Investigating the Efficacy of Nutritional Status, Dietary Acumen, and Sugary Beverage Consumption Patterns in Secondary School Adolescents

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Abstracts: Introduction: Excessive consumption of sugary drinks increases the risk of obesity and negatively affects nutritional health because they contain additional sugars and empty calories. Making well-informed decisions that prioritize nutrient-dense options enables people to reduce health risks and improve their general nutritional state. Objectives: The objectives of this study to is to assess the relationship between nutritional status, dietary knowledge and sugary beverage consumption habits among secondary school children in Lahore. Methodology: A cross-sectional study was conducted among a sample of 384 secondary school children studying in public and private schools of Lahore, Pakistan and data was collected through a combination of 2 validated questionnaires, composed of 4 parts (personal information, frequency of sugary beverages consumed, sugary beverage consumption pattern and & dietary knowledge). For BMI calculation, height and weight were measured. Data analysis was done through SPSS version 23. Results: The study reveals that 51.8% of the students in Pakistani secondary schools in Lahore fell within the normal BMI limit. The remainder, however, were malnourished; 13% of the adolescents were underweight, 21.6% were overweight, and 13.5% were obese. Furthermore, it was found that there was no significant relationship between dietary knowledge, use of sugary beverages, and nutritional status. Conclusion: In conclusion, it is evident that the consumption of sugary sweet beverages among the secondary school children of Lahore, Pakistan is significantly higher. Also, the burden of malnutrition and the body mass index is significantly high among these adolescents, associated with SSB consumption. However, BMI is no significantly related to dietary knowledge.

1. INTRODUCTION

The percentage of overweight children has increased dramatically. UNICEF, WHO, and World Bank estimates from 2013 state that there were 42 million overweightchildren globally in 2000 compared to 32 million in 2013. Overweight among children is becoming more common worldwide, but especially in Asia and Africa. In South-EastAsia, the percentage of children under five who are overweight rose from 3 to 7% between 2000 and 2013. The issue of malnourishment in the pediatrics has garnered significant focus due to its long-term and short-term negative health effects, as well as its continuation into adulthood. For instance, in their systematic review on the association between consumption of sweet-sugary beverages (SSBs) and obesity risk, Trumbo and Rivers noticed varying findings (with adjustments for physical activity and energy intake) for the assessed groups of children, adolescents, and adults (Trumbo & Rivers, 2014).

Overweight and obesity have a variety of causes, including genetic, behavioral,and environmental factors that interact with metabolism, food, and exercise. These days, a number of sources have reported that rising rates of obesity and overweight people throughout the world have coincided with rising food intake of sugar. Fruit or vegetable drinks, carbonated drinks, other sweet-sugary beverages (SSB) and tea, are a prominent cause of excessive sugar intake (Pan et al., 2016).

Chaput et al. (2018) suggested that sweet-sugary beverages (SSBs), which are any liquids sweetened with various added sugars, make up most of the added sugar and is responsible for 10% to 15% of children's energy consumption. Heart disease, obesity, and type 2 diabetes are among the negative health outcomes associated with SSB use.

Snacking and beverage consumption patterns among adolescents have been linked to the worldwide increase in obesity and overweight. Obesity has grown to be an important threat to public health in the twenty-first century. Obesity and overweighthave quadrupled in Canada in the last 40 years, impacting nearly 30% of children between the ages of 5 and 17. A number of noncommunicable diseases and sociopsychological issues, such as depression, anxiety, type 2 diabetes, CVD, and hypertension, are more common in these. These problems have an ongoing impact ona child's morbidity and death. Merely 60% of children's beverage intake, as reported bythe Canadian Community Health Survey (CCHS), comprises of nutritious options suchas milk, water, and 100% fruit juice. Sweet-sugary beverages (SSB) such pop, fruit- flavored drinks, sports drinks, and energy drinks are thought to make up the remaining40% of the total (Irwin et al., 2019). consume more energy since liquid calories might not be as filling as solid calories (Vanselow et al., 2009).

Even with the present focus on public health, obesity is becoming a worldwide problem. The global rate of increase for health concerns is largest when it comes to excess body weight. It is concerning to note that children and adolescents are becomingmore obese at a faster rate than adults. Over the course of 1975, the prevalence of childhood obesity has climbed more than four times worldwide. It is particularly concerning because obese children are more likely to grow up to be obese adults, whichcan lead to cardiometabolic issues and other health problems. Overweight and obesity are major risk factors for noncommunicable diseases that have been shown to have comparable increases in prevalence, including type 2 diabetes, CVD, and some forms of cancer. The prevalence of obesity has been linked to a high consumption sweet- sugary beverage (SSBs). High-fructose corn syrup (HFCS) and sucrose are two sweeteners that contribute significantly to the caloric content of sweet-sugary beverages, which include fruit drinks, energy drinks, sports drinks, and sodas. Because these drinks contain lots if energy but have fewer other nutrients, which typically add to the total number of empty calories in the diet. These arguments explain why consumption of SSBs has been linked globally to overweight and obesity (Nguyen et al., 2023).

One major public health concern is the rising incidence of childhood obesity. Atpresent, 14% of kids in the 2–5 age range and 19% of kids in the 6–11 age range are obese. These children have a higher chance of remaining overweight or obese as adults,which increases their risk of diabetes, hypertension, and cardiovascular disease. In thelast ten years, children have become more likely to have type 2 diabetes, and overweightyoungsters are also more likely to have respiratory disorders. A significant study including children and teenagers between the ages of 5 and 17 revealed that 58% of overweight kids had at least one risk factor for cardiovascular disease. The burden of childhood obesity must be lessened, and this requires finding modifiable risk factors for prevention, such as food. Drinking patterns during the last few decades indicate thatchildren's overall nutritional profiles are evolving. Children's overall energy intake from beverages is rising, which has led to the theory that the higher incidence of childhood obesity may be linked to excess energy from calorically sweetened beverages. While some researches have confirmed this theory, others have not. The quality of children's overall diet may also be harmed by the replacement of micronutrient-dense liquids like milk and 100% fruit juices with less nutritious options(LaRowe et al., 2007).

Early childhood nutrition habits are crucial for the implementation of nutritionaleducation programs, improving health conditions, fostering the development of healthy decision-making skills, and lowering future health consequences. Research has indicated that an individual's understanding of nutrition can impact eating habits, whichin turn can change an individual's child or adult's nutritional status. Others, however, have demonstrated that there is little correlation between knowledge and eating behavior and that kids and teenagers need more than just isolated knowledge to develophealthy eating habits (Da Silva et al., 2021).

Obesity is becoming a major global public health concern. Of the 1.4 billion overweight or obese persons worldwide, more than 500 million are obese. Among the countries where the number of overweight and obese individuals has increased dramatically is Canada, where the obesity rate nearly doubled between 1981 and 2008. According to body mass index (BMI) estimates, around 25% of Canadian adults are obese and 37% are overweight, while 17% of children between the ages of 2 and 17 areoverweight and 9% are obese. A possible explanation for the rising obesity epidemic is the increased consumption of sweet-sugary beverages. Sugar-sweetened sodas, syrup, or other calorie-dense sweeteners are beverages sweetened with sugar or corn syrup.

Other carbonated and non-carbonated beverages, such as energy and sports drinks, are particularly harmful because of their high-calorie content and minimal to nonexistent nutritional value. About one-third of all added sweeteners in the American diet come from non-diet "regular" soft drinks. This makes them the biggest source of added sweeteners. Studies indicate that youngsters in Canada and the United States consume comparable amounts of energy from beverages overall. According to a recent nationwide survey of Canadians aged 4 to 18, beverages account for 20% of all caloriesingested by kids (Vanderlee et al., 2014).

