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Title: Nutritional knowledge, attitude, behaviours and anthropometric data among adolescent female secondary school students.

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NUTRITIONAL KNOWLEDGE, ATTITUDE, BEHAVIOURS AND ANTHROPOMETRIC DATA AMONG ADOLESCENT FEMALE SECONDARY SCHOOL STUDENTS

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ABSTRACT

Background: Adolescence is the period of life which is often characterized by unhealthy nutritional behaviours including irregular consumption of meals, excessive snacking, eating away from home and meal skipping. While many factors have been found to influence these behaviours, most notable of these are nutrition knowledge and attitudes towards nutrition. Previous research has indicated a significant relationship between nutritional knowledge, attitude and behaviours among adolescents, particularly females. However, little is known about the relationship among these variables amid female secondary school students, particularly those of St. Joseph's Covent, San Fernando.

Objective: To determine the association between nutritional knowledge, attitudes, behaviours and Body Mass Index (BMI) among the students of St. Joseph's Convent (SJC), San Fernando.

Study Design: In this cross-sectional study, 218 students from all the form classes of St. Joseph's Convent, San Fernando were investigated. This sample was acquired by means of non-probability sampling.

Materials and Method: A structured questionnaire divided into four (4) sections was the sole method for data collection over a three-week period. BMI was calculated from self-reported weight and height measures. Questionnaires with attached parental consent forms were given to students to complete at home and return to their respective form dean the following day.

Statistical Analyses: One-way ANOVA and Post Hoc tests, Simple Linear Regression, Pearson's Correlation and Spearman's Rho Correlation were used to analyse all collected data.

Results: The majority and minority of students were from Form Six (28.4%) and Form Four (10.1%) respectively. The mean BMI of the study population was 20.88 ± 5.100. BMI for Form One students was statistically lower (p = 0.012) than Form Twos. The mean nutritional knowledge score was 13.74 ± 1.296 out of 15. Nutritional knowledge level was not the same across form classes and was statistically higher (p = 0.009) among Form Sixes than Form Twos. Ninety-six point nine percent (96.9%) of the students had 'good' nutritional knowledge. The mean attitude score was 2.31 ± 4.659 out of 14. Form Ones and Form Sixes had the highest and lowest mean attitude score respectively. Attitude towards nutrition differed across the form classes, with Form Sixes having a statistically lower (p = 0.006) attitude score (or more negative attitude) than Form Ones. Most of the students (67.0%) had a negative attitude towards nutrition. The mean behaviour score was 34.86 ± 5.246 out of 72. The highest and lowest scores attained were 49 (1.0%) and 21 (1.0%) respectively. Form Fours and Form Sixes had the highest (36.14 ± 5.285) and lowest (33.07 ± 4.682) behaviour scores respectively. No statistically significant difference (p > 0.05) in behaviour score among the form classes was found, indicating that nutritional behaviours were the same across form classes. Most of the students (88.5%) had 'average' nutritional behaviours. Both nutritional knowledge and attitude towards nutrition were associated with nutritional behaviours. Three nutritional behaviours were associated with increased BMI.

Conclusion: Nutritional knowledge and attitude towards nutrition were different across all forms classes while nutritional behaviours were not. An association between nutritional knowledge and behaviours and between attitude towards nutrition and nutritional behaviours exist among this study population. Three nutritional behaviours were associated with an increasing BMI.

CHAPTER I: INTRODUCTION

Background

Research in the field of nutrition is continuously expanding, with increased emphasis and focus directed towards the aspects of nutrition knowledge, attitude and behaviours (practices) among various population groups, especially adolescent females. Adolescence, often defined as the period of life that occurs between the ages of 12 and 21 years, is very often characterized by unhealthy and unconventional nutrition (eating) behaviours including irregular consumption of meals, excessive snacking, eating away from home (especially fast-food venues), dieting and meal skipping (Turconi et al. 2008; Mahan and Escott-Stump 2008; Brown 2011). While many factors have been found to influence these behaviours, most notable of these are knowledge and attitudes towards nutrition (Stanley et al. 1996; Mahan and Escott-Stump 2008).

In reviewing research literature, nutritional knowledge has been defined as an understanding of different types of foods, and how foods nourish the body and influence health (Insel et al. 2012). It is also defined as the ability of students to identify the type of foods they need to consume each day, in order to ensure that the essential nutrients required for proper body functioning are met (Ikorok et al. 2012). Being a predisposing factor for making healthful food selections and adopting safe and healthy lifestyle decisions, nutrition knowledge is a key independent variable of nutritional behaviour which should not be overlooked (Grace et al. 1996; Turconi et al. 2008). Numerous sources of nutrition information available to students include: nutrition-based subjects at school, internet websites, television or even health professionals, yet researchers have contended that high school students neither possess adequate knowledge of nutrition nor practise good nutrition behaviour (Ikorok et al. 2012). Ignorance about healthy patterns of eating, and the

nutrient and energy content of food can result in negative consequences, if they are translated into unsatisfactory food choices and unhealthy practices (Turconi et al. 2008).

Along with the former, attitude is another determinant of the nutritional behaviour, playing a vital role in the adoption and maintenance of a variety of nutritional practices (Turconi et al. 2008). Attitude as it relates to nutrition, refers to the predisposition or a tendency to respond positively or negatively towards food choices and healthy nutrition behaviours. Although general research findings have given little theoretical attention to attitudes of adolescents particularly female secondary school students towards nutritional behaviours, an assessment of such attitude is essential as it can help to explain the nutritional behaviours commonly practised among this population group.

As stated earlier, a range of unhealthy nutrition practices are common among high school female students, the most prevalent being breakfast skipping. Research findings revealed that on a given day, 24% of females generally skip breakfast of which, 15% are between the ages of 9 to 13 years, and 34% are within the 14 to 18 years age bracket (Mahan and Escott-Stump 2008). Evidence is replete in literature to attest that the consequences of this practice are many inclusive of: dysmenorrhea, high body mass index (BMI), reduced macro- and micronutrient intake, dental caries and lowered cognitive performance in terms of concentration and memory (Moore et al. 2007; Yang et al. 2006; Taskar et al. 2010).

In addition to breakfast skipping, other behaviours often exhibited by these individuals include: low fruit and vegetable intake, over consumption of snack foods containing added fats, sweeteners and sodium as well as decreased protein, dietary fibre, dairy and water intake (Rasmussen et al. 2006). However, it must be noted that a common trend which is growing in

popularity is the consumption of fast foods from outlets such as school canteens, franchised food restaurants or road-side vendors (Mahan and Escott-Stump 2008). Although these outlets are often convenient, low priced and represent socially-acceptable places for teenagers to spend time with friends, most of the food choices sold are notably low in vitamins, minerals, and fibre content but high in fat and sodium.

Nutritional behaviour can also serve as a useful predictor of Body Mass Index (BMI). Overconsumption and/or under-consumption of specific foods can lead to increased and/or decreased intake of a particular nutrient(s), which may inadvertently progress into nutritional deficiencies that can negatively affect physical growth and development, leading to altered BMI (Brown 2011). It must be noted that unhealthy nutrition behaviours coupled with their health-compromising consequences are serious issues which must be addressed because if allowed to go unchecked, can increase the risk for Obesity and Non-Communicable Diseases (NCDs) such as Diabetes Mellitus (DM), Cancer in adulthood (Turconi et al. 2008; Ikorok et al. 2012).

Previous research, utilizing various methodologies, indicated a significant relationship between nutrition knowledge, attitude and behaviours among adolescents, particularly females. However, little is known about the relationship among these variables amid female secondary school students in Trinidad and Tobago. At the St. Joseph's Convent, San Fernando, the current student population is seven hundred and fifty (750) in number, and comprises of students from different ethnic backgrounds and various social classes. Across this student population, an issue of concern is the seemingly unhealthy nutritional behaviours practised by the students and the possible impact of poor nutritional knowledge and attitudes towards nutrition with the resultant risky behaviours. In this particular research, nutritional behaviour refers to the food choices, frequency of food consumption and the patterns of eating among secondary school students.

Purpose of the Study

The purpose of this study is twofold. First, this study will investigate the relationship between nutritional knowledge, attitudes and behaviours, and second, determine the relationship between nutritional behaviour and Body Mass Index (BMI) among the students of St. Joseph's Convent, San Fernando.

Rationale

It is believed that several unhealthy nutritional behaviours are practised by the students of this institution. Since no research has ever been conducted to assess the prevalence of these behaviours, the influence of knowledge and attitude towards nutrition on the behaviours and the impact of the behaviours on Body Mass Index (BMI), doing so as a research project is most appropriate. Being the former school of the researcher, only this institution will be investigated. The results from this study are intended to be shared with the school's administration, so that future policies and programmes pertaining to nutrition and health can be well guided and effective.

Problem Statement

The issue affecting the students of St. Joseph's Convent, San Fernando is that they engage in seemingly poor and unhealthy nutritional behaviours. Also, with greater knowledge of basic nutrition and improved attitudes toward nutrition, the students' ability to establish judicious nutrition behaviours will be improved. Lack of knowledge and negative attitude towards nutrition greatly impact such behaviours; and in turn, such behaviours are also believed to negatively impact BMI.

Objectives

General Objective:

To determine the association between nutritional knowledge, attitudes, behaviours and Body Mass Index (BMI) among the students of St. Joseph's Convent (SJC), San Fernando.

Specific Objectives:

1. To compare the extent of basic nutritional knowledge across form classes at SJC
2. To compare attitudes towards nutrition across form classes at SJC
3. To compare nutritional behaviours across form classes at SJC
4. To determine if there is an association between knowledge and behaviours across form classes at SJC
5. To determine if there is an association between attitude and behaviours across form classes at SJC
6. To determine if there is an association between behaviours and Body Mass Index (BMI) across form classes at SJC

Null Hypotheses:

1. Basic nutritional knowledge is the same across form classes at SJC
2. Attitude towards nutrition is the same across form classes at SJC
3. Nutritional behaviours are the same across form classes at SJC

4. There is no association between knowledge and behaviours across form classes at SJC
5. There is no association between attitude and behaviours across form classes at SJC

Hypothesis:

1. There is an association between nutritional behaviours and Body Mass Index (BMI) across form classes at SJC

Scope

This study is limited to students of all form classes of St. Joseph's Convent, San Fernando, Trinidad. Data to be collected will be done over a three-week period through the administration of questionnaires.

Key Terms

Adolescence	the period of life that occurs between the ages of 12 and 21 years
Nutritional Knowledge	the ability of students to know the type of foods they need to consume each day, in order to ensure that the essential nutrients required for proper body functioning are met
Attitude	the predisposition or a tendency to respond positively or negatively towards food choices and healthy nutrition behaviours
Nutritional Behaviour	the food choices, frequency of food consumption and the patterns of eating among secondary school students

CHAPTER II: LITERATURE REVIEW

Introduction

Adolescence is the transitory period between childhood and adulthood, which is marked by rapid growth and maturation as well as high demands for energy and nutrients (Story and Storm 2005; Mahan and Escott-Stump 2008; Schinidt 2010; Brown 2011). With the onset of puberty and its associated biological changes including sexual maturation, increased weight and height, accumulation of skeletal mass and changes in body composition, nutrient needs sharply increase, with the greatest demands occurring at the adolescent's peak velocity of growth (Stang and Story 2005; Brown 2011).

A critical factor influencing adolescents' ability to meet their nutrient needs is the extent to which healthy nutritional behaviours are practised. Previous research findings show that healthy eating behaviours during adolescence are imperative for physical, psychological and social growth and development (Chin and Nasir 2009). With respect to secondary school adolescents, Ikorok et al. (2012) posited that students who engage in good nutrition practices often manifest socially, mentally and physically alert personalities, which is later translated into academic success.

Evidence is replete in literature to attest to the fact that adolescents are exposed to a multitude of internal (personal) factors and external factors which can affect their nutritional choices and behaviours. Some of these factors include perception towards healthy eating, level of family income, mass media and advertising, access to fast food outlets, availability of food items, religious affiliation, culture, self-efficacy, locus of control, knowledge of nutrition, state of

health, and attitudes toward the adoption and maintenance of nutritional habits (Gracey et al. 1996; Turconi 2008; Steyn 2010; Ikorok 2012).

