 24 years group having contributing to the majority (86.9%) of the population. It was also found that there was not any significant association (p=0.052) between the overall risk factor score and participants perceived risk of developing colorectal cancer. Although there wasn't a statistically significant association between the two variables the p-value was near that of significance. A larger sample size may have assisted in making this association statistically significant. There was a significant association (p=0.003) between the knowledge and number of risk factors found in the population. Hence as the lower the knowledge level of participants the higher the prevalence of risk factors are observed. This finding opposes the findings from Bhurgri et al. who found no significant associations between the two previously mentioned variables. The difference may be as a result that the present study a larger sample size of greater than 700 individuals. (Bhurgri 2008, 584-588) An important finding from the study was the prevalence of the total number risk factors associated with the

development of colorectal cancer. It was found that majority of the population (47.5%) had ≥ 5 risk factors which were then followed by 42.3% of the population had ≥ 3-4 risk factors. The remaining amount had less than 2 of these risk factors. Overall even though the population were found to have a healthy body weight however, 89.7% of the students from the study population had at least more than or equal to 3 risk factors of which are associated with the development of colorectal cancer. This finding was similar to the recent findings of Hausdorf et al. (2008) who found in an Australian population that 79.4% of that population reported at least four cancer related risk behaviours.(Hausdorf 2008, 1339-1347) From the present study it is observed that the majority of the study population were at increased risk increasing their risk based on their reported risk factors for developing cancer not only of the colorectum but of other sub-sites such as the breast, prostate, cervix and lung or any other chronic non-communicable disease as discussed previously from previous research.

CHAPTER VI

CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

Conclusion

Students from the University of the West Indies, St. Augustine Campus were seen to have a poor knowledge of colorectal cancer and its risk factors. It was found that there was a statistical difference between knowledge levels between gender groups, faculties, knowledge of knowing someone with colorectal cancer and perceived risk for developing colorectal cancer. There was a high prevalence of at least1-2 lifestyle and environmental and dietary risk factors. Overall, the student population was found to have an overall prevalence of at least 3-4 risk factors. Statistically significant differences were seen between prevalence of risk factors with gender and age groups. In ending, there were not any statistically significant associations between the number of risk factors and one's perceived risk of developing colorectal cancer.

Limitations

- Reported weights, heights and perceived body image BMI were only sampled from only 400 participants.
- Reported weights, height and perceived body image BMI may have been underreported or over reported.
- Overweight/ Obesity were not considered in computing the overall lifestyle and overall risk scores.
- Participant may have overestimated frequency and amount of foods consumed.
- There was an uneven distribution between males and females sampled for the study.
- The use non-probability sampling hindered giving each student from the target population had an equal chance of being selected for the study; hence this increased the selection bias which reduces the validity of the study.
- The research instrument food frequency section did not include all types of typical foods which were typical of the student's diet.
- The reliability of the instrument was not determined.

Recommendations

- This research should be repeated among the target population and a larger cross section of tertiary education students in Trinidad and Tobago to determine the validity and reliability of findings from this present study.
- Implement campus wide campaigns focusing on increasing the awareness and knowledge level of the student population to the colorectal cancer and its risk factors using print, social and broadcast media.
- Implement dietary and lifestyle recommendations set out by the WCRF to encourage weight loss to normal weight, physical activity of at least 45 minutes for 5 days per week, reduction of red meat and fat intake, avoid intake of processed meats and increase consumption of fruit, vegetable and fiber in the diet.
- Encourage smoking cessation on the campus of UWI St. Augustine by implementing a no smoking policy in open populated areas.
- Conducting further research on determining the prevalence of risk factors for other types of cancer such as breast, prostate, lung and cervical cancer among the elderly population of Trinidad and Tobago.

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APPENDIX A

Copy of Questionnaire #1 used

Questionnaire

Participant Code #_____

Dear UWI student: This questionnaire is aimed at collecting data for an approved study. The aim of this venture is to objectively accumulate data on the prevalence, awareness and knowledge of the risk factors which lead to the development of colon/rectal cancer.