Of the 43 million overweight children under five in the world in 2010, 35 million lived in poor countries. Globally, the prevalence rose from 4.2% (95% CI: 3.2%,5.2%) to 6.7% (95% CI: 5.6%, 7.7%) between 1990 and 2010. Obesity has many complex causes, including genetic, psychological, social, and environmental factors. These factors all contribute to the disease's long-term risk of major health issues and death. According to recent findings, sugar-containing drinks are a major factor in the development of obesity and overweight. Soft drinks, fruit drinks, lemonade, and iced tea are the primary sources of added sugar, which is estimated to account for 15.8% of Americans' overall energy intake. Over the past few decades, children have increased their intake of sweet-sugary beverages (SSBs) while decreasing their consumption of milk significantly. Early childhood is a critical period for the development of beveragepreferences and consumption patterns, which might endure over time (Pérez-Morales et al., 2013).

caries (ECC). The relationship between intake of SSBs and body weight has attracted significant attention from the public and scientific community as efforts to combat the global obesity pandemic persist. These sweeteners are added to beverages by producers, businesses, or individuals, and they typically have more than 25 calories per 8 fluid ounces. Average intakes continue to be above recommended levels, despite US data trends between 2000 and 2008 showing a decline in added sugar consumption, primarily as a result of SSB decreases. SSBs continue to be the primary source of added sugar and calories in the US diet (Malik et al., 2013).

The consumption of SSBs, particularly carbonated soft drinks, may be a major contributing factor to the obesity and overweight epidemic because of the high added sugar content, inadequate satiety, and inadequate replacement of calories. Comparable patterns are observed in kids and teenagers, which may cause major health issues as adults. Obesity and overweight are linked to a number of serious comorbid conditions that should worry the public health, such as depression, diabetes, cardiovascular disease, hypertension, and malignancies of the breast, ovaries, colon, and prostate. Softdrinks that are not on a diet are the primary source of these added sugars, accounting for 47% of all added sugars in diets. Soft drinks include sodas and other sugar- sweetened drinks including iced tea, fruit drinks, and lemonade. Carbonated drinks withadded sugar, such colas, are referred to as sodas (Malik et al., 2006).

Consuming significant amounts of SSBs is related to high sugar and calorie levels, as well as weight gain and obesity. According to the literature, having a good understanding of the sugar content and calories in SSBs, as well as the health hazards, is associated with changing attitudes toward SSBs and lowering consumption levels. Individuals' consumption of SSBs decreases as their nutritional understanding increases (alothmani & almoraie, 2023).

1.1. Objectives

- Assessing the nutritional status of secondary school children.
- Assessing the sugary beverage consumption among secondary school children.
- Assessing the dietary knowledge of secondary school children.
- Determining the relationship between nutritional status and sugary beverageconsumption.
- Determining the relationship between nutritional status and dietary knowledge.
- Assessing the relationship between nutritional status, dietary knowledge andsugary beverage

consumption.

2. LITERATURE REVIEW

2.1. Nutritional Status in Secondary School Children

While an excess proportion of body weight attributed to fat is the most widely used definition of obesity, there are no set diagnostic standards or thresholds for children. To help understand developmental patterns, mean body fat percentages for 12-year-old US children (derived from bioelectrical impedance measurements) and percentile curves for 5- to 18-year-old British children are available. The currently accepted standard for identifying childhood obesity in the United States is the percentile distributions of the 2000 growth charts from the Centers for Disease Control and Prevention (CDC), divided by age and gender. BMI has been suggested by a number of expert and advisory bodies as the favored metric for assessing obesity in kids and teenagers between the ages of 2 and 19. BMI uses a ratio to express the weight-for-height relationship: weight (in kilograms) / [height (in meters)]. Experts recommend using BMI because it is easy to compute, accurately and consistently identifies the fattest individuals at the upper end of the distribution (e.g., the 85th or 95th percentile for age and gender), has a strong correlation with body fat percentage (particularly at extreme BMI levels), and has a weak correlation with height (Krebs etal., 2007).

Since adolescence, which spans the ages of 10 to 19, marks the transition from childhood to adulthood, it is a critical developmental stage. Dietary habits during this critical time have a significant impact on health and lifetime nutritional status. During this period, adolescents gain up to 50% of their adult weight, more than 20% of their adult height, and 50% of their adult bone mass. This means that they now require a higher nutritional intake. Undernutrition (in terms of stunting and wasting), overweight, and obesity are the main nutritional issues affecting teenage populations.

2.2. Childhood Obesity

Obesity is a significant public health concern. The number of overweight kids and teenagers in the US has more than doubled in the past 20 years. According to the 1999–2000 National Health and Nutrition Examination Survey, approximately thirty percent of teenagers are overweight or at risk for overweight, which is defined as having a BMI higher than the national 85th percentile for their age and gender. Maintaining a healthy weight may be especially crucial during the late adolescent and early adult years. In the Coronary Artery Risk Development in Young Adults (CARDIA) study, the prevalence of overweight (measured using the previous cutoff criterion of BMI > 27.3 kg/m2) increased from 13% to 24% among white women and from 32% to 50% among African-American women over a 7-year period in early adulthood. Age-related changes in weight status indicate an increased likelihood of overweight children growing up to be obese adults. An obese child had roughly twice the chance of becoming an obese adult as a non-obese youngster in preschool research. However, compared to their thinner friends, adolescents who were overweight had an almost 18-fold higher likelihood of becoming obese in their early adult years. Furthermore, 8.5 times as many overweight teenagers in the Bogalusa Heart Study as their leaner counterparts had hypertension as young adults (Field et al., 2005).

2.3. Sugary Beverage Consumption and Obesity

Between 1980 and 1994, the percentage of obese youngsters in the United States increased by 100%. The US Department of Agriculture (USDA) reports that over the previous 50 years, the average person's intake of soft drinks has climbed by over 500%. Soft drink consumption increased from 195 to 275 milliliters in the general population and from 345 to 570 milliliters among teenage boys between 1989–1991 and 1994–1995. Half of all Americans and the majority of adolescents (65% of girls and 74% of boys) regularly consume soft drinks, the majority of which are sugar-sweetened rather than artificially sweetened. The primary source of added sugars in the diet nowadays is soft drinks, which provide 36·2 g for teenage girls and 57·7 g for boys daily. School-age children's total energy intake and soft drink consumption are positively connected; for non-consumers, the adjusted mean daily energy intake is 7650 kJ, while for those who drink an average of 265 mL or more, it is 8435 kJ. Even though the prevalence of childhood obesity is rising along with the consumption of soft drinks, it is still

necessary to look ahead and assess the long-term impacts of drinking sugar-sweetened beverages on body weight measurements (Ludwig et al., 2001).

Soft drinks with added sugar are the main food source of calories in the US diet, making about 7.1% of total energy consumed. According to one study, the odds of getting obese rose by 1.6 times for every additional daily drink that was sweetened with sugar. Obesity in children was inversely correlated with increased diet soda intake. The fact that the findings of the study by Schulze et al. are based on longitudinal data is one of its key characteristics. Cross-sectional studies may underestimate the association between sugar-sweetened beverages and overweight because obese individuals may make the transition to diet soft drinks in an effort to lose weight. The study found that women who consumed more sugar-sweetened soft drinks also reported consuming 358 kcal more on average per day, with soft drinks accounting for the majority of the excess calories. This result is valid for fruit punches, fruit juices, and soft drinks with added sugar. This result supports the hypothesis that people do not consume less solid food in response to increases in their intake of liquid carbohydrates. Contrarily, consuming more liquid carbs results in consuming more calories. 40–50 g of sugar and 150 kcal can be found in a 12-oz can of sugar-sweetened soda (Apovian, 2004). boys. For men and women, the average daily consumption of fruit drinks is 105 g and 115 g, respectively (Forshee et al., 2008).

With over one-third of children and adolescents being overweight or obese in 2012, childhood obesity has more than doubled in children and quadrupled in adolescents during the previous 30 years. Nowadays, the most common dietary issue affecting children and adolescents is obesity. Though occasionally in disproportionate ways, this disease has impacted people of all ages, most ethnic groups, and socioeconomic backgrounds. Pakistan, a nation undergoing change, is currently burdened by both undernutrition and overnutrition. Like with other developing nations, obesity is becoming a bigger issue in Pakistan, although undernourishment is still a concern. India, Pakistan's neighbor, is also suffering from a double standard; an urban Madras study of schoolchildren revealed that 15.8% of girls and 17.8% of boys were overweight. The prevalence of obesity in wealthy Indian cities has surpassed that of industrialized nations, with values rising with socioeconomic status. Increased calorie intake, sedentary lifestyles, low levels of physical activity, and high socioeconomic position are all closely linked to childhood obesity (Khan et al., 2016).