While Mahan and Escott-Stump (2008) and Brown (2011) gave credence to views mentioned above, they further explained the impact of cognition on the heath behaviours of adolescence. Specifically, they highlighted that early adolescence often characterized by concrete thinking, egocentrism and impulsive eating behaviours limits the ability of these individuals to understand complex health issues. In middle adolescence, concrete thinking also occurs but is interrupted by abstract thinking as these adolescents develop emotional and social independence from their parents and are drawn closer to peers and peer influences. Late adolescence on the other hand, is the time where abstract thinking is dominant and behaviours are less impulsive. These individuals possess the ability understand others perspective and view future health consequences associated with comprising dietary behaviours.

Additionally, a number of studies dealing with nutritional (eating or dietary) behaviours have alluded to the fact that poor dietary practices such as high-fat/high-energy food consumption, low intakes of fruits, vegetables, dairy and meat/fish as well as irregular breakfast consumption can partially explain the continuous increase in adiposity among this population group (Al-Almaie 2005; Triches and Giugliami 2005). Along with the former, Gracey et al. (1996) and Chin (2009) also postulated that if unhealthy habits acquired during adolescence persist into adulthood, the result may be both short-term and long-term health consequences including obesity and obesity-related conditions like diabetes mellitus and cardiovascular disease.

In that regard, this literature review will focus on two factors: nutritional knowledge and attitude towards nutrition as key determinants of nutritional behaviour, and the extent to which some of these nutritional behaviours impact BMI.

Nutritional Knowledge

Literature on nutrition knowledge as it relates to nutritional (eating) behaviours among adolescents primarily focuses on both females and males, with very few studies emphasizing the role of class (grade level) as the variable for comparison.

The premise that nutritional knowledge influences the eating behaviours of adolescents has been posited and reported on by Pirouznia (2001). In his study, Pirouznia emphasized the plausibility of this relationship among middle school children (ages 11 to 13 years), and made comparisons on the basis of grade level (6^{th}, 7^{th} and 8^{th} grade). In terms of nutritional knowledge level, he reported that among 6^{th} graders, the overall mean knowledge score was 13.7 / 20 (68.5%), while among 7^{th} and 8^{th} grades, the mean scores were 11.80 / 25 (47.2%) and 11.50 / 25 (46.0%) respectively. By means of one-way ANOVA, Pirouznia found no significant difference ($p = 0.488$) in nutritional knowledge between students in grades 7^{th} and 8^{th}. Regardless of the insignificant results, Pirouznia noted that 7^{th} and 8^{th} grade students were knowledgeable about the needs of the body but not about the functions and sources of nutrients or energy.

Similar to Pirouznia (2001), Turconi et al. (2008) and Ikorok et al. (2012) also discovered that nutrition knowledge was a predisposing factor of nutritional behaviours. Turconi et al. (2008), who focused on the nutritional knowledge of Italian Adolescents ages 15 and 16 years found that among their study population, 49.2%, 8.6% and 42.2% had ‘good’, ‘quite good’ and ‘insufficient’ nutrition knowledge respectively, with more females (than males) in ‘good’ and

'quite good' knowledge category and less in the 'insufficient' knowledge category. They noted that incorrect responses were given to questions pertaining to protein content, dietary fibre and the caloric values of food items. Additionally, Ikorok et al. (2012) whose objectives were to investigate the nutritional knowledge level, nutritional behaviours and the relationship between these two variables among secondary school students in Nigeria, highlighted the general trend between the two factors rather than making comparisons based on class (grade level), age or gender. They indicated that students were generally knowledgeable about nutrition as 69.2% and 30.8% were the recorded correct and wrong responses respectively, and 97.9% and 24.5% of students were able to correctly identify sources of protein and energy-giving foods respectively.

Most noticeable is the congruence in the literature as it relates to female adolescent knowledge of dietary fibre. Like Turconi et al. (2008), Al-Almaie (2005) also discovered that there is a deficit in the knowledge of dietary fibre among female adolescents. Of the 1331 16- year old female students in his study, Al-Almaie found that only 2.1% and 24.2% knew the benefits of dietary fibre and examples of fibre-rich diets respectively. He also highlighted the knowledge of students as it related to the type of fat in foods, and posited that 65.3% females correctly identified 'unsaturated fat' as the healthy fat in food and 66% knew that cholesterol was a type of saturated fat.

In terms of fruit and vegetable intake, Thakur and D'Amico (1999) who studied nutrition knowledge of 9^{th} to 12^{th} graders as it related to obesity, noted that more than 75% of the students were unaware of the recommendation for five (5) fruits and vegetables a day based on the Food Guide Pyramid, and thought the recommended number of servings were only 2 -3.

As mentioned previously, research findings on the relationship between nutritional knowledge and nutritional behaviours of adolescents has focused on both females and males however, it is also viewed as contradictory with knowledge being positively related to nutritional behaviour in some studies but showing little correlation in others (Pirouznia 2001).

More specifically, Pirouznia (2001) found that no relationship existed between nutritional knowledge and eating behaviours of students in the 6^{th} grade but among 7^{th} and 8^{th} graders, two significant relationships ($p < 0.008$ and $p < 0.01$ respectively) were noted. Similarly, the null hypothesis proposed by Ikorok et al. (2012) of 'no association between knowledge of nutrition and nutritional behaviours' was rejected at 0.05 alpha level, and they postulated that there was a statistically significant influence of knowledge on the behaviours practiced among Nigerian secondary school students ($p < 0.05$).

Equally important to aspect of nutritional knowledge, is the method of evaluating knowledge and the score categories utilized by researchers. Accordingly, Ikorok et al. (2012) used a 42- item questionnaire, which was designed by the researchers, then reviewed and edited by experts in the fields of nutrition, food and health. The instrument's reliability which was measured on a split ½ data, and had a reliability coefficient of 0.74 obtained by Kuder- Richardson Formula 21 Statistic, was deemed appropriate for the study. The score categories used for the variables of knowledge and behaviour were modified from previous study, and ≤ 40% , 41-60% and ≥60% , were labelled low, moderate and high respectively.

Like the former, Turconi et al. (2008) also used a questionnaire as their primary data collection tool. Their dietary questionnaire was developed from a previous study and consisted of nine (9) sections. It was checked for internal consistency and temporal stability using Cronbach's alpha

and Pearson's Correlation respectively. While the nutrition knowledge sections had poor internal consistency (Cronbach 0.56), the Pearson's correlation showed statistical significance ($p < 0.01$) indicating very good temporal stability. Instead of using percentage categories for knowledge scores, Turconi et al. divided the score for each section into tertiles, assigning the lowest tertile, the worst assessment and the highest, the best assessment.

Additionally, Pirouznia (2001) employed the use of a Comprehensive Assessment of Nutrition Knowledge, Attitude and Practice (CANKAP) test as the instrument for data collection. This test which was reviewed by professionals in the field of nutrition and food science had its content validity analysed by several methods. Each knowledge question was determined to have a Cronbach's alpha reliability coefficient of 0.70 or greater. Fundamentally, CANKAP tests were written for each appropriate grade level, with 6^{th} graders having one test and 7^{th} and 8^{th} graders having another test. The 6^{th} grade test comprised of thirty (30) questions (10 on eating behaviours, 20 on nutrition knowledge) while the $7^{th} – 8^{th}$ grade test contained thirty five (35) questions (10 on eating behaviours and 25 on nutritional knowledge). No information on the scoring categories for the knowledge section was provided.

Attitude towards Nutrition

The subject of female adolescent attitude towards nutrition has received minimal attention, especially as it relates to nutritional behaviours. However, research conducted by Sangperm (2008) among 7^{th} to 9^{th} grade students in Bangkok revealed that attitude was a useful predictor of 'intentions to eat healthy'. Fundamentally, it was noted that attitude significantly ($b = 0.038$, $p < 0.05$) affected behaviour among all subjects, and that the girls' attitude did correlate significantly ($p < 0.05$) with their intention to eat healthy. In addition to the former, research findings also

revealed that that as students progressed into higher grades, their level of attitude consequently increased (Lin et al. 2007). Specifically, Lin et al. (2007) focused on the nutrition attitudes of elementary students, and discovered that 4^{th}, 5^{th} and 6^{th} grade students displayed more positive attitudes when compared to 1^{st} to 3^{rd} graders. This relationship was statistically significant (t-test, $p < 0.05$).

Notwithstanding the works of Lin et al. (2007) and Sangperm (2008) who directly addressed attitude, several other researchers have cited the factors of 'self-efficacy' and 'locus of control' as important aspects of attitude-behaviour consistency. Gracey et al. (1996) put forth the notion that in order to undertake health behaviours, personal control (the belief that it is actually possible to perform the health behaviour), and self-efficacy are required. Turconi et al. (2008) affirmed the work of Gracey et al. and further explained that knowledge-behaviour correlations are higher among adolescents possessing a greater sense of self-efficacy, as opposed to those with low self-efficacy. Turconi et al., who assessed self-efficacy among a 16 year old adolescent population group, discovered that 65.4% of subjects reported the ability to use advice aimed at improving well-being whereas 7.1% reported an inability to use advice aimed at improving well-being. Additionally, 13.6% indicated that modification of their diet is possible if needed while 36.4% indicated the opposite to the former statement.

With respect to locus of control, Gracey et al. (1996) postulated that although it is similar to self-efficacy, locus of control is more general, relating to an individual's interaction with the environment rather than his/her belief about the practice of specific health behaviour. Therefore, individuals with high 'internal' locus of control have a greater likelihood of practising preventive health behaviours since they view these steps as protective against ill- health (Gracey et al. 1996).

Nutritional Behaviours

There is a growing body of knowledge that suggests adolescents are generally uninterested in nutrition and the benefits of good nutritional habits. More so, these extensive studies have affirmed the fact that unhealthy nutrition-related behaviours among adolescents can contribute to a range of life-threatening health issues such as Diabetes Mellitus, Coronary Heart Disease (CHD) and stroke, both in adolescence as well as in adulthood.

Accordingly, Pirouznia (2001) who studied the eating behaviours of 6^{th} to 8^{th} graders, discovered that there was a significant difference (F_1 339 = 19.03, P= 0.0001) between the eating behaviour score of 7^{th} and 8^{th} graders, with the mean score of 7^{th} graders (29.85 out of 50) being higher than that of 8^{th} graders (26.84 out of 50). Contrastingly, Lin et al. (2007) noted that among elementary school adolescents 4^{th} to 6^{th} grade students out-performed their 1^{st} to 3^{rd} grader colleagues on the basis on nutrition behaviour.

By using the Taiwanese Food Guide which provides the serving size recommendations for six (6) food groups, Lin et al. (2007) assessed the dietary quality of their study population and found that the percentage of students meeting required vegetable and fruit intakes were 9.1% and 15.2% in 1^{st} to 3^{rd} graders and 4^{th} to 6^{th} grade students respectively. These findings were not different from Pearson et al. (2009) who posited that older adolescents consumed higher intakes of fruits and vegetables per day when compared to younger adolescents ($p < 0.001$). Noteworthy also are the findings of Mullie et al. (2006), which failed to corroborate those of Lin et al. (2007) and Pearson et al. (2009). Muliie et al. (2006) reported that fruit and vegetable consumption lowered with age, and was significant for girls ($p < 0.05$). More specifically, they illustrated that girls achieving the required intake of fruits and vegetables decreased from 16.8% at 12 years of

age to 12.2% at the age of 15 years. Over this age period also, the number of girls reporting fruit and vegetable intake between 0 – 1 portions a day increased from 16.9% to 28.9%.

Along with fruit and vegetable intake, irregular breakfast consumption among adolescents has also been the focus of published findings. Turoni et al. (2008) noted that the worst eating habit among 16 year old Italian adolescents was skipping breakfast, which was practised by 20% of the subjects. On the other hand, Chin and Nasir (2009) discovered that among Malaysian females aged 13 to 19 years, 52.6% took breakfast everyday while 19.7%, 16.7% and 4.4% consumed breakfast 4-6 days, 2-3 days, once per week respectively.