The following questionnaire consists of five sections comprising of socio-demographic, knowledge, risk assessment, food frequency and general information questions. Kindly please respond to all of the questions by placing a tick (√) in the relevant spaces provided. All information obtained will be completely **anonymous** and **confidential**

Thank you for your time and cooperation in participating in this study.

Section I- Socio-demographic

1. **Sex:** Male ☐ Female ☐
2. **Age:** ≤ 18 ☐ 19-24 ☐ 25-30 ☐ 31-35 ☐ 35-40 ☐ >40 ☐
3. **Ethnicity:**

   Indo-Trinidadian ☐

   Afro-Trinidadian ☐

   Hispanic ☐

   Chinese ☐

   Mixed ☐

   Other ☐ Please Specify:_____

4. **Faculty:**

Food and Agriculture	☐	Science and Technology	☐
Social Sciences	☐	Engineering	☐
Humanities and Education	☐	Medical Sciences	☐
Law	☐		

5. **Programme of Study**:_____

6. **Student Classification:** Full-time ☐ Part-Time ☐

   Evening ☐

7. **Level of study:**

   Undergraduate ☐ Postgraduate ☐

8. Do you know anyone who has or had colon/rectal cancer?

   Has ☐

   Had ☐

   No ☐

Section II- Risk Assessment

9. Does any member of your family have/ had any of the following conditions: **(Please select all that apply)**

Breast Cancer	☐
Prostate Cancer	☐
Colon Cancer	☐
Cervical Cancer	☐
Lung Cancer	☐
Not Applicable	☐

10. How long have you been smoking?

- Never ☐
- <1 year ☐
- 1-5 years ☐
- >5 years ☐

11. How regular do you smoke?

- 1-2 times daily ☐
- More than 2 times daily ☐
- 1-2 times/ week ☐
- 3-4 times/ week ☐
- More than 4 times/ week ☐
- Irregularly/ Socially ☐
- Never smoked ☐

12. Are you exposed to *second hand* smoke?

- Very often ☐
- Often ☐
- Sometimes ☐
- Seldom ☐
- Never ☐

13. How often do you drink alcoholic beverages?

- 1-2 drinks daily ☐
- More than 2 drinks daily ☐
- 1-2 drinks / week ☐
- 3-4 drinks / week ☐
- More than 4 drinks/ week ☐
- Irregularly/ Socially ☐
- I do not drink alcohol ☐

14. How often are you engaged in activities such as sitting, reading, watching television playing video games and computer use during a typical day?

- <4 hours/day ☐
- 4-8 hours/day ☐
- >8 hours/day ☐

15. How often do you engage in **moderate** physical activity? (bicycling, jogging, at a comfortable pace or activities which you make you breathe harder than usual)

- 0 days/week ☐
- 1 day/week ☐
- 2 days/week ☐
- 3 days/week ☐
- 4 days/week ☐
- 5 days/week ☐
- 6 days/week ☐
- 7 days/week ☐

16. How often do you engage in **vigorous** physical activity? (aerobics, football, cricket, swimming, hockey, athletics training, weight training or other similar sporting activities)

0 days/week ☐

1 day/week ☐

2 days/week ☐

3 days/week ☐

4 days/week ☐

5 days/week ☐

6 days/week ☐

7 days/week ☐

17. How much time do you spend in a single session of your **USUAL** exercise routine?

< 45minutes ☐ ≥ 45 minutes ☐ Not applicable ☐

Section III- Knowledge of Colorectal Cancer and Risk Factors

18. How much do you know about colon or rectal cancer?

Very Little ☐ Fair amount ☐ Very much ☐ None ☐

19. Which group of individuals do you think is at highest risk of developing colon cancer?

Adult Male ☐

Adult Female ☐

Both male and female ☐

Children ☐

None ☐

20. To what extent, do you agree or disagree that the following factors contribute to increasing a person's risk of developing of colon cancer?