2.4. Trends and Beverage Consumption

To study trends in beverage intake, national surveys such as the National Food intake Survey, the National Health and Nutrition Examination Surveys, and the Continuing Survey of Food Intakes by Individuals (CSFII) have been employed. There's proof that evidence that children and teenagers in the US are consuming less milk and more fizzy drinks on a secular basis. According to a recent study by Yen and Ling based on CSFII 1994–1996 data, there is a corresponding rise of 4.2 ounces of soft drinks for every ounce that is reduced in milk, which also leads in an increase of 31 calories. Research has indicated that children and adolescents who use soft drinks had reduced dietary intakes of calcium, magnesium, riboflavin, and vitamins A and C. A rise in children's calorie consumption has also been connected to dietary increases in fruit and soft beverages. According to Troiano and colleagues, children and adolescents who are overweight consume significantly more soft drinks (2%) than children and adolescents who are not overweight. In a similar vein, Nicklas et al. found that regular soda, in particular, only contributed 1% to the explanation of BMI variation in children taking part in the Bogalusa Heart Study (Blum et al., 2005).

In the past few decades, there has been a significant growth in the use of sugar- sweetened drinks (SSBs) (Duffey & Popkin, 2007; Nielsen & Popkin, 2004). At least one sugar-sweetened beverage (SSB) is consumed daily by 80% of American kids and 63% of adults (Bleich, Wang, & Gortmaker, 2009). SSBs are defined as fruit drinks, energy drinks, sports drinks, soda, and any other kind of liquid with added sugars, according to the United States Department of Agriculture (2010). Bleich, Herring, Flagg, and Gary-Webb (2012) report that the average adult in the US drinks 203 kilocalories from these sugary drinks every day, or about 9% of their total daily caloric intake. All people, regardless of age, are advised to limit their daily use of sugar- sweetened beverages (SSBs) by the 2010 Dietary Guidelines for Americans since they are high in calories and low in critical nutrients (U.S. Department of Agriculture, 2010). SSBs have been linked in a number of studies to chronic conditions like

diabetes, high triglycerides, cardiovascular disease, and dental caries (Centers for Disease Control and Prevention, 2010; Vartanian, Schwartz, & Brownell, 2007), as well as overweight/obesity (Chen et al., 2009; Rivard, Smith, McCann, & Hyland, 2012) (Gase et al., 2014).

daily soda consumption dropped sharply from 33.8% to 20.5%. Between 2007 and 2011, there was little change in the daily consumption of milk and juice; however, between 2011 and 2015, the percentages decreased from 44.3% to 37.4% and from 27.2% to 21.6%, respectively. Even while fewer sodas are consumed each day is a good thing, soda consumption is still excessive (Miller et al., 2017).

Concerns regarding the consumption of SSBs and its effects on the global epidemic of obesity and chronic diseases have gained prominence during the past year. Both the prevalence of obesity and the use of soft drinks have significantly increased during the last 30 years. Sugar-sweetened beverages, which include sodas and soft drinks together with other liquids with added sugars or caloric sweeteners, such as fruit-flavored drinks, sports and energy drinks, and sweetened coffee and tea, account for a large portion of the caloric intake of young adults. Owing to sugar-sweetened beverages' (SSBs) high added sugar content, poor satiety, and insufficient calorie compensation, particularly in carbonated soft drinks, use of these beverages may be a major factor in the obesity and overweight epidemic. High-glycemic index beverages, or SSBs, raise blood glucose levels after meals, reduce insulin sensitivity, and diminish feelings of fullness, all of which contribute to overindulgence in food. Most of the prospective studies discovered links between drinking beverages sweetened with calories and obesity that were beneficial (Bipasha et al., 2017).

2.5. Dietary Knowledge

Nutrition educators have developed the scientific concept of nutrition knowledge to describe people's mental processes in relation to food and nutrition- related information. The premise that knowledge, attitudes, and behavior are significantly related to one another is supported by research findings. Though no one is explicitly credited with creating the construct and its relationship to dietary behavior, the nutrition knowledge construct and its theoretical relationship to behavior are probably logical extensions of the historical proposition that people think, feel, and do, and that what people think should therefore be related to what they feel and do. Over the past 25 years, the Journal of Nutrition Education has published numerous research measuring the correlation between dietary behavior and nutrition knowledge. Still, other researchers have noted that the theoretical relationship appears weak (small effect size), have been discouraged by the modest changes in dietary behavior that nutrition education programs have brought about, and have noted that these changes often do not persist over time (Axelson & Brinberg, 1992).

The necessity for nourishing culinary skills has increased due to societal changes, to the point where youth education must include them in order for them to survive and maintain excellent health. Students need to understand that eating a healthy diet has a direct impact on their growth, emotions, and behavior. Junk food is mostly composed of large amounts of saturated fats, which are harmful to the body after digestion and cause the production of several toxins. Junk food, which includes things like burgers, sandwiches, hot dogs, patties, pastries, popcorn, potato chips, fizzy beverages, chocolates, and so on, is increasingly commonly consumed in large quantities by adolescents. Frequent junk food consumption can negatively affect one's energy, concentration, and weight, which can result in heart disease, anxiety, sadness, stunted growth, early aging, and teeth damage (“Nutritional Knowledge, Attitudes and Junk Food Consumption Habits Among Students of Abubakar Tatari Polytechnic (ATAP) Bauchi,” n.d.).

Fatikhani and Setiawan (2019) suggested that people's eating habits have been significantly impacted by globalization, with many being compelled to eat junk food—fast food and high-calorie items—because of this. Research indicates that a correlation exists between the growing number of fast-food establishments and the rise in fast food consumption. 40% of school-age children have little nutritional awareness, 43.8% have intermediate nutritional knowledge, and just 16.2% have good nutritional knowledge, per Deni and Dwiriani's 2009 research. Kids typically eat low- fiber, high-calorie foods on a regular basis. Inadequate understanding of nutrition, especially what foods are healthy and bad, might lead to this practice. Teenagers' consumption of

fruits, vegetables, and foods like milk to meet their body's demands is greatly influenced by their parents. Six Adolescent eating habits are increasingly influenced by outside forces during adolescence, and teenagers may adopt eating patterns that differ from their parents. Parents can have an impact on their children's nutrition, even though they are already aware that they can. They can buy healthier foods, reduce the amount of bad foods they eat, and provide nutritious meals for their children to eat at home. They also believe that additional social variables, such as fast- food advertisements, a lack of awareness about healthy snack options, and peer pressure, influence youngsters to consume unhealthy foods.

2.6. Relationship Between Dietary Knowledge and Sweet-Sugary Beverages Consumed

It has been shown that a variety of physical environment characteristics, including availability, pricing, product promotion, and advertising, are connected withthe consumption of obesogenic foods, including sugar-sweetened beverages (SSBs) (Story et al., 2008). Due to their widespread availability in convenience stores, restaurants, homes, and workplaces, SSBs are easy to purchase and consume (Centersfor Disease Control and Prevention, 2010). Strongest evidence for this effect is foundin young children; exposure to heavily marketed sweet-sugary beverages (SSBs) can affect preference, purchases, and volume of consumption (Hattersley et al., 2009). A foundation of appropriate knowledge about the contents and implications of food and beverage choices informs many public health programs aimed at changing eating behavior, including the intake of sugar-sweetened drinks (SSBs) (Ball et al., 2011;

Klohe-Lehman et al., 2006). Media campaigns have been launched in New York City, Philadelphia, Boston, San Francisco, and Los Angeles with the goal of increasing public awareness of the sugar content of sugar-filled beverages (SSBs) and their possible detrimental impacts on health (Gase et al., 2014).