The behaviour of skipping breakfast meals has also been linked with BMI and with overweight and obesity status. According to Deshnukh-Taskar et al. (2010), breakfast skippers between the ages of 9-13 years had a greater BMI z score for age than breakfast consumers, and the prevalence of obesity ($\geq 95^{th}$ percentile) was higher (22.1%) in breakfast skippers than in Ready-to-Eat (RTE) cereal consumers. Among adolescents aged 14-years, Deshnukh-Taskar et al. (2010) also noted similar findings with the prevalence of obesity being slightly lower (20.7%) among breakfast skippers than in RTE cereal consumers. Additionally, Rashidi et al. (2007), who studied 11-16 year old Iranian students, and defined overweight, pre-obesity and obesity as BMI values $\geq 85^{th}$, 85^{th} to 95^{th}, and $\geq 95^{th}$ percentiles of age-specific BMI values respectively, found a the differences between pre-obese and normal, and between obese and normal female students to be statistically significant ($p < 0.002$ and $p < 0.001$) respectively.

Many adolescents most notably females, do not consume the daily recommended intake for calcium, set at 1300 mg per day for 9- to 18- year-olds (Brown 2011). A study by Ortega et al. (1998) supports this premise as they noted that among 9 to 13 year old students, 80.5% of girls

did not consume the recommended intake of calcium. Research findings from longitudinal studies also established a connection between low calcium intake and girls, as Vatanparast et al. (2006) studied 14 -16 year old Canadian adolescents, and noted a significant negative trend in total daily consumption of calcium among girls, and a significant decrease in the mean intake of milk overtime (from 1991-2004). Fundamentally, Vatanparast et al. (2006) also indicated a significant negative association between milk intake and consumption of non-carbonated beverages ($r = -0.322$, $P = 0.001$).

With respect to snack consumption, similar findings were noted by Chin and Nasir (2009), Steiner-Asiedu (2012) and Boon et al. (2012). Chin and Nasir (2009) noted that among female adolescents aged 13 – 19 years, 51.4% and 48.6% of the participants snacked and did not snack between meals daily respectively. Steiner-Asiedu (2012) discovered also that among 11-15 year olds adolescents, 63.60% snacked during mid-morning, 32.20% snacked between lunch and supper, and 4.10% consumed their after supper. Similar findings by Boon et al. (2012) also noted that among secondary school students aged 13-15 years, 68.6% like to snack while 31.4% do not like to snack. In terms of the types of snacks consumed, Chin and Nasir (2009) found that snacks most frequently consumed between meals included fruits (26.9%), breads (15.0%), and local cakes (14.2%), while the beverages most frequently consumed between meals were tea (33.3%), chocolate milk (27.9%) and fruit juices (26.5%). While Chin and Nasir (2009), Steiner-Asiedu (2012) and Boon et al. (2012) all used food frequency questionnaires to evaluate snack consumption, Boon et al. (2012) also utilized a 24-hour diet recall to compare meal patterns with snacking patterns.

Notably, Phillips et al. (2004) illustrated a connection between energy-dense snacks (EDS) and students 10 to 16 years of age, and found a significant decrease ($p < 0.05$) in daily serving of

EDS foods with increasing age. When EDS food consumption was expressed as a percentage of daily kilocalories from EDS foods, an insignificant relationship with age was observed. In their longitudinal study, Phillips et al. reported no significant association between BMI and snack intake during adolescence. These findings were similar to those of Boon et al. (2012) who by use of one-way ANOVA, highlighted no significant association between meal and snacking pattern with BMI.

Theoretical Framework

The Theory of Planned Behaviour (TPB) developed by Ajzen (1991), is a conceptual framework which can be applied to the students of SJC San Fernando, to help explain their nutritional behaviours. The primary objective of the TPB is to predict behaviours and understand its causes. It also proposes that personal intention (motivation to perform a specific behaviour) is the most proximate predictor of a specific behaviour, and is determined by three factors: attitude, subjective norms and perceived behavioural control (Kiger 2004; Bilic 2005).

Theoretically, attitude is defined as a positive or negative evaluation or appraisal of the behaviour in question (Biliac 2005). Subjective norm, the second determinant of intentions, is a social factor representing the perceived social pressure to perform or not to perform the behaviour. Perceived behavioural control (PBC), the third determinant of intentions, refers to a person's appraisal of their ability to perform the behaviour (Biliac 2005). According to Ajen (2002) the intention to perform a particular behaviour increases as the person's attitude and subjective norms become more positive.

Therefore, students who possess positive attitudes toward nutrition are more likely to be motivated to practise healthy nutritional behaviours than those having negative attitudes toward

nutrition. Similarly, students who perceive pressure to engage in healthy nutritional behaviours by persons around them (family or peers) have a greater likelihood to practice behaviours beneficial to their health. In terms of PBC, if students believe that they possess the ability to perform healthy nutritional behaviours as opposed to unhealthy ones, their belief can lead to stronger intentions to perform such behaviour, which ultimately results in the behaviour being practiced.

CHAPTER III: METHODOLOGY

In this cross-sectional study, the subjects under investigation were the students from all the form classes of St. Joseph's Convent, San Fernando. The sample size was generated from the formula ($n = \frac{1.96^2\ \hat{p}\ \hat{q}}{d^2}$), which was based on the estimated prevalence of the students who always eat breakfast. A prediction of 50% was made, and the sample size calculated with a 5% level of significance was two hundred and eighty eight (288) students. Data was collected over a three-week period with questionnaire distribution as the sole method for data collection.

Subjects

In order to achieve the required sample size and a representation of all forms, the non-probability method of quota sampling was used. In this case, a total of four hundred and eight six (486) questionnaires were distributed to students from all forms across the school population, and data collection proceeded until a quota of 288 questionnaires were returned. Since the questionnaires had to be completed at home and returned the next day, the response rate was 44.85% and the calculated sample size was not met. The sample consisted of 218 students.

Instrument

Data collection for this study was done using a structured questionnaire, which was divided into four (4) sections. Except for section IV which asked participants to indicate class form and weight and height measures, the other sections contained 35 items overall. Appendix A shows the questionnaire, which is sectioned into the various topics described below:

Section I – Behaviours: comprised of thirteen (13) questions aimed at evaluating behaviours such as the frequency of breakfast, fast food and snack consumption, and the daily consumption of

items such as fruits, meals containing vegetables, meat/fish/poultry, milk/cheese/yogurt, legumes, cereals/grains/porridge and water.

Four of the questions had the following response categories: always, often, sometimes, never; the other 9 had instead 4 response categories structured in different ways.

The response to each question in this section was assigned a score which ranged from 0 to 3, with the highest score assigned to the healthiest behaviour and the lowest score to the least healthy behaviour. The total score of this section was 72.

Section II- Knowledge: consisted of fifteen (15) questions with four (4) having three response categories, 'True', 'False', 'Not Sure', and eleven (11) having four response categories structured in different ways.

This section focused on a few nutritional aspects, investigating the level of knowledge that the participants have with respect to the macronutrients, dietary fibre, calcium, water, fruits and vegetables, breakfast skipping and healthy snack consumption.

A score of 1 was assigned to each correct response while a score 0 was ascribed to any incorrect response. The total score for this section was 15.

Section III- Attitude: contained seven (7) statements aimed at assessing the attitudes of the participants toward breakfast consumption, fruit and vegetable and water intake as well as snacking. Each statement in this section had a 4 response categories: strongly agree, agree, neutral, disagree and strongly disagree. The scoring for each statement ranged from -2 to 2 with the maximum score assigned to the most positive attitude and the minimum score to the least positive (most negative) attitude. The total score for this section was 14.

*Section IV-Demographic and Anthropometric Dat*a: Three (3) questions comprised this section. One (1) was based on class form and the other two (2) questions were self-reported weight (in pounds) and height (in feet and inches) measures.

Data Collection

Having received the necessary approvals from the Ministry of Education and the school principal to conduct the study, permission was also needed from the parents of each student who volunteered to participate in the study. A consent form was drafted (as shown in Appendix B) and attached to each questionnaire. Each questionnaire was self-administered and contained instructions on how to respond to the questions in each section.

Before the majority of questionnaires were printed for distribution, fourteen (14) were pretested by two (2) students from each form. The students were all seated in a quiet room to complete the questionnaires, and later presented their feedback one-on-one to the researcher. Based on the comments received, minor modifications were made and the questionnaire was printed.

Because the students had internal examinations for a period of three (3), it would not have been possible for the researcher to distribute the questionnaires for herself. Therefore, questionnaire distribution was done by the deans of each form, and the 486 questionnaires were divided among each of the seven (7) forms as follows: Form One – 82 questionnaires, Form Two – 82 questionnaires, Form Three – 82 questionnaires, Form Four – 60 questionnaires, Form Five – 60 questionnaires, Lower Six – 60 questionnaires and Upper Six – 60 questionnaires.

Regular announcements were made by the principal and dean for the quick return of questionnaires, and the researcher visited the school three (3) days for a period of three (3) week to collect the returned questionnaires.

Evaluation of Scores

The total score obtained for sections I to III was divided into tertiles or three (3) categories, with the lowest tertile assigned the worst evaluation and the highest, the best evaluation. The evaluation for each section is as shown below:

Section I – Behaviour Score:

- 0 – 24: Unhealthy Nutritional Behaviours
- 25 – 49: Average Nutritional Behaviours
- 50 – 72: Healthy Nutritional Behaviours

Section II- Knowledge Score:

- 0 – 5: Insufficient Knowledge
- 6 – 10: Quite Good Knowledge
- 10 – 15 : Good Knowledge

Section III- Attitude Score:

- ≤ 4: Negative Attitude
- 5 – 9: Moderate Attitude
- 10 – 14 : Positive Attitude

Calculation of BMI

All self-reported weight and height measures were converted into pounds and inches respectively, and BMI was calculated using the formula, Weight (lb) / Height $(in)^2$ x 703.

Statistical Analysis

The Statistical Package Software for Social Sciences (SPSS) version 17.0 was used to analyse all data. Descriptive statistics were reported as frequencies, percentages and means ± standard deviation for all the variables. Inferential statistics were also used to make generalizations about the school population and to test the hypotheses outlined in Chapter One. One-way Analysis of Variance (ANOVA) was used to compare the extent of basic nutritional knowledge, attitude towards nutrition and nutritional behaviour across all forms. Post – Hoc tests were also used to determine which form classes differed from the other classes. A simple linear regression analysis was conducted to determine if nutritional knowledge, attitude and behaviour scores can be predicted by class form. To determine if there is an association between nutritional knowledge and nutritional behaviours and between attitude and nutritional behaviours across all forms, Pearson's correlation analysis was employed. Additionally, Spearman's Rho Correlation was also used to determine if there is an association between nutritional behaviours and BMI.

CHAPTER IV: RESULTS

Demographics and Anthropometric Data

The study consisted of 218 students, the majority of which were Form Six students and minority were Form Four students who accounted for 28.4% (n = 62) and 10.1% (n =22) respectively. Table 1 summarises the demographic data.

In terms of the anthropometric data, only 192 (88.1%) of the 218 students provided weight and height measures for the computation of Body Mass Index (BMI). Among the 192 students, the mean BMI was 20.88 ± 5.100. There was a statistically significant difference (5, 186) = 2.903, p = 0.015 in the mean BMI between the form classes as determined by one-way ANOVA. A post-hoc test revealed that BMI was statistically lower (p = 0.012) between Form Ones (18.69 ± 4.726) and Form Twos (23.19 ± 6.603). Tables 2 - 3 summarise these results.