Factor	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Family history of colon cancer					
Not being physically active					
Diabetes					
Frequent alcohol intake					
Frequent high fat intake					
Increasing age					
Frequent low fiber intake					
Being overweight					
Smoking					
High frequent intake of red meats (beef, pork)					
High frequent intake of processed meat					
Low vegetable intake (≤ 2 servings)					
Low fruit intake (≤ 2 servings)					
Frequent high levels of stress					

21. "Vegetarians are at a lesser risk than non-vegetarian individuals of developing colon cancer"

Agree ☐ Disagree ☐ Not sure ☐

<u>Section IV- Food Frequency:</u> How often and in what amount do you consume these foods? (Please Tick)

Food Item	Time					YOUR USUAL SERVING SIZE
Fruit, Vegetable and Grains	**Less than once per WEEK**	**About 1 time per WEEK**	**2-3 times a WEEK**	**4-5 times a WEEK**	**>5 times a WEEK**	
Fruit juice such as fresh, canned, bottled (Not carbonated beverages) **1 serving= 1 glass of juice**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Fruit (fresh, frozen, canned) (not including juice) **1 serving= 1 orange, apple, banana etc**.						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Green Salad **1 serving = 1 cup of salad**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Potatoes (baked, mashed or fried) **1 serving= 1 baked potato or 1 cup mash potatoes or 1 small serving of French fries**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Fiber cereals (Granola, Raisin Bran etc.) **1 serving= ½ cup of cereal**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Whole Wheat bread, pastries & crackers **1 serving= 1 slice of bread or, 1 small pastry or 5 crackers**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Beans or peas (baked beans, pinto, kidney split or lentils) **1 serving= 1/4 cup of peas or beans**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Vegetables raw, steamed, boiled, fried (broccoli, cauliflower, carrots, bell peppers) **1 serving= 1 cup of vegetables**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings

Garlic, onions (raw or cooked in meals) **1 serving= 1 clove of garlic or 1 onion**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings

<u>Section IV- Food Frequency Cont'd</u> (Please Tick)

Food Item	**Time**					**YOUR USUAL SERVING SIZE**
Meats and Snacks	**Less than once per WEEK**	**About 1 time per WEEK**	**2-3 times a WEEK**	**4-5 times a WEEK**	**>5 times a WEEK**	
Fried chicken **1 serving= 1 chicken piece**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Hamburgers or ground beef (Homemade, Burger King, Mc Donald's etc.) **1 serving= 1 burger**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Beef or pork such as included in sandwiches, stew, pies, curried or BBQ **1 serving= 1/2 cup of meat**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Hot dogs, bacon, salami, ham or canned sausage **1 serving= 1 can or hotdog or slice of salami or ham**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Salad dressings (not low-fat) **1 serving= 1 teaspoon of salad dressing**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Margarine or butter on bread or potatoes **1 serving= 1 teaspoon margarine or butter**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Mayonnaise as included in potato/ macaroni salad or cole slaw **1 serving= 1 teaspoon of mayonnaise**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings

Margarine, butter, oil in cooking **1 serving=1 teaspoon of margarine or butter or oil**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Eggs (entire egg or just egg whites) **1 serving= 1 egg**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Cheese, cheese spread (not low-fat) **1 serving= 1 teaspoon of spread or slice of cheese**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Whole milk (not low fat or reduced fat) **1 serving= 1 glass of milk**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
French fries, fried potatoes **1 serving= 1 potato or small serving of French fries**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Pastries, cookies, cakes **1 serving= 1 pastry, slice of cake, 1 cookie**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings
Fried hot appetizers (Doubles, Aloo Pie) **1 serving= 1 doubles or aloo pie**						☐ 1 Serving ☐ 2-3Servings ☐ ≥ 4Servings