Particularly among young individuals, sweetened beverages like milk tea, chocolate ice, and coffee frappés are popular. These drinks have a delightful and energizing flavor. On the other hand, it has detrimental effects on health. With a total of 20.23 liters per son each year, Indonesia ranks third in Southeast Asia for the consumption of sweet drinks. Drinking sugar-filled beverages raised the chance of dying young from non-communicable illnesses like heart attacks and some forms of cancer. It demonstrated a notable rise in Indonesia. Smartphone use and eating patterns are linked to preferences for sugar-sweetened beverages. Children's obesity increased significantly in Indonesia, from 4.2% in 1990 to 9.1% in 2020, as did the prevalence of non-communicable disorders like diabetes and cardiovascular disease. The tendency of young individuals consuming sugar-filled beverages is influenced bya few things. The social media advertisement was one of the contributing elements. The generation of young adults ranked their mobile phones second only to their wallets in importance (Ulfah et al., 2022).

3 METHODS

3.1. Study Design

This study was based on the properties of qualitative research and the cross-sectional study design was implemented in this research.

3.2. Study Setting

This research was conducted within the premises of two schools of Lahore;

3.2.1. Government Girls High School Rangers, Lahore

3.2.2. The National School Aimed Education

3.3. Study Duration

The study duration was of 4 months and the data was collected betweenSeptember and December

2023.

3.4. Sampling Techniques

Simple random sampling method was used in this study.

3.5. Sample Size

A sample size of 384 was selected in this study by using 95% confidenceinterval, ± 5% confidence limit and expected level of significance as 5%. It was calculated by OpenEpi.com.

The following equation was used to calculate the sample size;

$$n = [DEFF*Np(1-p)]/ [(d^2/Z^2 1-\alpha/2*(N-1)+p*(1-p)]$$

where;

N = Population size

n = Sample size = 384

p = Anticipated % frequency of outcome factor = 50%d = Confidence limits as % of 100 = +/- 5%

Z = Confidence interval = 95%

α = Expected level of significance = 5%

3.6. Personal Information of Participants

The first part of the questionnaire collected the personal information of the participants, which consisted of each participant's: age, gender, grade and school.

3.7. Anthropometrics and Derivative Calculations

The height and weight of each participant was measured to calculate their BMI.

- Height: The height of the participant was measured by using the gold standardmethod utilizing a stadiometer (Warrier et al., 2022).
- Weight: The weight of the participants was measured using weighing scales.
- Body Mass Index (BMI) for Age: The BMI was calculated from the participantsweight (kg) divided by the square of the height (m) (Deurenberg et al., 1991).

3.8. Assessment of Dietary History

The second part of the questionnaire contained questions regarding the regular consumption patterns of the intake of sugary beverages of the students. Furthermore, a frequency table was included. The questions included the sugary beverages consumedaccordingly (daily, 2-3 times in a week, more than 4 times in a week, once in a week or once in a month or rarely) for flavored milk, carbonated soft drinks, energy drinks, fruit juices (processed), sports drinks and tea or coffee.

3.9. Assessment of Sugary Beverage Consumption

The third part of the questionnaire contained questions regarding the sugary beverage consumption. It

contained 10 questions, particularly to assess the consumption of SSBs among students.

3.10. Assessment of Dietary Knowledge

The fourth part of the questionnaire contained questions dietary knowledge. It contained 10 questions, particularly to assess the knowledge regarding sugary beverageconsumption among students.

3.11. Data Analysis

Data collected was gathered and entered a database, and then evaluated with Crosstabs/Chi square and Pearson Co-relation. Statistical Package for Social Sciences (SPSS) version 23 was used for analyzing the data (Bano et al., 2017).

4. Results and Discussion

4.1. Demographic Distribution

Table 1: Age Distribution of Participants

Age	Frequency	Percent
13	48	12.5
14	206	53.6
15	85	22.1
16	45	11.7
Total	384	100.0

Table 1 shows the age distribution of the students participating in the study.The ages varied from 13 to 16 years old, and the mean age of the sample was 14.5.

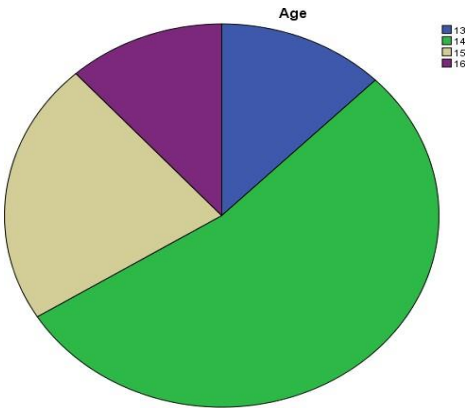

Figure 1: Age distribution of participants

Table 2: Gender Distribution of participants

Gender	Frequency	Percent
Male	100	26.0
Female	284	74.0
Total	384	100.0

Table 2 shows the total number of 384 participants were selected out of which100 were male participants (26%) and 284 were female participants (74%).

4.2. Assessment of Nutritional Status of Secondary School Students ofLahore, Pakistan

Table 3: Distribution of body mass index of participants

Body Mass Index	Frequency	Percent
Underweight	50	13.0
Normal	199	51.8
Overweight	83	21.6
Obese	52	13.5
Total	384	100.0

Table 3 shows the total number of 384 participants were selected out of which 50 (13%) were underweight, 199 (51.8%) were normal 83 (21.6%) were overweight with and 52 (13.5%) were obese. A study conducted by Valente (2020) on 267participants showed that 1.5% of children met the CDC criterion for underweight, 61.8% had normal weight, 19.5% had pre-obesity, and 17.3% had obesity. It was noted that pre-obesity and obesity were more common in boys and that most people with low weight were female. This variability is due to the difference in age group of participantsand difference in study settings.

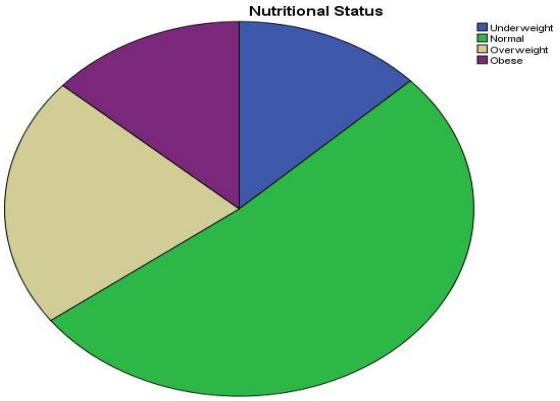

Figure 2: Nutritional Status of participants

4.3. Frequencies of Sugary Beverage Consumption

Table 4: Frequency of flavoured milk consumption

Flavored Milk		
Frequency of Consumption	**Frequency**	**Percent**
Daily	168	43.8
2-3 times in a week	63	16.4
More than 4 times in a week	9	2.3
Once in a month or rarely	144	37.5
Total	384	100.0

Table 4 shows the frequency of flavored milk consumption. Out of 384 participants, 168 (43.8%) participants were consuming flavored milk daily, 63 (16.4%)participants were consuming flavored milk 2-3 times in a week, 9 (2.3%) participants were consuming flavored milk more than 4 times in a week and 144 (37.5%) participants were consuming flavored milk once in month or rarely. A study conductedby Valente (2020) on 267 participants showed that consumption of sugar-filled beverages indicates a very high frequency of chocolate milk consumption. 52.8% of people report consuming chocolate milk "more than once a week." This variability is due to the difference in age group of participants and difference in study settings.