Table 1: Frequency and Percentage of Students by Form Class

Form Class	Frequency (n = 218)	Percentage (%)
Form One	39	17.9
Form Two	28	12.8
Form Three	40	18.3
Form Four	22	10.1
Form Five	27	12.4
Form Six	62	28.4

Table 2: Mean BMI across Form Classes

Form Class	Mean BMI ± Standard Deviation
Form One	18.69 ± 4.726
Form Two	23.19 ± 6.603
Form Three	20.30 ± 4.318
Form Four	22.48 ± 7.151
Form Five	20.29 ± 4.064
Form Six	21.15 ± 4.004

Table 3: Post Hoc Differences in BMI with Class Form as the Selected Independent Variable

Dependent Variable: BMI

Class Form (1)	**Class Form (2)**	**Mean Difference (1-2) ± Standard Error**	**Significance**
Form One	Form Two	-4.50* ± 1.344	0.012
	Form Three	-1.61 ± 1.235	0.783
	Form Four	-3.79 ± 1.398	0.077
	Form Five	-1.60 ± 1.314	0.827
	Form Six	-2.46 ± 1.103	0.229
Form Two	Form One	4.50* ± 1.344	0.012
	Form Three	2.89 ± 1.335	0.259
	Form Four	0.71 ± 1.487	0.997
	Form Five	2.90 ± 1.409	0.315
	Form Six	2.04 ± 1.215	0.548
Form Three	Form One	1.61 ± 1.235	0.783
	Form Two	-2.89 ± 1.335	0.259
	Form Four	-2.18 ± 1.390	0.618
	Form Five	-2.18 ± 1.305	1.000
	Form Six	-0.85 ± 1.091	0.971
Form Four	Form One	3.79 ± 1.401	0.077
	Form Two	-0.71 ± 1.487	0.997
	Form Three	2.18 ± 1.390	0.618
	Form Five	2.19 ± 1.460	0.665
	Form Six	1.33 ± 1.273	0.902
Form Five	Form One	1.60 ± 1.314	0.827
	Form Two	-2.90 ± 1.409	0.315
	Form Three	-0.01 ± 1.305	1.000
	Form Four	-2.19 ± 1.461	0.665
	Form Six	-0.86 ± 1.181	0.979
Form Six	Form One	2.46 ± 1.103	0.229
	Form Two	-2.04 ± 1.214	0.548
	Form Three	0.85 ± 1.215	0.971
	Form Four	-1.33 ± 1.092	0.902
	Form Five	0.86 ± 1.274	0.979

*Significant at the 0.05 level

Nutritional Knowledge

From the study sample of 218 students, the total nutritional knowledge score was calculated and evaluated for only 195 of the students. The mean nutritional knowledge score for the entire sample was 13.74 ± 1.296. The highest and lowest score attained were 15 (27.8%) and 6 (0.5%) respectively. Form Six students had a mean score of 14.10 ± 1.361, which was the highest among all form classes, while Form Two students had the lowest mean score among the forms, which was 13.08 ± 1.598. There was a statistically significant difference ($p = 0.006$) in knowledge score between the form classes as determined by one-way ANOVA. A post-hoc test revealed that knowledge score was statistically higher ($p = 0.009$) between Form Sixes (14.10 ± 1.361) and Form Twos (13.08 ± 1.598). Of the 195 respondents with calculated knowledge scores, 189 (96.9%), 6 (3.1%) and 0 (0%) had good, quite good and insufficient nutritional knowledge respectively.

From the frequencies and percentages of correct responses to each question/statement calculated, Form Six students provided most of the correct answers when compared to the other class forms. For all the questions/statements excluding questions 2 and 5, which were 'Which foods contain carbohydrates?' and 'Fibre is important for all of the following except?', Form Four students provided the least correct answers compared to other forms.

A comparison between the two questions on dietary fibre among class forms showed that the correct response to the question 'Which of the following is high in fibre?' was generally higher (94.6%) than the correct response to question, 'Fibre is important for all of the following except?' which was 56.8%. Most students (99.5%) elicited the correct responses to statements 'Fruits and Vegetables are excellent sources of' and 'The healthiest snack is' as 'vitamins and

minerals' and 'a fruit bowl' respectively. Eighty-three point four percent (83.4%) of the students knew that protein is an important nutrient to help build muscles while 90.8% were knowledge of the fact that potato chips/pastries/cookies/milkshakes/preservatives/salted peanuts/cakes provide a lot of energy. Tables 4 – 7 summarises the results noted above.

Table 4: Mean Nutritional Knowledge Score across Class Forms (n = 195)

Class Form	**Mean ± Standard Deviation**
Form One	13.40 ± 1.311
Form Two	13.08 ± 1.598
Form Three	14.00 ± 0.775
Form Four	13.95 ± 1.026
Form Five	13.56 ± 1.158
Form Six	14.10 ±1.361

Table 5: Post Hoc Differences in Nutritional Knowledge Score with Class Form as the Selected Independent Variable

Dependent Variable: Nutritional Knowledge Score

Class Form (1)	**Class Form (2)**	**Mean Difference (1-2) ± Standard Error**	**Significance**
Form One	Form Two	0.33 ± 0.326	0.920
	Form Three	-0.60 ± 0.384	0.384
	Form Four	-0.55 ± 0.647	0.647
	Form Five	-0.16 ± 0.997	0.997
	Form Six	-0.70 ± 0.098	0.098
Form Two	Form One	-0.32 ± 0.920	0.920
	Form Three	-0.92 ± 0.068	0.068
	Form Four	-0.87 ± 0.202	0.202
	Form Five	-0.48 ± 0.744	0.744
	Form Six	-1.03* ± 0.009	0.009
Form Three	Form One	0.60 ± 0.384	0.384
	Form Two	0.92 ± 0.068	0.068
	Form Four	0.05 ± 1.000	1.000
	Form Five	0.44 ± 0.784	0.784
	Form Six	-0.10 ± 0.999	0.999
Form Four	Form One	0.55 ± 0.647	0.647
	Form Two	0.87 ± 0.202	0.202
	Form Three	-0.05 ± 1.000	1.000
	Form Five	0.39 ± 0.913	0.913
	Form Six	-0.15 ± 0.997	0.997
Form Five	Form One	0.16 ± 0.997	0.997
	Form Two	0.48 ± 0.744	0.744
	Form Three	-0.44 ± 0.784	0.784
	Form Four	-0.39 ± 0.913	0.913
	Form Six	-0.54 ± 0.465	0.465
Form Six	Form One	0.70 ± 0.268	0.098
	Form Two	1.03* ± 0.296	0.009
	Form Three	0.10 ± 0.279	0.999
	Form Four	0.15 ± 0.332	0.997
	Form Five	0.54 ± 0.300	0.465

*Significant at the 0.05 level

Table 6: Nutritional Knowledge Status of Students

Nutritional Knowledge Status	**Frequency (n=195)**	**Percentage (%)**
Good	6	3.1
Quite Good	189	96.9
Insufficient	0	0

Table 7: Correct Response to Each Question/Statement by Class Form

Question/Statement	Class Form	Frequency (n =218)	Percentage (%)
1. The main source of energy for our body is:	*Form One*	24	11.0
	Form Two	18	8.3
	Form Three	33	15.1
	Form Four	17	7.8
	Form Five	18	8.3
	Form Six	54	24.8
2. Which food contains carbohydrates?	*Form One*	37	17.0
	Form Two	21	9.6
	Form Three	34	15.6
	Form Four	21	9.6
	Form Five	25	11.5
	Form Six	58	26.6
3. Which of the following is high in fibre?	*Form One*	38	17.4
	Form Two	26	11.9
	Form Three	37	17.0
	Form Four	21	9.6
	Form Five	27	12.4
	Form Six	58	26.6
4. Which food is high in protein?	*Form One*	37	11.9
	Form Two	26	17.4
	Form Three	38	17.4
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	61	28.0
5. Fibre is important for all of the following except	*Form One*	21	9.6
	Form Two	12	5.5

	Form Three	21	9.6
	Form Four	14	6.4
	Form Five	12	5.5
	Form Six	44	20.2
6. Is protein an important nutrient to help build muscle, skin and bones?	*Form One*	33	15.1
	Form Two	23	10.6
	Form Three	35	16.1
	Form Four	21	9.6
	Form Five	26	11.9
	Form Six	60	27.5
7. Which food contains the least fat?	*Form One*	38	17.4
	Form Two	27	12.4
	Form Three	38	17.4
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	60	27.5
8. Fruits and Vegetables are excellent sources of:	*Form One*	39	17.9
	Form Two	28	12.8
	Form Three	39	17.9
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	62	28.4
9. Is calcium an important nutrient for bone development	*Form One*	37	17.0
	Form Two	27	12.4
	Form Three	38	17.4
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	60	27.5
10. The following foods are high in calcium except:	*Form One*	35	16.1
	Form Two	28	12.8

	Form Three	38	12.4
	Form Four	21	9.6
	Form Five	26	11.9
	Form Six	60	27.5
11. Breakfast should never be skipped.	*Form One*	38	17.4
	Form Two	26	11.9
	Form Three	39	17.9
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	62	28.4
12. Skipping breakfast on mornings results in all of the following except:	*Form One*	32	14.7
	Form Two	21	9.6
	Form Three	34	15.6
	Form Four	17	7.8
	Form Five	20	9.2
	Form Six	48	22.0
13. The healthiest snack is:	*Form One*	39	17.9
	Form Two	28	12.8
	Form Three	39	17.1
	Form Four	22	10.1
	Form Five	27	12.4
	Form Six	62	28.4
14.Potatochips/pastries/cookies/milkshakes/preservatives/salted peanuts/cakes provide a lot of:	*Form One*	28	12.8
	Form Two	24	11.0
	Form Three	32	14.7
	Form Four	19	8.7
	Form Five	21	9.6
	Form Six	58	26.6

15. Not drinking enough water leads to dehydration	*Form One*	39	17.9
	Form Two	28	12.8
	Form Three	39	17.9
	Form Four	20	9.2
	Form Five	27	12.4
	Form Six	61	28.0

Class Form as a Useful Predictor of Nutritional Knowledge

The results of the simple linear regression analysis suggest that class form is a useful predictor of nutritional knowledge of students, $p = 0.003$. This prediction can be expressed by an equation: $\hat{y} = 13.199 + 0.143\ x$, where $\hat{y}$ = nutritional knowledge and x = class form. The coefficient of 0.143 shows that nutritional knowledge increases as students progress to higher forms.

Attitude towards Nutrition

A total attitude score was calculated and evaluated for only 206 of the 218 students. The mean attitude score for the entire sample was 2.31 ± 4.659. The highest and lowest score attained were -11 (0.5%) and 14 (3.2%) respectively. Form One students had a mean score of 4.21 ± 5.428, which was the highest among all form classes, while Form Six students had the lowest mean score among the forms, which was 0.82 ± 3.591. There was a statistically significant difference in attitude score between the form classes as determined by one-way ANOVA (5, 200) = 2.894, p = 0.015. A post-hoc test revealed that Form Sixes have a statistically lower (p = 0.006) attitude score than Form Ones. Of the 206 respondents with calculated attitude scores, 146 (67.0%), 60 (27.5%) and 0 (0%) had negative, moderate and positive attitude towards nutrition respectively.

Eighty one point one percent (81.8%) of students had a positive attitude towards the statement 'I think that I should eat breakfast on mornings, providing I have the time to do so', with Form Six and Form Four students accounting for the highest (24.8 %) and lowest (9.7 %) percentage respectively. More than 50% of the students had a negative attitude towards the statement 'I think that it doesn't really matter if I don't eat breakfast, as long as I'm not hungry' with Form Six students accounting for highest percentage. With respect to the statements, 'I know I should eat fruits & vegetables but I just don't feel to do so' and 'As long as the food tastes good, I'm not really interested in its nutritional content' Form Six students had the most positive and negative attitude when compared to the other forms. Of the 79.1 % students who responded positively to the statement 'I think that it's okay to snack throughout the day, without eating proper meals', 19.8%, 6.9%, 12.9%, 15.1%, 9.7% and 14.7% were from Forms Six, Five, Four, Three, Two, One respectively. Tables 8-11 summaries the results stated above.