Section V- General Information

22. Based on your eating habits stated in the food frequency table, which of the following factors influences your purchasing behaviour of these foods? **(Please select all that apply)**

- Cost ☐
- Location ☐
- Culture ☐
- Peer pressure ☐
- Perceived health benefits ☐
- Food Safety ☐

23. How would you rate your health status?

- Excellent ☐
- Very Good ☐
- Good ☐
- Fair ☐
- Poor ☐
- Very Poor ☐

24. How did you obtain any information on colon cancer? **(Please select all that apply)**

- Internet (Websites- WHO, Wikipedia, WCRF etc.) ☐
- Research Articles (Journals, Research Papers) ☐
- Word of mouth (Friends, Family etc.) ☐
- Print media (newspaper, magazine, brochures, flyer etc.) ☐
- Broadcast Media (videos, television, talk shows etc.) ☐
- Other ☐
  Please specify: _____
- Not applicable ☐

25. What additional information would you like to get on colon cancer?

_____

_____

26. What do you think is your risk of developing colon cancer?

High ☐ No risk ☐

Low ☐

27. What is your current weight?

Weight _____lbs

28. What is your current height?

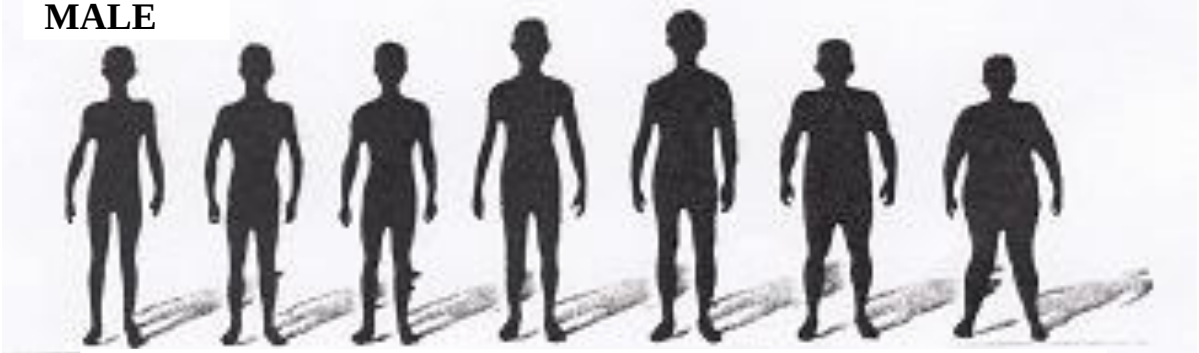
Feet_____ Inches_____

29. Please circle the number that best describes your body type:

FEMALE

1 2 3 4 5 6 7

MALE



1 2 3 4 5 6 7

Thank You for Your Participation

APPENDIX B

Copy of Questionnaire #2 used for sub sample

Questionnaire

Participant Code #_____

30. **Sex:** Male ☐ Female ☐

31. **Age:** ≤ 18 ☐ 19-24 ☐ 25-30 ☐ 31-35 ☐ 35-40 ☐ >40 ☐

32. **Ethnicity:**

Indo-Trinidadian ☐

Afro-Trinidadian ☐

Hispanic ☐

Chinese ☐

Mixed ☐

Other ☐ Please Specify:_____

33. **Faculty:**

Food and Agriculture	☐	Science and Technology	☐
Social Sciences	☐	Engineering	☐
Humanities and Education	☐	Medical Sciences	☐
Law	☐		

34. **Programme of Study**:_____

35. **Student Classification:** Full-time ☐ Part-Time ☐

Evening ☐

36. **Level of study:**

Undergraduate ☐ Postgraduate ☐

37. What is your current weight?

Weight _____ lbs

38. What is your current height?

Feet_____ Inches_____

39. Please circle the number that best describes your body type:

Thank You for Your Participation