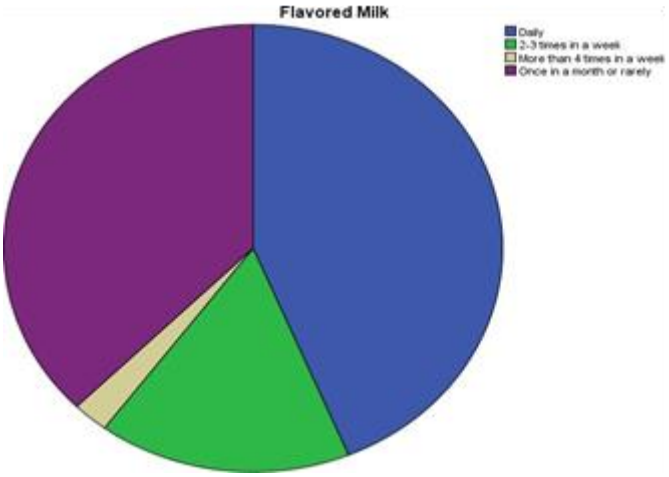

Figure 3: Frequency of flavoured milk consumption

Table 5: Frequency of carbonated soft drink consumption

Frequency of consumption	Frequency	Percent
Daily	52	13.5
2-3 times in a week	17	4.4
More than 4 times in a week	26	6.8
Once in a week	42	10.9
Once in a month or rarely	247	64.3
Total	384	100.0

Table 5 indicates the frequency of carbonated soft drinks being consumed. Out of 384 participants, 52 (13.5%) participants were consuming carbonated soft drinks daily, 17 (4.4%) participants were consuming carbonated soft drinks 2-3 times in a week, 26 (6.8%) participants were consuming carbonated soft drinks more than 4 times in a week, 42 (10.9%) participants were consuming carbonated soft drinks once in a week and 247 (64.3%) participants were consuming carbonated soft drinks once in month or rarely. A study conducted by Valente (2020) on 267 participants showed that Drinks like fruit concentrate, powdered soft drinks, Pepsi or Coca-Cola, carbonated ornon-carbonated soft drinks, and milk substitutes seem to be less common.

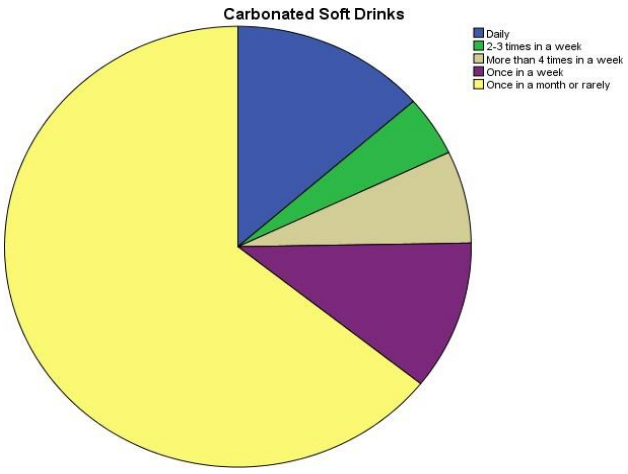

Figure 4: Frequency of Carbonated soft drinks consumption

Table 6: Frequency of energy drink consumption

Frequency of consumption	Frequency	Percent
Daily	72	18.8
2-3 times in a week	21	5.5
More than 4 times in a week	55	14.3
Once in a week	64	16.7
Once in a month or rarely	172	44.8

Table 6 indicates the frequency of energy drinks being consumed by the 384 participants out of which 72 (18.8%) participants were consuming energy drinks daily,21 (5.5%) participants were consuming energy drinks 2-3 times in a week, 55 (14.3%) participants were consuming energy drinks more than 4 times in a week, 64 (16.7%) participants were consuming energy drinks once in a week and 174 (44.8%) participantswere consuming energy drinks once in month or rarely. A study conducted by Irwin etal. (2019) on 1049 participants showed that energy drink consumption was 1.91% which is very less as compared to present results (1.8%). This variability is due to the difference in age group of participants and difference in study settings.

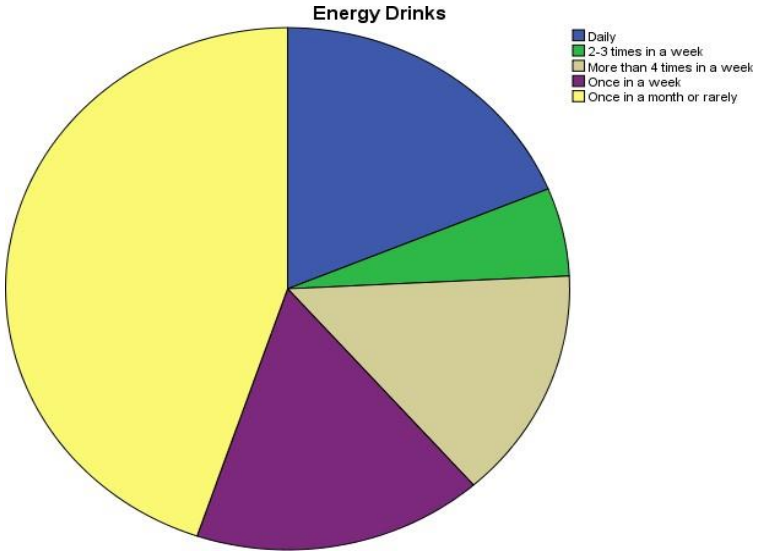

Figure 5: Frequency of energy drink consumption

Table 7: Frequency of fruit juice (processed) consumption

Frequency of consumption	Frequency	Percent
Daily	52	13.5
2-3 times in a week	82	21.4
More than 4 times in a week	30	7.8
Once in a week	118	30.7
Once in a month or rarely	102	26.6
Total	384	100.0

Table 7 indicates the frequency of fruit juices (processed) being consumed in which out of 384 participants, 52 (13.5%) participants were consuming fruit juices (processed) daily, 82 (21.4%) participants were consuming fruit juices (processed) 2-3 times in a week, 30 (7.8%) participants were consuming fruit juices (processed) more than 4 times in a week, 118 (30.7%) participants were consuming fruit juices (processed) once in a week and 102 (26.6%) participants were consuming fruit juices (processed) once in month or rarely. A study conducted by Irwin et al. (2019) on 1049 participants showed that fruit juices consumption was 5.43% which is very less as compared to present results (13.5%). This variability is due to the difference in age group of participants and difference in study settings.

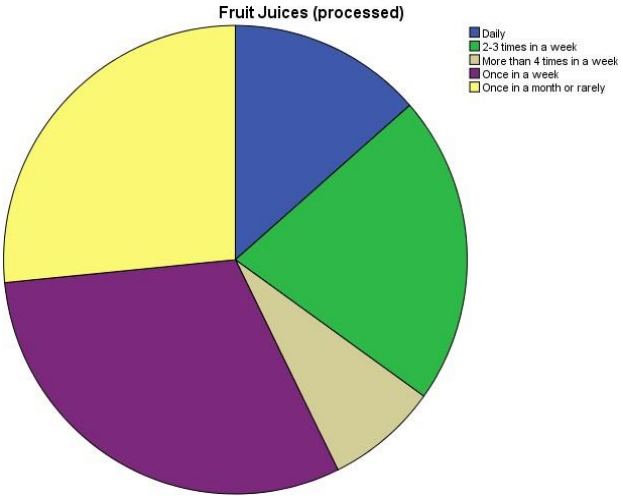

Figure 6: Frequency of fruit juices (processed) consumption

Table 8: Frequency of sports drink consumption

Frequency of consumption	Frequency	Percent
Daily	38	9.9
2-3 times in a week	21	5.5
More than 4 times in a week	16	4.2
Once in a week	79	20.6
Once in a month or rarely	230	59.9
Total	384	100.0

Table 8 indicates the frequency of sports drinks being consumed. Out of 384 participants, 38 (9.9%) participants were consuming sports drink daily, 21 (5.5%) participants were consuming sports drink 2-3 times in a week, 16 (4.2%) participants were consuming sports drink more than 4 times in a week, 79 (20.6%) participants wereconsuming sports drink once in a week and 230 (59.9%) participants were consuming sports drink once in month or rarely. In a study by Irwin et al. (2019), with a sample size of 1049 participants, 16.68% were consuming sports drink per day which is high as compared to present results (9.9%). This variability is due to the difference in age group of participants and difference in study settings.