Table 8: Mean Attitude Score across Class Forms (n = 206)

Class Form	Mean ± Standard Deviation
Form One	4.21 ± 5.428
Form Two	2.70 ± 3.136
Form Three	2.97 ± 5.338
Form Four	2.05 ± 4.603
Form Five	1.52 ± 3.591
Form Six	2.31 ± 4.659

Table 9: Post Hoc Differences in Attitude Score with Class Form as the Selected Independent Variable

Dependent Variable: Attitude Score

Class Form (1)	**Class Form (2)**	**Mean Difference (1-2) ± Standard Error**	**Significance**
Form One	Form Two	1.51 ± 1.147	0.777
	Form Three	1.24 ±1.038	0.841
	Form Four	2.17 ± 1.220	0.485
	Form Five	2.69 ± 1.203	0.227
	Form Six	3.39* ± 0.954	0.006
Form Two	Form One	-1.51 ± 1.157	0.777
	Form Three	-0.27 ± 1.140	1.000
	Form Four	0.66 ± 1.308	0.996
	Form Five	1.18 ± 1.293	0.942
	Form Six	1.88 ± 1.064	0.490
Form Three	Form One	-1.24 ± 1.038	0.841
	Form Two	0.27 ± 1.140	1.000
	Form Four	0.93 ± 1.215	0.973
	Form Five	1.45 ± 1.198	0.830
	Form Six	2.15 ± 0.947	0.211
Form Four	Form One	-2.17 ± 1.220	0.485
	Form Two	-0.66 ± 1.308	0.996
	Form Three	-0.93 ± 1.215	0.973
	Form Five	0.52 ± 1.358	0.999
	Form Six	1.22 ± 1.143	0.894
Form Five	Form One	-2.69 ± 1.203	0.227
	Form Two	-1.18 ± 1.293	0.942
	Form Three	-1.45 ± 1.198	0.830
	Form Four	-0.52 ± 1.358	0.999
	Form Six	0.70 ± 1.125	0.989
Form Six	Form One	-3.39* ± 0.954	0.006
	Form Two	-1.88 ± 1.064	0.490
	Form Three	-2.15 ± 0.947	0.211
	Form Four	-1.22 ± 1.143	0.894
	Form Five	-0.70 ± 1.125	0.989

*Significant at the 0.05 level

Table 10: Attitude Status of Students

Nutritional Knowledge Status	Frequency (n=206)	Percentage (%)
Moderate	60	29.1
Negative	146	70.9
Positive	0	0

Table 11: Students Response to Each Attitude Statement

Statement	Class Form	Strongly Agree (-) N (%)	Agree (-) N (%)	Disagree (+) N (%)	Strongly Disagree(+) N (%)
1. I think that I should eat breakfast on mornings, providing I have the time to do so	*Form One*	20 (9.2)	9 (4.1)	2 (0.9)	5 (2.3)
	Form Two	18 (8.3)	5 (2.3)	0 (0)	0 (0)
	Form Three	16 (7.3)	12 (5.5)	1 (5)	6 (2.8)
	Form Four	13 (6.0)	8 (3.7)	0 (0)	0 (0)
	Form Five	13 (6.0)	10 (4.6)	1 (0.5)	0 (0)
	Form Six	36 (16.5)	18 (8.3)	4 (1.8)	0 (0)
2. I think that it doesn't really matter if I don't eat breakfast, as long as I'm not hungry	*Form One*	0 (0)	0 (0)	13 (6.0)	19 (8.7)
	Form Two	0 (0)	3 (1.4)	8 (3.7)	13 (6.0)
	Form Three	3 (1.4)	3 (1.4)	8 (3.7)	16 (7.3)
	Form Four	1 (0.5)	4 (1.8)	5 (2.3)	8 (3.7)
	Form Five	0 (0)	3 (1.4)	9 (4.1)	11 (5.0)
	Form Six	0 (0)	8 (3.7)	23 (10.6)	18 (8.3)
3. I know I should eat fruits & vegetables but I just don't feel to do so	*Form One*	7 (3.2)	6 (2.8)	7 (3.2)	11 (5.0)
	Form Two	2 (0.9)	7 (3.2)	7 (3.2)	4 (1.8)
	Form Three	3 (1.4)	8 (3.7)	9 (4.1)	9 (4.1)
	Form Four	1 (0.5)	6 (2.8)	6 (2.8)	5 (2.3)
	Form Five	4 (1.8)	11 (5.0)	2 (0.9)	4 (1.8)
	Form Six	7 (3.2)	21 (9.6)	14 (6.4)	9 (4.1)
4. Drinking at least 8 glasses (2.1 L) of water each day is important to me	*Form One*	3 (1.4)	0 (0)	8 (3.7)	17 (7.8)
	Form Two	1 (0.5)	1 (0.5)	9 (4.1)	14 (6.4)
	Form Three	2 (0.9)	2 (0.9)	9 (4.1)	18 (8.3)

	Form Four	1 (0.5)	0 (0)	7 (3.2)	9 (4.1)
	Form Five	1 (0.5)	1 (0.5)	5 (2.3)	10 (4.6)
	Form Six	4 (1.8)	5 (2.3)	18 (8.3)	16 (7.3)
5. I will focus on nutrition and its impact on my health when I finish secondary school	*Form One*	6 (2.8)	4 (1.8)	6 (2.8)	17 (7.8)
	Form Two	2 (0.9)	7 (3.2)	6 (2.8)	6 (2.8)
	Form Three	2 (0.9)	12 (5.5)	9 (4.1)	8 (3.7)
	Form Four	3 (1.4)	2 (0.9)	6 (2.8)	4 (1.8)
	Form Five	5 (2.3)	3 (1.4)	8 (3.7)	6 (2.8)
	Form Six	9 (4.1)	3 (1.4)	18 (8.3)	3 (1.4)
6. As long as the food tastes good, I'm not really interested in its nutritional content	*Form One*	2 (0.9)	5 (2.3)	9 (4.1)	13 (6.0)
	Form Two	2 (0.9)	4 (1.8)	7 (3.2)	5 (2.3)
	Form Three	4 (1.8)	5 (2.3)	7 (3.2)	7 (3.2)
	Form Four	3 (1.4)	4 (1.8)	6 (2.8)	4 (1.8)
	Form Five	3 (1.4)	9 (4.1)	4 (1.8)	4 (1.8)
	Form Six	8 (3.7)	15 (6.9)	14 (6.4)	8 (3.7)
7. I think that it's okay to snack throughout the day, without eating proper meals	*Form One*	1 (0.5)	2 (0.9)	13 (6.0)	19 (8.7)
	Form Two	1 (0.5)	1 (0.5)	8 (3.7)	13 (6.0)
	Form Three	1 (0.5)	1 (0.5)	16 (7.3)	17 (7.8)
	Form Four	1 (0.5)	1 (0.5)	10 (4.6)	18 (8.3)
	Form Five	0 (0.5)	1 (0.5)	8 (3.7)	7 (3.2)
	Form Six	1 (0.5)	9 (4.1)	25 (11.5)	18 (8.3)

(-) Negative attitude (+) Positive attitude

Class Form as a Useful Predictor of Attitude towards Nutrition

The results of the simple linear regression analysis suggest that class form is a useful predictor of attitude towards nutrition of students, $p = 0.003$. This prediction can be expressed by an equation: $\hat{y} = 4.617 - 0.630x$, where $\hat{y}$ = attitude and x = class form. The coefficient of -0.630 shows that attitude towards nutrition decreases as students progress to higher forms.

Nutritional Behaviours

A total behaviour score was calculated and evaluated for only 199 of the 218 participants. The behaviour score for the entire sample was 34.86 ± 5.246. The highest and lowest score attained were 49 (1.0%) and 21 (1.0%) respectively. Form four students had a mean score of 36.14 ± 5.285, which was the highest among all form classes, while Form Six students had the lowest mean score among the forms, which was 33.07 ± 4.682. There was no statistically significant difference $p > 0.05$ in behaviour score among the form classes as determined by one-way ANOVA. Of the 199 respondents with calculated behaviour scores, 6 (2.8%), 193 (88.5%) and 0 (0%) had unhealthy, average and healthy nutritional behaviour respectively. Tables 12-13 highlight these results.

Among this study population, fast foods such as fried chicken/fries/pizza/calzones/burgers/sandwiches/gyros are consumed the most (98.2%), while Chinese foods (e.g. Stir-fried rice/noodles/chicken/wontons) are consumed the least (90.3%). In terms of the type of snacks most frequently consumed, pastries (e.g. beef pies/current rolls)/cookies/cakes/doughnuts intake was the highest (93.5%) while preservatives (e.g. red mango/plum) were consumed the least (58.7%). Table 14 summarises these findings.

As shown in Figure 1, there is a high prevalence (65.3%) of breakfast skipping among the students of SJC San Fernando with Form Sixes (19.2%) followed by Form Fours (14.2%) practising this behaviour the most. The majority of students (99.5%) eat less than 4 fruits daily while 98.5% consume less than four meals containing vegetables daily. Of all the form classes, Form Sixes consumed the least fruits and meals containing vegetables daily which were 28.4% and 27.9% respectively. These results are shown in Figures 2 and 3. With respect to daily

snacking patterns, it was found that 95.4% of students snack daily. Form Sixes practise this behaviour the most (27.9%), followed by Form Threes and Form Ones with percentages of 17.4 and 16.5 respectively. Figure 4 highlights these findings.

Table 12: Mean Nutritional Behaviour Score across Class Forms (n = 206)

Class Form	Mean ± Standard Deviation
Form One	35.97 ± 5.480
Form Two	35.40 ± 5.439
Form Three	35.41 ± 4.862
Form Four	36.14 ± 5.285
Form Five	34.65 ±5.875
Form Six	33.07 ± 4.682

Table 13: Nutritional Behaviour Status of Students

Nutritional Knowledge Status	Frequency (n=206)	Percentage (%)
Unhealthy	6	3.0
Average	193	97.0
Healthy	0	0

Table 14: Frequency of Students' Consumption of Fast Foods and Snacks

Question/Statement	Response	Frequency (n =218)	Percentage (%)
1.How often do you eat fried chicken/fries/pizza/calzones/burgers/sandwiches/gyros	*Always*	13	6.0
	Often	78	35.8
	Sometimes	123	56.4
	Never	2	0.9
	No response	2	0.9
2. How often do you eat doubles/aloo pies/roti/saheena	*Always*	10	4.6
	Often	46	21.1
	Sometimes	141	64.7
	Never	18	8.3
	No response	3	1.4
3. How often do you eat Chinese foods (e.g Stir-fried rice/noodles/chicken/wontons)	*Always*	10	4.6
	Often	45	20.6
	Sometimes	142	65.1
	Never	19	8.7
	No response	2	0.9
4. How often do you eat creole foods (e.g Pelau/stewed chicken/potato salad)	*Always*	27	12.4
	Often	82	37.6
	Sometimes	90	41.3
	Never	16	7.3
	No response	3	1.4
5. How often do you snack on chips (e.g. potato/corn), popcorn, salted peanuts, cheesy items (e.g. sticks/chips), crackers	*Always*	12	5.5
	Often	74	33.9
	Sometimes	107	49.1
	Never	22	10.1
	No response	3	1.4
6. How often do you snack on pastries (e.g. beef	*Always*	10	4.6

pies/current rolls), cookies, cakes, doughnuts	*Often*	57	26.1
	Sometimes	136	62.4
	Never	12	5.5
	No response	3	1.4
7. How often do you snack on candies (e.g. cotton candy, snow cone, sweets), chocolates	*Always*	13	6.0
	Often	43	19.7
	Sometimes	126	57.8
	Never	33	15.1
	No response	3	1.4
8. How often do you snack on milkshakes (e.g. frozen chillers), ice cream, soft drinks)	*Always*	7	3.2
	Often	39	17.9
	Sometimes	137	62.8
	Never	30	13.8
	No response	5	2.3
9. How often do you snack on preservatives (e.g red mango/plum)	*Always*	3	1.4
	Often	22	10.1
	Sometimes	103	47.2
	Never	83	38.1
	No response	7	3.2