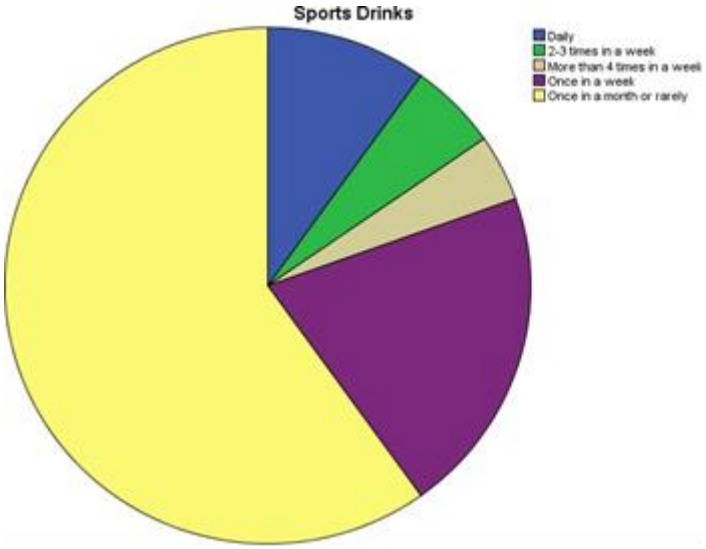

Figure 7: Frequency of energy drink consumption

Table 9: Frequency of tea or coffee consumption

Frequency of consumption	Frequency	Percent
Daily	252	65.6
2-3 times in a week	58	15.1
More than 4 times in a week	12	3.1
Once in a week	1	.3
Once in a month or rarely	61	15.9
Total	384	100.0

Table 9 indicates the frequency of tea or coffee being consumed in which out of384 participants, 252 (65,6%) participants were consuming tea or coffee daily, 58 (15.1%) participants were consuming tea or coffee 2-3 times in a week, 12 (3.1%) participants were consuming tea or coffee more than 4 times in a week, 1 (0.3%) participant was consuming tea or coffee once in a week and 61 (15.9%) participants were consuming tea or coffee once in month or rarely. A study conducted by Irwin et al. (2019), with a sample size of 1049 participants showed that 2.52% were consumingtea or coffee per day which is extremely less as compared to our results (65.6%). This variability is due to the difference in age group of participants and difference in study settings.

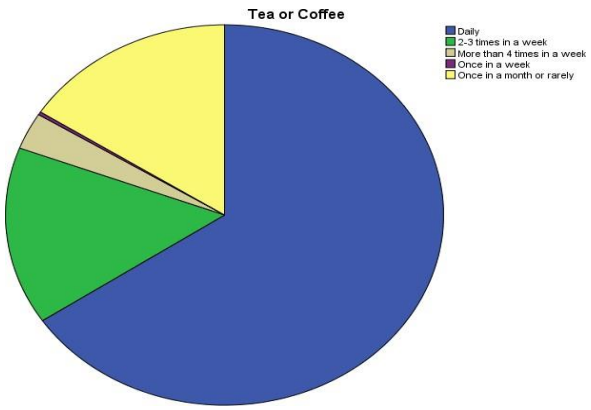

Figure 8: Frequency of tea or coffee consumption

4.4. Relationship between Sugary Beverage Consumption andNutritional Status of Secondary School Children

Table 10: Association between nutritional status and sugary beverageconsumption

			Nutritional Status (NS)				Total
			UW	Normal	OW	Obese	
Sugary Beverage Consumption(SBC)	**Low**	Count	18	50	17	10	95
		% within SBC	18.9%	52.6%	17.9%	10.5%	100.0%
		% withinNS	36.0%	25.1%	20.5%	19.2%	24.7%
		% of Total	4.7%	13.0%	4.4%	2.6%	24.7%
	Moderate	Count	18	64	39	20	141
		% withinSBC	12.8%	45.4%	27.7%	14.2%	100.0%
		% withinNS	36.0%	32.2%	47.0%	38.5%	36.7%
		% ofTotal	4.7%	16.7%	10.2%	5.2%	36.7%
	High	Count	14	85	27	22	148
		% withinSBC	9.5%	57.4%	18.2%	14.9%	100.0%
		% withinNS	28.0%	42.7%	32.5%	42.3%	38.5%
		% ofTotal	3.6%	22.1%	7.0%	5.7%	38.5%
Total		Count	50	199	83	52	384
		% withinSBC	13.0%	51.8%	21.6%	13.5%	100.0%
		% withinNS	100.0%	100.0%	100.0%	100.0%	100.0%
		% ofTotal	13.0%	51.8%	21.6%	13.5%	100.0%

Table 11 displays the results of association between sugary beverageconsumption and nutritional status.

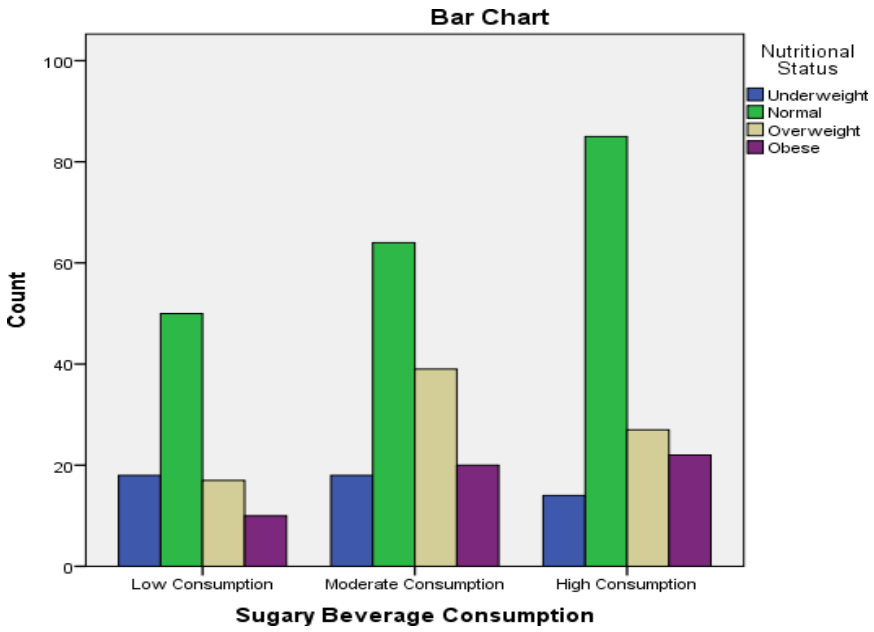

Figure 9 Bar chart for association between nutritional status and sugarybeverage consumption

Figure 9 is a bar chart representing the nutritional status of students in the bars. Each bar represents different BMI categories. The blue bar represents 'Underweight category'. The green one represents 'Normal category', yellow as 'Overweight' and purple one as 'Obese'. The above-mentioned BMI categories are representing the number of students with low consumption of sugary beverages, moderate consumption and high consumption i.e. students who had a total score of 0-3 out of 10 in the sugary beverage consumption were defined as one with low consumption. Students who had atotal score of 4-6 were defined as one with moderate consumption and the students whohad a total score of 7-10 were defined as the one with high consumption. It can be observed that the number of underweight students is less in all of the three categories of sugary beverage consumption than the other 3 categories. Also, the ratio of studentswith normal BMI is higher in all 3 categories. A study conducted by Irwin et al. (2019),with a sample size of 1049 participants showed a mean of 3·9 (sd 4·3) times/day was self-reported by them, meaning that SSB accounted for roughly 22·0% of their total daily beverage intake. Half (49·6%) reported consuming an SSB three or more times aday, and about four out of five (79·4%) reported consuming one at least once a day.