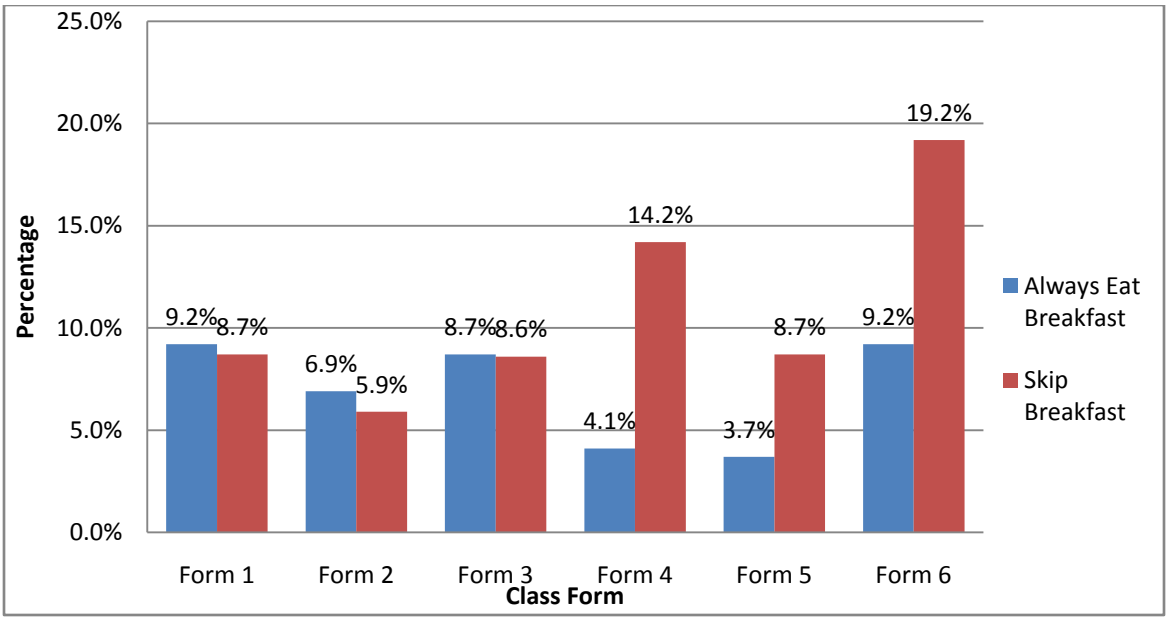

Figure 1: Bar Chart showing the Percentages of Students who Always Eat Breakfast Compared to those who Skip breakfast by Class Form

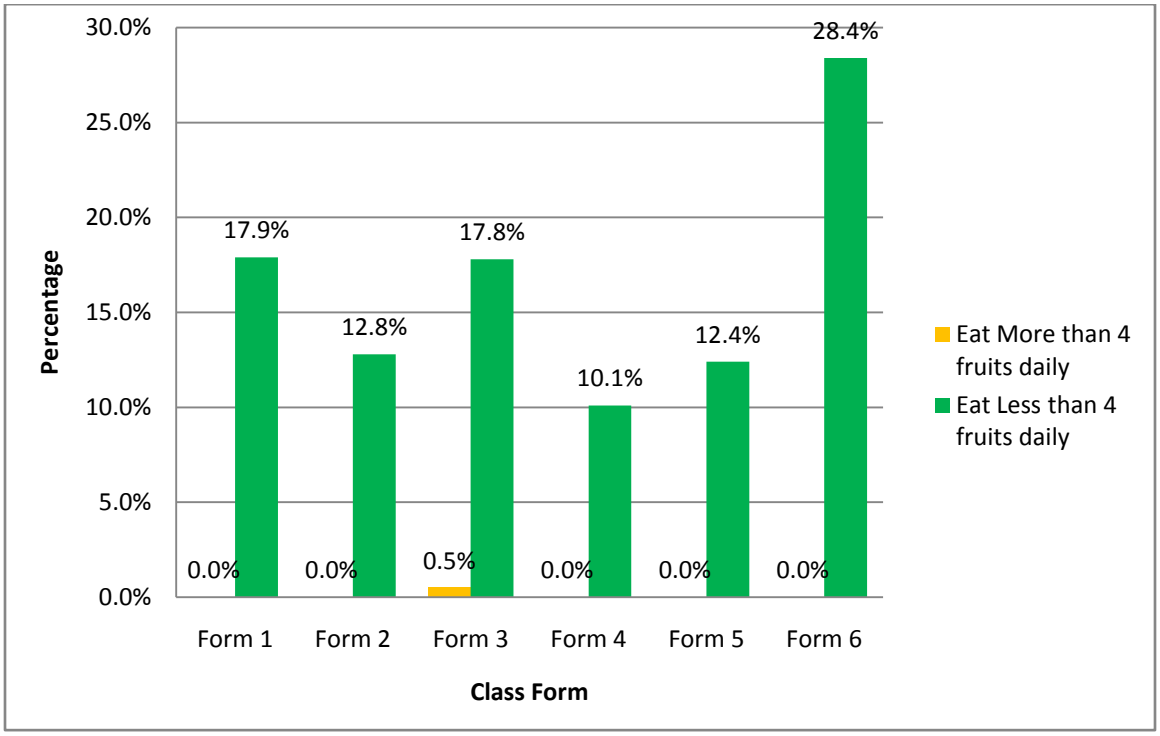

Figure 2: Bar Chart showing the Percentages of Students who Eat More than 4 Fruits Daily Compared to those who Eat Less than 4 Fruits Daily by Class Form

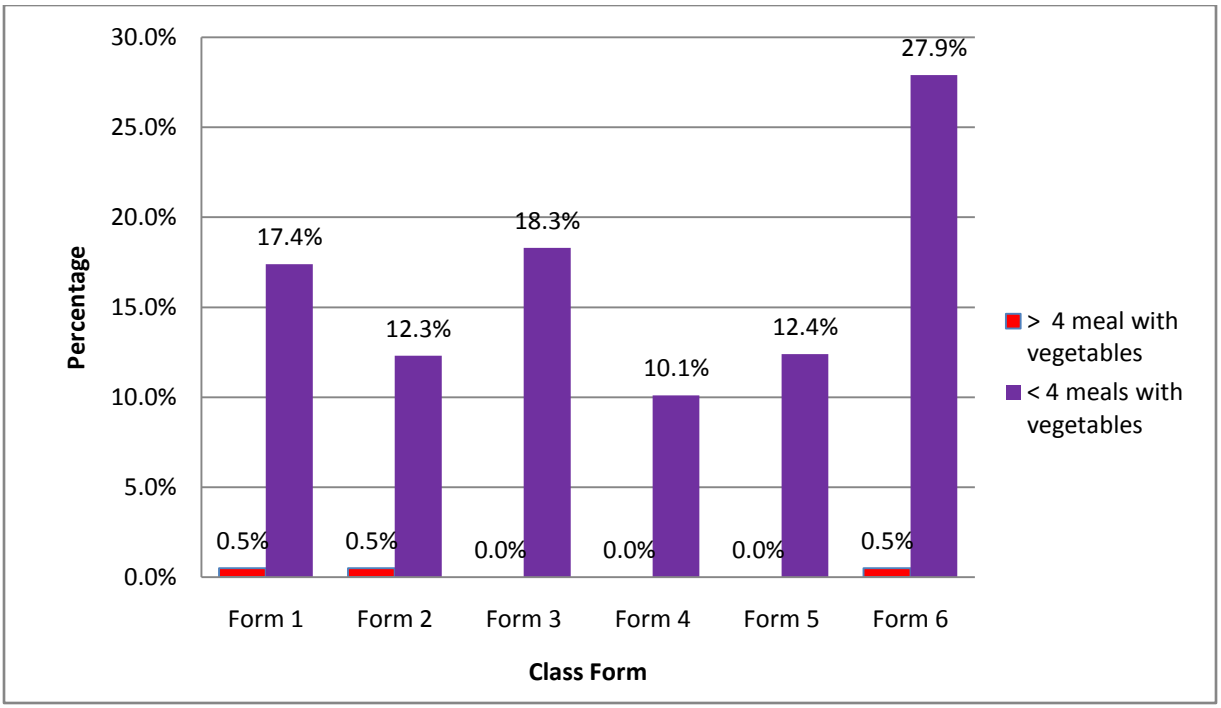

Figure 3: Bar Chart showing the Percentages of Students who eat More than 4 Meals with Vegetables Daily Compared to those who Eat Less than 4 Meals with Vegetables by Class Form

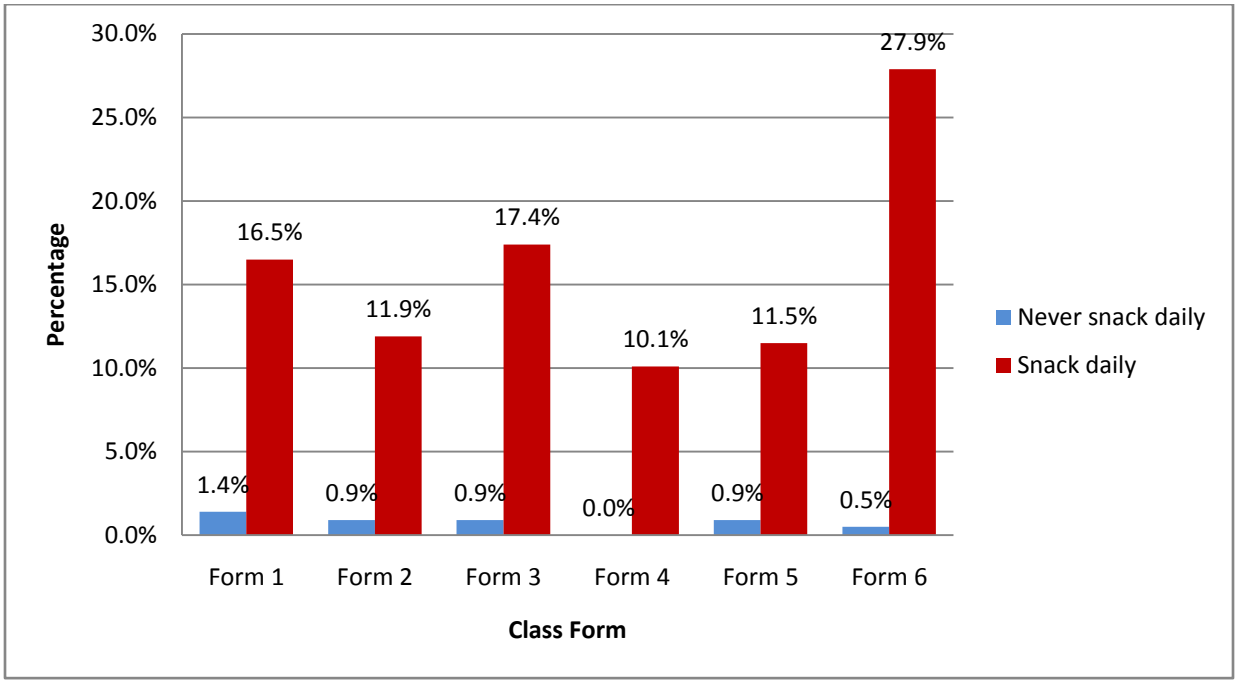

Figure 4: Bar Chart showing the Percentages of Students who Never Snack Daily Compared to those Snack Daily by Class Form

Class Form as a Useful Predictor of Nutritional Behaviour

The results of the simple linear regression analysis suggest that class form is a useful predictor of nutritional behaviour of students, p = 0.007. This prediction can be expressed by an equation: $\hat{y}$ = 36.84 - 0.538 x, where $\hat{y}$ = nutritional behaviour and x = class form. The coefficient of – 0.630 shows that nutritional behaviour decreases as students progress to higher forms.

Association between nutritional knowledge and behaviours

Pearson's correlation was run to determine if there is an association between the nutritional knowledge of participants and their nutritional behaviours. The test showed a weak, positive correlation between nutritional knowledge score and nutritional behaviour score, which was statistically significant (r = 0.195, p = 0.009). Thus as nutritional knowledge increases, nutritional behaviours become healthier.

Association between attitude and nutritional behaviours

Pearson's correlation was run to determine if there is an association between the attitude of students and their nutritional behaviours. The test showed a weak, positive correlation between attitude score and nutritional behaviour score, which was statistically significant (r = 0.433, p < 0.001). Thus, as attitude towards nutrition increases (or become more positive) nutritional behaviours become healthier.

Association between nutritional behaviours and BMI

Spearman's Rho correlation was run to determine if there is an association between 14 nutritional behaviour questions and BMI. Statistically significant associations were noted for the following behaviours and BMI: how often participants ate the fast food: doubles/aloo pies/roti/saheena (r_s

= 0.165, p = .023), how often they snacked on 'chips/popcorn/salted peanuts/cheesy items and crackers' (r_s = 0.143, p = .049), and how often they snacked on 'pastries/cookies/cakes/doughnuts' (r_s = 0.208, p = .004). Therefore, as the intake of doubles/aloo pies/roti/saheena, pastries/cookies/cakes/doughnuts, chips/popcorn/salted peanuts/cheesy items/crackers increases, BMI also increases. Table 15 summaries these findings.

Table 15: Spearman's Rho Correlation for the Association between 14 Nutritional Behaviour Questions and BMI

Question		**BMI**
1.How often do you eat breakfast?	*Correlation Coefficient*	-0.038
	Significance	0.640
	N	192
2. How often do you eat fruits daily?	*Correlation Coefficient*	-0.015
	Significance	0.842
	N	192
3. How many meals containing vegetables do you eat daily?	*Correlation Coefficient*	0.077
	Significance	0.293
	N	191
4. How many times do you eat in a fast food outlet in a week?	*Correlation Coefficient*	0.070
	Significance	0.334
	N	192
5. How often do you eat fried chicken/fries/pizza/calzones/burgers/sandwiches/gyros?	*Correlation Coefficient*	-0.008
	Significance	0.912

	N	191
6. How often do you eat doubles/aloo pies/roti/saheena?	*Correlation Coefficient*	0.165*
	Significance	0.023
	N	191
7. How often do you eat Chinese foods (e.g Stir-fried rice/noodles/chicken/wontons)?	*Correlation Coefficient*	-0.006
	Significance	0.023
	N	192
8. How often do you eat creole foods (e.g Pelau/stewed chicken/potato salad)?	*Correlation Coefficient*	0.017
	Significance	0.815
	N	191
9. How times do you snack in a day?	*Correlation Coefficient*	-0.072
	Significance	0.324
	N	191
10. How often do you snack on chips (e.g. potato/corn), popcorn, salted peanuts, cheesy items (e.g. sticks/chips), crackers?	*Correlation Coefficient*	0.143*
	Significance	0.049
	N	192
11. How often do you snack on pastries (e.g. beef pies/current rolls), cookies, cakes, doughnuts?	*Correlation Coefficient*	0.208*
	Significance	0.004
	N	192
12. How often do you snack on candies (e.g. cotton candy, snow cone, sweets), chocolates?	*Correlation Coefficient*	0.135
	Significance	0.063
	N	191
13. How often do you snack on milkshakes (e.g. frozen	*Correlation*	0.137

chillers), ice cream, soft drinks)?	*Coefficient*	
	Significance	0.060
	N	190
14. How often do you snack on preservatives (e.g red mango/plum)?	*Correlation Coefficient*	0.139
	Significance	0.058
	N	188

*. Significant at a 0.05 level (2-tailed)

CHAPTER V: DISCUSSION

The purpose of this study was twofold as it investigated the relationship between nutritional knowledge, attitudes and behaviours, and determined the relationship between nutritional behaviour and BMI among the students of St. Joseph's Convent, San Fernando. Similar to Pirouznia (2001) who used grade level as the variable for comparison, this study examined the relationship between the above factors based on class form.

Nutritional Knowledge

The highest and lowest score attained were 15 (27.8%) and 6 (0.5%) respectively. Form Six students had a mean score of 14.10 ± 1.361, which was the highest among all form classes, while Form Two students had the lowest mean score among the forms, which was 13.08 ± 1.598. Unlike Form Twos who are exposed to only two years of integrated science and home economics (of which Food and Nutrition is a component), most Form Six students would have had exposure to specific science courses namely human and social biology and biology or food and nutrition as a subject (particularly those reading for this subject at the CAPE level).

The results of the one-way ANOVA analysis which highlighted a statistically significant difference ($p = 0.006$) in the knowledge score between the form classes rejected the null hypothesis of basic nutritional knowledge being the same across form classes. The findings of the post-hoc test revealed that knowledge score was statistically higher ($p = 0.009$) between Form Sixes (14.10 ± 1.361) and Form Twos (13.08 ± 1.598). Contrastingly, Pirouznia (2001) who focused on 6^{th}, 7^{th} and 8^{th} graders, found no significant difference ($p = 0.488$) in nutritional knowledge between students in grades 7^{th} and 8^{th} by means of a one-way ANOVA analysis. He

noted also that 7th and 8th grade students were knowledgeable about the needs of the body but not about the functions and sources of nutrients or energy.

The division of scores for each section into tertiles and classification of nutritional knowledge as 'good', 'quite good' and 'insufficient' employed by Turconi et al. (2008) were also used in this study. Of the 195 respondents with calculated knowledge scores, 189 (96.9%), 6 (3.1%) and 0 (0%) had good, quite good and insufficient nutritional knowledge respectively. Since this school's primary focus is academics, its students generally perform well at internal and external examinations. Therefore, the student population as whole possess a high degree of knowledge when it comes to various topics including nutrition.

A comparison between the two questions on dietary fibre among class forms showed that the correct response to the question 'Which of the following is high in fibre?' was generally higher (94.6%) than the correct response to question, 'Fibre is important for all of the following except?' which was 56.8%. This result was similar to Al-Almaie (2005) who found that only 2.1% and 24.2% knew the benefits of dietary fibre and examples of fibre-rich diets respectively. Most students (99.5%) elicited the correct responses to statements 'Fruits and Vegetables are excellent sources of' and 'The healthiest snack is' as 'vitamins and minerals' and 'a fruit bowl' respectively. Poor phrasing of the questions could have accounted for such results and should have been rephrased to determine students' knowledge of the recommended daily servings of fruits and vegetables.

Pearson's correlation analysis which showed an association between nutritional knowledge score and nutritional behaviour score ($r = 0.195, p < 0.05$), rejected the null hypothesis of 'no association between knowledge and nutritional behaviours across from classes'. Therefore

nutritional knowledge statistically influences nutritional behaviour, and as knowledge increases, nutritional behaviours become healthier. Although the relationship is statistically significant and positive, it is also weak. It must be noted that while their study was not based on class form and done among the students of SJC, the findings of Ikorok et al. (2012) were similar to this study as their null hypothesis of 'no association between knowledge of nutrition and nutritional behaviours' was rejected at 0.05 alpha level.

Attitude towards Nutrition

Results of the post-hoc test revealed that Form Sixes have a statistically lower ($p = 0.006$) attitude score than Form Ones ($p = 0.006$). These findings indirectly contradicted the viewpoints of Mahan and Escott-Stump (2008) and Brown (2011) who stated that late adolescents possess the ability to view future health consequences associated with comprising dietary behaviours, while early adolescents' egocentrism and impulsive eating behaviours limits their ability to understand complex health issues. Therefore, Form Sixes, who are also late adolescents, were expected to display a positive attitude towards nutrition as they possess a level of cognition that views health and nutritional issues as important for future health. On the other hand, Form Ones (early adolescents) who are seemingly concrete thinkers and lack the ability to understand complex health issues were expected to have a negative attitude towards nutrition.

Of the 206 respondents with calculated attitude scores, 146 (67.0%), 60 (27.5%) and 0 (0%) had negative, moderate and positive nutritional knowledge respectively. The high negative attitude towards nutrition can be interpreted as the students paying more intention to academic performance as opposed to engaging in health behaviours.

The results of Pearson's correlation rejected the null hypothesis, 'there is no association between attitude and nutritional behaviours across from classes.' Although it is statistically significant ($r = 0.433$, $p < 0.001$) and positive, meaning that as attitude towards nutrition increases (or become more positive) nutritional behaviours become healthier, the association between these variables is weak. Numerous studies evaluating attitude towards nutrition have directed focus on the aspects of 'locus of control' and 'self-efficacy'. Therefore, future research among this population can investigate the association between each of these variables with nutritional behaviours.

Nutritional Behaviour

The findings generated from the one-way ANOVA analysis supported the null hypothesis, 'nutritional behaviours are the same across form classes', as there was no statistically significant difference $p > 0.05$ in behaviour score among the form classes. In contrast, Pirouznia (2001) who studied the eating behaviours of 6^{th} to 8^{th} graders, found that there was a significant difference ($p = 0.0001$) between the eating behaviour score of 7^{th} and 8^{th} graders.

The high intake of fast foods such as fried chicken/fries/pizza/calzones/burgers/sandwiches/gyros by students of SJC can be explained by the school's geographic location. This institution is located close to High Street, the most commercial business area in San Fernando, which is lined by several fast food establishments such as KFC, Royal Castle, Church's Chicken, Pizza Boys, Subway and Burger King. Therefore, the close proximity to these types of fast food outlets makes it convenient for students to purchase items like fried chicken and fries, pizza, calzones, burgers, sandwiches and gyros.

A high prevalence (65.3%) of breakfast skipping among the students of SJC San Fernando was discovered, and these findings paralleled those of Turconi et al (2008) who discovered that the

worst eating habit among 16 year old Italian adolescents was skipping breakfast, which was practised by 20% of the subjects. The results of Chin and Nasir (2009) were contradictory to this study's findings and those of Turconi et al (2008), as breakfast skipping was 40.8% among Malaysian females aged 13 to 19 years, 11.8% lower than those who took breakfast every day.

When fruit and vegetable intakes were assessed, the results showed that the majority of students (99.5%) eat less than 4 fruits daily while 98.5% consume less than four meals containing vegetables daily. Of all the form classes, Form Sixes consumed the least fruits and meals containing vegetables daily which were 28.4% and 27.9% respectively. While these findings differed from those of Pearson et al. (2009) who posited that older adolescents consumed higher intakes of fruits and vegetables per day when compared to younger adolescents ($p < 0.001$), it was in congruence with those of Mullie et al. (2006), who reported that fruit and vegetable consumption lowered with age. Unlike this study which just compared fruit and vegetable intakes separately across class forms, Mullie et al. (2006) evaluated the association between fruit and vegetable intake and age, and found this relationship to be significant ($p < 0.05$) for girls.

With respect to snack consumption, it was found that 95.4% of these students snack daily, and this behaviour was most common among Form Sixes. Although age as opposed to class form, was used as the variable for comparison, a high snack intake among female adolescents was also noted by Chin and Nasir (2009). They discovered that among females aged 13 – 19 years, 51.4% and 48.6% of the participants snacked and did not snack between meals respectively. Similar to these findings were that of Boon et al. (2012) who also indicated that among secondary school students aged 13-15 years, 68.6% like to snack while 31.4% do not like to snack. While SJC students prefer to snack on pastries (e.g. beef pies/current rolls)/cookies/cakes/doughnuts the most (93.5%) and preservatives (e.g. red mango/plum) the least (58.7%), among their study

population, Chin and Nasir (2009) found that snacks most frequently consumed between meals included fruits (26.9%), breads (15.0%), and local cakes (14.2%).

The results of the simple linear regression analysis suggests that class form is a useful predictor of nutritional behaviour of students, $p = 0.007$. This prediction equation which has a negative coefficient shows that nutritional behaviour decreases as students progress to higher forms. In addition to class form, students' intentions to practise particular behaviours can also predict their behaviour, based on the Theory of Planned Behaviour (Ajen 1991). Attitude, subjective norms and perceived behavioural control are factors which can affect a person's intention to perform a particular behaviour. Therefore, students possessing positive attitudes toward nutrition are more likely to be motivated to practise healthy nutritional behaviours such as eating breakfast daily or consuming the required amounts of fruits and vegetables daily than those having negative attitudes toward nutrition. Similarly, students who perceive pressure to engage in healthy nutritional behaviours by persons around them (family or peers) have a greater likelihood to practice behaviours beneficial to their health. The more students believe that they possess the ability to perform healthy nutritional behaviours as opposed to unhealthy ones; the stronger their intentions will be to practise such behaviour.