Table 11: Chi-Square test 1

Chi-Square Tests			
	Value	**df**	**p-value**
Pearson Chi-Square	37.026[a]	30	0.176
N of Valid Cases	384		

The above table shows various statistical test specifically Pearson chi square test that is conducted on the data. The Pearson chi square evaluates the independence of categorical variables. The p value of 0.176 indicates that there is a non-significant relationship between the two variables. A study conducted by Valente (2020) on 267 participants showed that children's drinking habits were taken into consideration when classifying drinks into three groups: "never less than once a month," "up to once a week," and "more than once a week." Coca-Cola or Pepsi, carbonated soft drinks (with and without gas), energy and sports drinks, fruit concentrate, powdered soft drinks, and milk substitutes were the beverages that were under class 1. Fruit juice and nectar were among the items in class

2. Lastly, class 3 exclusively included chocolate milk. Following the frequency-based correlation between each drink and the children's consumption behavior, a binary logistic regression was used to establish a relationship between the classes and the children's nutritional status. There is a trend between being overweight and belonging to one of the groups, even if the results are not statistically significant (p> 0.005). Class 1 membership is linked to a protective impact against excess weight (OR = 0.40), whereas class 2 membership has the opposite effect (OR = 1.95. Regarding class 3, membership in this class yields a non- significant outcome.

4.5. Relationship between Dietary Knowledge and Nutritional Statusof Secondary School Children

Table 12: Association between nutritional status and dietary knowledge

			Nutritional Status (NS)				Total
			UW	Normal	OW	Obese	
Dietary Knowledge(DK)	Moderate	Count	12	42	12	10	76
		% withinDK	15.8%	55.3%	15.8%	13.2%	100.0%
		% withinNS	24.0%	21.1%	14.5%	19.2%	19.8%
		% ofTotal	3.1%	10.9%	3.1%	2.6%	19.8%
	High	Count	38	157	71	42	308
		% withinDK	12.3%	51.0%	23.1%	13.6%	100.0%
		% withinNS	76.0%	78.9%	85.5%	80.8%	80.2%
		% of Total	9.9%	40.9%	18.5%	10.9%	80.2%
Total		Count	50	199	83	52	384
		% withinDK	13.0%	51.8%	21.6%	13.5%	100.0%
		% withinNS	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	13.0%	51.8%	21.6%	13.5%	100.0%

Table 12 shows the association between two variables i.e., Nutritional statusand the Dietary knowledge among the students.

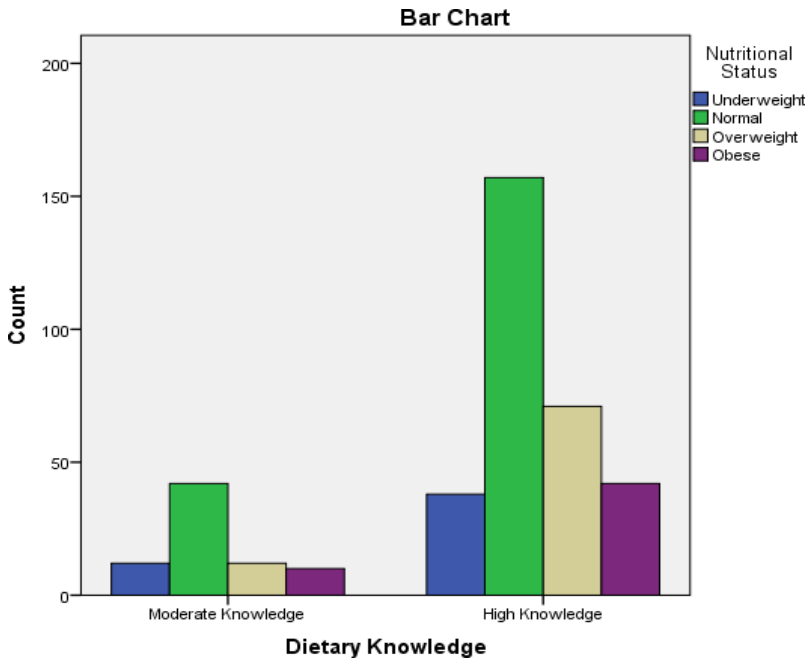

Figure 10 Bar chart for association between nutritional status and dietaryknowledge

Figure 10 is a bar chart representing the nutritional status of students in the bars. Each bar represents different BMI categories. The blue bar represents 'Underweight category'. The green one represents 'Normal category', yellow as 'Overweight' and purple one as 'Obese'. The above-mentioned BMI categories are representing the number of students with low dietary knowledge, moderate knowledge and high knowledge i.e. students who had a total score of 0-3 out of 10 in the dietary knowledgewere defined as one with knowledge. Students who had a total score of 4-6 were definedas one with moderate knowledge and the students who had a total score of 7-10 were defined as the one with high knowledge. It can be observed that the number of underweight students is less in both the categories of dietary knowledge than the other2 categories. Also, the ratio of students with normal BMI is higher in all 2 categories. It can be seen that there is no category of less knowledge demonstrating that there is nostudent having less knowledge. A study conducted by Irwin et al. (2019), with a samplesize of 1049 participants showed a one-point increase in total knowledge score that wasnassociated with a 0·34 % (95 % CI 0·16, 0·52 %; P = 0·0002) increase in total daily beverage consumption attributable to water however, SSB was found to be responsiblefor a 0·33 % (95 % CI −0·49, −0·18%; P < 0·0001) reduction in daily beverage consumption overall. This was after adjusting for dietary, behavioral, and sociodemographic characteristics. SSB is responsible for a 1·41 % (95 % CI −2·03, −0·79 %; P < 0·0001) drop in daily beverage consumption overall. This variability is due to the difference in age group of participants and difference in study settings

Table 13: Chi-Square test 2

Chi-Square Tests			
	Value	**df**	**p-value**
Pearson Chi-Square	18.405[a]	18	0.429
N of Valid Cases	384		

The above table shows various statistical test specifically Pearson chi square test that is conducted on the data. The Pearson chi square evaluates the independence of categorical variables. The calculated value of 18.40 with 18 degree of freedom and p value of 0.429 indicates that there is a non-significant relationship between the two

variables.

4.6. Relationship between Nutritional Status, Sugary Beverage Consumption and Dietary Knowledge of Secondary School Children

Table 14: Correlation between nutritional status, sugary beverage consumptionand dietary knowledge

		Nutritional Status	Total Sugary Beverage Consumption Score	Total Dietary Knowledge Score
NutritionalStatus	Pearson Correlation	1	0.037	0.014
	p-value		0.473	0.787
	N	384	384	384
Total Sugary Beverage ConsumptionScore	Pearson Correlation	0.037	1	0.081
	p-value	0.473		0.112
	N	384	384	384
Total Dietary Knowledge Score	Pearson Correlation	0.014	0.081	1
	p-value	0.787	0.112	
	N	384	384	384

Table 14 shows the correlation between nutritional status, total sugary beverage consumption and total dietary knowledge score. As shown by the above table, there is a non-significant relationship between nutritional status and total sugary beverage consumption score as evidenced by the p value that is 0.473 which is less than 0.05. However, there is a non-significant relationship between nutritional status and total dietary knowledge score as evidenced by the p value that is 0.787 which is less than 0.05. A study conducted by Irwin et al. (2019) showed that SSB was found to be responsible for a 0·29% (95 % CI −0·46, −0·12%; P = 0·0008) reduction in daily beverage consumption overall. This was after adjusting for dietary, behavioral, and sociodemographic characteristics. Higher consumption of sugar-sweetened beverages (SSBs) was linked to a number of factors, including being male, having a parent or guardian with less education and eating junk food more frequently.

CONCLUSION

Findings of the study reveal that half of the adolescents (51.8%) studying in secondary school of Lahore, Pakistan were within the normal range of BMI. However,the remaining were malnourished; 13% were underweight, 21.6% overweight and 13.5% of the adolescents were obese. Therefore, it can be stated that the findings of this research indicate that half of the burden of malnutrition exists among secondary schoolchildren in Pakistan.