Spearman's Rho correlation findings supported this study's alternate hypothesis of an association between nutritional behaviours and BMI. This finding however, contrasted those of Phillips et al. (2004) and Boon et al. (2012). In their longitudinal study, Phillips et al. reported no significant association between BMI and snack intake during adolescence while Boon et al. (2012) noted no significant association between meal and snacking pattern with BMI when a one-way ANOVA analysis was done. Statistically significant associations were noted for the following behaviours and BMI: how often participants ate the fast food: doubles/aloo pies/roti/saheena ($r_s = 0.165$, $p =$

.023), how often they snacked on ‘chips, popcorn, salted peanuts, cheesy items and crackers’ (r_s = 0.143, p = .049), and how often they snacked on ‘pastries, cookies, cakes, doughnuts’ (r_s = 0.208, p = .004). These results can be explained by the fact that fast foods such as doubles/aloo pies/roti/saheena have a high fat content owing to their methods of preparation, which can be shallow or deep fat frying, and the ingredients used for their preparation which are primarily fat in the form of ghee, butter or shortening. Such methods and ingredients can increase the body fatness or the degree of fat deposition in adipose tissues, leading to a higher incidence increased BMI and a shift towards overweight and obese status. In addition to being high in fat, snacks such as pastries, cookies, cakes, doughnuts, chips, popcorn, salted peanuts, cheesy items and crackers also have a high sugar content as sugar of varying types are used in their preparation. When sugar is converted to fat through the process of fatty acid synthesis, more fat is available for storage in adipose tissues, increasing the degree of body fatness, resulting in a higher BMI and increasing the potential for overweight and obesity. It must be noted that confounding factors such as students’ low metabolic status or physical inactivity can also explain why high sugar intake leads to a greater BMI.

CHAPTER VI: CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

The purpose of this study was twofold. First, it investigated the relationship between nutritional knowledge, attitudes and behaviours, and second, determined the relationship between nutritional behaviour and BMI among the students of St. Joseph's Convent, San Fernando. Based on the data collected and analysed, it was found that basic nutrition knowledge as well as attitude towards nutrition differed across forms with Form Six students being the most knowledgeable when compared to the other form classes, and Form One students possessing the most positive attitudes towards positive nutrition. Nutritional behaviours practised among all form classes were the same, with most of the behaviours being categorised as 'average'. An association was noted between nutritional knowledge and behaviours and between attitude and behaviours across all form classes. An association was also found between three nutritional behaviours: the intake of doubles/aloo pies/roti/saheena, the snacking of pastries/cookies/cakes/doughnuts and the snacking of chips/ popcorn/salted peanuts/cheesy items/crackers with BMI. The greater the consumption of these food items, the higher the BMI and the increased potential of being overweight and obese.

Limitations

In conducting this study, the following limitations were encountered which inadvertently affected the accuracy of the research findings.

- The reliability of questionnaire was not effectively measured
- The use of a non-probability method of sampling (quota sampling) which introduced researcher-bias into the study

- Time constraints and low return of questionnaires did not allow the researcher to meet the required sample size
- Participants completed the questionnaires at home and any clarifications in answering any of the questions could not be explained
- There was missing data for each section of the questionnaire which skewed some of the findings
- BMI was not adjusted for age or classified as students were not asked questions pertinent to age neither the school administration possess accurate data on the mean age of students at the school. Although there is a typical age range per form class, accurate identification of what exactly were these ranges was conflicting as the school's administration (i.e. vice principal) provided information which was different from the teachers.

Recommendations

If this study is to be re-conducted by the researcher, the following improvements will be made:

- A reliable food frequency questionnaire with defined serving sizes will be used to measure nutritional behaviours
- The knowledge questions will be similarly structured and reviewed for its validity and readability by a group of health and nutrition professionals
- Attitude towards nutrition will be addressed through other aspects such as: self-efficacy, barriers to changes and locus of control
- Students will be asked to indicate their age

- BMI will be determined by more objective methods, for example using a Bioelectrical Impedance Analysis (BIA) machine, and adjusted for age
- The students will be required to complete the questionnaire in the presence of the researcher in a quiet area

Future Research

Among the students of SJC, further research may need to be done with respect to:

- The impact of other factors such as socioeconomic status, location, culture and stress level on nutritional behaviours
- The impact of physical activity on such nutritional behaviours
- Several specific behaviours such as breakfast consumption as opposed to many nutritional behaviours at a time

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APPENDIX A

Participant Code #:_____

Questionnaire

Dear Student: The following questions are aimed at collecting data for a final year research project at the University of the West Indies. The aim of this instrument is to collect data on nutritional knowledge, attitudes, and behaviours as well as weight and height measurements.

The questionnaire contains four (4) sections which include demographic and anthropometric information; nutrition knowledge, eating behaviours and attitudes. Kindly answer all questions by placing a tick (√) in the relevant spaces provided.

Thank you for your time and cooperation in this venture.

SECTION I – BEHAVIOURS

1. **How often do you eat breakfast?**

□	Always **3**	□	Sometimes **1**
□	Often **2**	□	Never **0**

2. **How often do you eat the following at breakfast?**

	Always **3**	Often **2**	Sometimes **1**	Never **0**
Fruit/Fruit Juice (e.g. banana/orange juice)				
Cereal/Porridge (e.g. corn flakes/oatmeal porridge)				
Protein (e.g. eggs/sausages/soya/peanut butter)				
Bread Item (e.g. bread/bake)				
Hot Beverage (e.g. milk/milk drink/tea)				

3. **How many fruits do you eat daily?**

□	More than 4 **3**	□	1 – 2 **1**
□	3 – 4 **2**	□	0 **0**

4. **How many meals containing vegetables do you eat daily?**

□	More than 4 meals	**3**	□	1 – 2 meals	**1**
□	3 – 4 meals	**2**	□	0	**0**

5. **How many times do you eat in a fast food outlet in a week?**

□	More than 7 times	**0**	□	1 – 3 times	**2**
□	4 – 6 times	**1**	□	0 times	**3**

6. **How often do you eat the following fast foods?**

	Never **3**	Sometimes **2**	Often **1**	Always **0**
Fried chicken/fries/pizza/calzones/burgers/sandwiches/gyros				
Doubles/aloo pies/roti/saheena				
Chinese foods (e.g. Stir-fried rice/noodles/chicken/wontons)				
Creole foods (e.g. Pelau/stewed chicken/potato salad)				

7. **How many times do you eat meat/fish/poultry in a day?**

□	More than 7 times	**3**	□	1 – 3 times	**1**
□	4 – 6 times	**2**	□	0 times	**0**

8. **How many times do you eat milk/cheese/yogurt in a day?**

□	More than 7 times	**3**	□	1 – 3 times	**1**
□	4 – 6 times	**2**	□	0 times	**0**

9. **How many times do you eat legumes (e.g. red beans, pigeon peas, nuts) in a day?**

□	More than 7 times	**3**	□	1 – 3 times	**1**
□	4 – 6 times	**0**	□	0 times	**0**

10. **How many times do you eat grains/cereals/porridge (e.g. corn flakes, multigrain bread, oats) in a day?**

☐	More than 7 times	**3**	☐	1 – 3 times	**1**
☐	4 – 6 times	**2**	☐	0 times	**0**

11. **How many times do you snack in a day?**

☐	More than 7 times	**0**	☐	1 – 3 times	**2**
☐	4 – 6 times	**1**	☐	0 times	**3**

12. **How often do you snack on the following foods?**

	Always **0**	Often **1**	Sometimes **2**	Never **3**
Chips (e.g. potato/corn), popcorn, salted peanuts (e.g. cashew), cheesy items (e.g. sticks/chips), crackers				
Pastries (e.g. beef pies/currents roll), cookies, cakes, doughnuts				
Candies (e.g. cotton candy, snow cone, sweets), chocolates				
Milkshakes (e.g. frozen chillers), ice cream, soft drink				
Preservatives (e.g. red mango/plum)				

13. **How much water do you drink in a day?**

☐	More than 8 glasses	**3**	☐	1 – 4 glasses	**1**
☐	5 – 8 glasses	**2**	☐	Less than 1 glasses	**0**

SECTION II - KNOWLEDGE

1. **The main source of energy for our body is:**

☐	Carbohydrates *	☐	Protein
☐	Fats	☐	Vitamin

2. **Which food contains carbohydrates?**

- □ Meat
- □ Bread *
- □ Butter
- □ Cheese

3. **Which of the following is high in fibre?**

- □ Bread, beans, oats, carrots, banana *
- □ Butter, margarine
- □ Beef, fish, chicken
- □ Milk, cheese, yogurt

4. **Which food is high in protein?**

- □ Bread
- □ Tomato
- □ Eggs *
- □ Butter

5. **Fibre is important for all of the following except:**

- □ Normal bowel function
- □ Lowering blood sugar levels
- □ Lowering blood cholesterol (fat) levels
- □ Providing vitamins and minerals *

6. **Is protein an important nutrient to help build muscle, skin and bones?**

- □ Yes *
- □ Not Sure
- □ No

7. **Which food contains the least fat?**

- □ Fried eggs
- □ Hamburger with mayo
- □ Oatmeal porridge *
- □ Meat Pizza

8. **Fruits and vegetables are excellent sources of:**

- □ Vitamins and minerals *
- □ Protein
- □ Saturated fat
- □ Cholesterol

9. **Is calcium an important mineral for bone development?**

- ☐ Yes *
- ☐ No
- ☐ Not Sure

10. **The following foods are high in calcium except:**

- ☐ Cheese
- ☐ Milk
- ☐ Yogurt
- ☐ Bread *

11. **Breakfast should never be skipped.**

- ☐ True *
- ☐ False
- ☐ Not Sure

12. **Skipping breakfast on mornings results in all of the following except:**

- ☐ Reduced energy intake
- ☐ Lowered protein intake
- ☐ Reduced calcium intake
- ☐ Increased protein intake *

13. **The healthiest snack is:**

- ☐ A chocolate bar
- ☐ A pack of salted peanuts
- ☐ A Fruit bowl *
- ☐ None of the above

14. **Potato chips/pastries/cookies/milkshakes/preservatives/salted peanuts/cakes provide a lot of:**

- ☐ Vitamins
- ☐ Protein
- ☐ Energy *
- ☐ Fibre

15. **Not drinking enough water leads to dehydration:**

- ☐ True *
- ☐ False
- ☐ Not Sure

*** Denotes the correct answers**

SECTION III - ATTITUDE

Mark an 'X' in the appropriate column of choice.

	Strongly Agree -2	**Agree** -1	**Neutral** 0	**Disagree** 1	**Strongly Disagree** 2
1. I think that I should eat breakfast on mornings, providing I have the time to do so					
2. I think that it doesn't really matter if I don't eat breakfast, as long as I'm not hungry					
3. I know I should eat fruits & vegetables regularly but I just don't feel to do so					
4. Drinking at least 8 glasses (2.1 L) of water each day is not important to me					
5. I will focus on nutrition and its impact on my health when I finish secondary school					
6. As long as the food tastes good, I'm not really interested in its nutritional content					
7. I think that it's okay to snack throughout the day, without eating proper meals					

SECTION IV – DEMOGRAPHIC AND ANTHROPOMETRIC DATA

1. **Class Form:**

□ 1 □ 4 □ Upper 6

□ 2 □ 5

□ 3 □ Lower 6

Please report the following as accurately as possible; and remember your information will be kept confidential:

2. **Your Height**: _____feet _____inches (e.g. 3 feet 5 inches)
3. **Your Weight**: _____lbs

APPENDIX B: PARENTAL CONSENT FORM

2013 February 21

CONSENT FORM

Dear Parent/Guardian

My name is Gabriella Alphonso, a past student of St. Joseph's Convent, San Fernando and a final year undergraduate student in the Human Nutrition and Dietetics programme at the University of the West Indies, St. Augustine Campus. I am required to conduct a mandatory research project as a partial fulfillment of my B.Sc. degree.

In that regard, I have selected the topic "***Nutritional Knowledge, Attitude, Behaviours and Anthropometric Data among the Student Population of St. Joseph's Convent, San Fernando.***"

This research will involve the use of a short survey, which your daughter will be asked to complete. This survey will consist of several short questions, placed into four (4) sections: Nutrition Knowledge, Behaviours, Attitudes and Anthropometric Data (self-reported weight and height measures).

I wish to assure you that all information collected will be treated with the strictest confidentiality and will only be used by researcher. Please indicate below with a check mark [✔] whether you consent to your daughter's participation in the survey.

I look forward to your kind cooperation as the results will benefit both current and future students.

Thanks sincerely,

_____

Gabriella Alphonso

Final Year Student/Project Researcher

University of the West Indies

St. Augustine

I give consent for my daughter's participation in the survey [ ]

I do not give consent for my daughter's participation in the survey [ ]

_____ _____

Parent/ Guardian Date