Furthermore, if the frequency of sugary beverages is seen among the secondary school children, out of all the beverages', flavoured milk was being consumed in the highest amount daily (43.8%) while only 37.5% were consuming flavored milk once ina month or rarely. While only, 13.5% participants were consuming carbonated soft drinks daily and 64.3% participants were consuming carbonated soft drinks once in month or rarely. For the energy drink consumption, only 18.8% participants were consuming energy drinks daily while 44.8% participants were consuming energy drinks once in month or rarely. In the case of fruit juices (processed), 3.5% participants were consuming fruit juices (processed) daily while 26.6% participants were consuming fruit juices (processed) once in month or rarely. In the case of sports drinks, 9.9% participants were consuming sports drink daily while 59.9% participants were consuming sports drink once in month or rarely. And for the tea and coffee consumption majority (65.6%) of the participants were consuming tea or coffee daily while 15.9% participants were consuming tea or

coffee once in month or rarely.

Moreover, it was observed that the number of underweight students was less in all of the three categories of sugary beverage consumption (low consumption, moderate consumption and high consumption) than the other 3 categories of nutritional status. It was observed that the number of underweight students were less in both (moderate dietary knowledge and high dietary knowledge) the categories of dietary knowledge than the other 2 categories. It was also seen that there was no category of less knowledgedemonstrating that none of the student had less dietary knowledge.

A non-significant relationship between the nutritional status and sugary beverage consumption is seen (p value = 0.176). Also, p value of 0.429 indicates thatthere is a non-significant relationship between nutritional status and dietary knowledge.

Correlation results showed a non-significant relationship between nutritional status and total sugary beverage consumption as evidenced by the p value that is 0.473 which is less than 0.05. Similarly, correlation between nutritional status and dietary knowledge non-significant relationship between them as evidenced by the p value that is 0.787 which is less than 0.05.

In conclusion, it is evident that the consumption of sugary sweet beverages among the secondary school children of Lahore, Pakistan is significantly higher. Also, the burden of malnutrition and the body mass index is significantly high among these adolescents. However, BMI is no significantly related to sugary beverage knowledge or dietary knowledge. More study is required in this area of research and these variables should be further investigated. Furthermore, it is necessary to spread awareness about SSB consumption, and educate about the health consequences due to excessive consumption for improving their overall nutritional status.

REFERENCES

[1] Alothmani, N. M., & Almoraie, N. M. (2023). Understanding the Knowledge, Attitudes, and Practices Concerning Sugar-Sweetened Beverages and Beverage Taxation among Saudi University Students. Nutrients, 15(19), 4151. https://doi.org/10.3390/nu15194151

[2] Apovian, C. M. (2004). Sugar-Sweetened soft drinks, obesity, and type 2 diabetes.

[3] JAMA, 292(8), 978. https://doi.org/10.1001/jama.292.8.978

[4] Athavale, P., Khadka, N., Roy, S., Mukherjee, P., Mohan, D. C., Turton, B., & Sokal- Gutierrez, K. (2020). Early Childhood Junk Food Consumption, Severe Dental Caries, and Undernutrition: A Mixed-Methods Study from Mumbai, India. International Journal of Environmental Research and Public Health, 17(22), 8629. https://doi.org/10.3390/ijerph17228629

[5] Axelson, M. L., & Brinberg, D. (1992). The measurement and conceptualization of nutrition knowledge. Journal of Nutrition Education, 24(5), 239–246. https://doi.org/10.1016/s0022-3182(12)81238-6

[6] Bermúdez, O. I., & Gao, X. (2010). Greater Consumption of Sweetened Beverages and Added Sugars Is Associated with Obesity among US Young Adults. Annals of Nutrition and Metabolism, 57(3–4), 211–218. https://doi.org/10.1159/000321542

[7] Bipasha, M. S., Raisa, T. S., & Goon, S. (2017). Sugar Sweetened Beverages Consumption among University Students of Bangladesh. https://www.researchgate.net/journal/International-Journal-of-Public-Health- Science-IJPHS-2252-

[8] 8806?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwic GFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlSGVhZGVyIn19, 6(2), 157. https://doi.org/10.11591/ijphs.v6i2.6635

[9] Forshee, R. A., Anderson, P. C., & Storey, M. (2008). Sugar-sweetened beverages and body mass index in children and adolescents: a meta-analysis. The American Journal of Clinical Nutrition, 87(6), 1662–1671. https://doi.org/10.1093/ajcn/87.6.1662

[10] Gase, L. N., Robles, B., Barragan, N., & Kuo, T. (2014). Relationship between nutritional knowledge and the amount of Sugar-Sweetened beverages consumed in Los Angeles County. Health Education & Behavior, 41(4), 431–439. https://doi.org/10.1177/1090198114529128

[11] Gebreyohannes, Y., Shiferaw, S., Demtsu, B., & Bugssa, G. (2014). Nutritional status of adolescents in selected government and private secondary schools of Addis Ababa, Ethiopia. International Journal of Nutrition and Food Sciences, 3(6), 504. https://doi.org/10.11648/j.ijnfs.20140306.13

[12] Khan, K. S., Jameel, N., Khalil, R., & Gul, S. (2016). Exploring nutritional status, physical activity and body mass index of Pakistani teens. International Journal of Research in Medical Sciences. https://doi.org/10.18203/2320-6012.ijrms20162330

[13] Krebs, N. F., Himes, J. H., Jacobson, D., Nicklas, T. A., Guilday, P., & Styne, D. M. (2007). Assessment of child and adolescent overweight and obesity. Pediatrics, 120(Supplement_4), S193–S228. https://doi.org/10.1542/peds.2007-2329d

[14] LaRowe, T. L., Moeller, S. M., & Adams, A. (2007). Beverage patterns, diet quality, and body mass index of US Preschool and School-Aged

children. Journal of the American Dietetic Association, 107(7), 1124–1133. https://doi.org/10.1016/j.jada.2007.04.013

[15] Miller, G. F., Merlo, C., Demissie, Z., Sliwa, S., & Park, S. (2017). Trends in beverage consumption among high school students — United States, 2007–2015. Morbidity and Mortality Weekly Report, 66(4), 112–116. https://doi.org/10.15585/mmwr.mm6604a5

[16] Mohsin, S., Zahoor, M., Mashhadi, S. F., Saleem, N., Ansari, W., Akhtar, S., Inam, A., Ahmed, S., & Karim, A. (2022). Sugar Sweetened Beverages (SSBs)- Awareness, Intention and Self-Efficacy among Low-Income Adults in a Tertiary care setting. Pakistan Armed Forces Medical Journal, 72(SUPPL-4), S703-07. https://doi.org/10.51253/pafmj.v72isuppl-4.9642

[17] Otaibi, H. H. A. (2017). Sugar Sweetened Beverages Consumption Behavior and Knowledge among University Students in Saudi Arabia Risk on Internet Banking Acceptance from the User Perspective. Journal of Economics, Business and Management, 5(4), 173–176. https://doi.org/10.18178/joebm.2017.5.4.507

[18] Pan, Y., Chen, Y., Zhao, A., Bai, Y., Zheng, Y., Zhao, W., & Zhang, Y. (2016). Consumption of sugar-sweetened beverages and its association with overweight among young children from China. Public Health Nutrition, 19(13), 2336–2346. https://doi.org/10.1017/s1368980016001373

[19] Pérez-Morales, E., Bacardí-Gascón, M., & Jiménez-Cruz, A. (2013). Sugar-sweetened beverage intake before 6 years of age and weight or BMI status among older children; systematic review of prospective studies. DOAJ (DOAJ: Directory of Open Access Journals), 28(1), 47–51. https://doi.org/10.3305/nh.2013.28.1.6247

[20] Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: policy and environmental approaches. Annual Review of Public Health, 29(1), 253–272. https://doi.org/10.1146/annurev.publhealth.29.020907.090926

[21] Teng, N. I. M. F., Juliana, N., Izlin, N. L., & Semaon, N. Z. (2020). Knowledge, Attitude and Practices of Sugar-Sweetened Beverages: A Cross-Sectional Study among Adolescents in Selangor, Malaysia. Nutrients, 12(12), 3617. https://doi.org/10.3390/nu12123617

DOI: https://doi.org/10.15379/ijmst.v11i1.3642