

# The Triple Effect of Nutrition in Abu Dhabi

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## Abstract

*The primary objective of this study is to assess the prevalence of obesity among children aged between 5 and 18 years living and schooling within Abu Dhabi, and how nutrition level, physical activities, and creating awareness on food education can impact their lives. One thousand students from an international school in Abu Dhabi were selected to participate in the survey. Three different questionnaires, including Body Image Survey, International Physical Activity Questionnaire, and Rate Your Plate, were used to collect data. Cross-tabulated descriptive statistics revealed that out of the students who were found to be obese, 62.8% were Emiratis, which suggests the high degree of obesity prevalence in the United Arab Emirates. By gender, obesity was more prevalent among females than males. In an attempt to provide possible responses to such nutrition-based problems, the study formulated and tested four hypotheses on nutrition, physical activity, and the creation of awareness. Multivariate regression analysis showed that nutrition levels have a significant negative effect on the prevalence of obesity ( $p = 0.015$ ) and cardiovascular diseases ( $p = 0.001$ ). Physical activity had a significant positive effect on the prevalence of obesity ( $p = 0.000$ ), while the creation of awareness also had a significant positive effect on dietary practices (0.025). In conclusion, the study established the need to boost nutrition education both at family and societal levels, encourage students to involve in physical activities, and create awareness on food choices. It is recommended that educational systems should integrate nutrition education and physical activities in the regular curriculum.*

**KEYWORDS:** NUTRITION, OBESITY, PHYSICAL ACTIVITY, FOOD CHOICES, UAE STUDENTS

## Introduction

Nutrition remains one of the most fundamental aspects that define a healthy and satisfying life. Good nutrition, which is fundamentally a healthy and balanced diet, immensely impacts not only health but also the quality of life that people have. An increasing number of nutritionist and health advocates continue to emphasise on the need for people to monitor what they eat as a way to nourish their hunger, maintain energy level, and minimise the chances of developing undesired health conditions, maintain a healthy body mass index, and boost the general immune system (Abdulla Saeed, 2017; Al Rufaye, 2019; Otten et al., 2006; World Health Organization, 2019).

According to Thompson and Amoroso (2014), nutrition can be described to be good if it helps the body to get all the vitamins, minerals, and other nutrients that it needs to ensure the best functionality. Nutritionists have consistently emphasised the need to eat plenty of vegetables, fruits, grains, low-fat milk, lean meats, and other foods with low calories for sustainable body nourishment. However, food insecurity, malnutrition, and obesity continue to be significant challenges that thwart the goal of better health and quality living (Loechl et al., 2019).

## Background of the Study

Nutrition is the pillar that defines a healthy person, since it supplies the body with the nutrients it needs to remain healthy. However, the burden of malnutrition is high, especially in the United Arab Emirates (UAE) and other developing countries (Loechl et al., 2019; Mabry et al., 2016). Malnutrition emerges from the imbalance between the intake of energy-giving foods and nutrients-based foods.

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Factors, such as rate stunted of growth, obesity, and lifestyle diseases have been widely used to measure malnutrition (Al Rufaye, 2019). A report shows that about 35% of child mortality in the UAE are caused by malnutrition (Simpson, 2012).

Recent research shows that there is a prevalence of stunted growth, obesity, diabetes, hypertension, and cardiovascular diseases within the UAE (Global Nutrition Report, 2020). World Health Organisation (2019) also reported that 40% of women and 25% of men in the Ajman were obese. Another study found that 29% of deaths in Dubai were a result of cardiovascular diseases with high-risk cardio-metabolic diseases, which are partially relatable to nutritional problems (Al-Shamsi et al., 2019).

Research by Al Anouti et al. (2011) shows that there is a general deficiency of vitamin D among young Emirati adults and related the problem to sun deprivation. According to the study, females tend to avoid sun more than males leading to a higher vitamin D deficiency in females than in males. As such, Al Anouti et al. (2011) exhibited the need to increase Emirati youths' exposure to the sun. Attia and Ibrahim (2012) found that the dressing style among women in UAE can significantly explain the inadequacy of vitamin D among them.

A study by Al Junaibi et al. (2013) found that childhood obesity is prevalent across the age spectrum. They found that male sex, older age, higher parental body mass index, and low dietary intake significantly predict childhood obesity. Another study established that poor dietary habits and sedentary lifestyles lead to non-communicable diseases such as diabetes and cardiovascular complications (Musaiger et al., 2011). According to Abdulla (2017), children whose mothers are well educated and are concerned about their dietary practices have better eating behaviour and thus are less exposed to lifestyle diseases such as diabetes type 2. All these data prove that there is a serious nutritional problem in UAE that needs to be addressed as a way to bolster public and individual health as well as the overall quality living.

The prevalence of malnutrition and undernutrition is attributable to numerous factors. The leading cause of poor diet in many developing countries is limited access to food and food insecurity, which drive people to opt for poor and unhealthy foods (Dudley, 2017). Such food options, in most cases, are energy giving and aim at sustaining life rather than promoting proper dietary practices. However, this might not be the case for the UAE. The country currently reported a zero percent poverty rate in Abu Dhabi and Dubai, meaning that almost all people in the regions are living above 73AED per day (The United Arab Emirates, 2020).

Nonetheless, there is high consumption of fatty and sugary foods and snacks in the country, which have considerably increased the risk of cardiovascular diseases, obesity (Ng et al., 2016). According to some reports, there are various bad dietary practices, including consumption of a lot of salt, eating of foods with high-calorie volumes, and little consumption of vegetables and grains are significant issues to reckon in the country (Bardsley, 2019). As such, many people in the area are essentially malnourished, reducing the body's ability to guard itself against diseases. The malnutrition is also directly linked to the expanding rate of obesity, which continues to be a significant threat to the country (Ekelund et al., 2016).

Low consumption of vegetables and fruits, consumption of energy-dense foods, low water intake and high intake of processed drinks and foods are precursors of not only obesity but also low body nutrient levels. Vegetables and fruits have high fibre content, which helps in digestion and absorption of nutrients. Physical inactivity, which is due to low participation in sports, sedentary lifestyle, and disrupted sleep patterns, also leads to nutrition-related disorders and diseases (Brownell & Walsh, 2017; Mabry et al., 2016). Physical activity and an active lifestyle increase the metabolic rate to improve appetite and burn excess body fats.

There has been a continuing argument that some nutritional problems can simply be addressed by creating awareness to ensure that people are well-informed about the potential impacts of their food choices (Gamburzew et al., 2016). In many instances, people make poor decisions about what they choose to eat primarily because they have no idea about the potential health problems that their choices might result in (Otten et al., 2006). The majority at risk are students who end up eating foods with no nutritional value (Thompson & Amoroso, 2014). This translates to stunted growth, obesity, and lifestyle diseases among children and youths. Hajat et al. (2012) noticed that the burden of non-communicable diseases in UAE, which is partially related to poor nutritional practices, is high. They

put emphasis on the need to implement lifestyle changes, develop cardiovascular screening for the whole population, change health policies and empower communities.

### **Problem Statement**

Proper nutrition is an indispensable determinant of a happy, healthy, and satisfying living. With proper dietary practices, attaining desirable body weights, which reduces exposure to heart diseases, poor bone density, diabetes, and some cancers, is attainable. Good nutrition is also linked with the sustainable health of the next generation, improved memory, better sleep, a balanced social life, and a better mood.

However, malnutrition continues to be a significant problem that thwarts the health standards of various global regions, especially the UAE. The impact of poor feeding trends is felt by the individuals, the nation, and the society at large. At the individual level, people are exposed to lifestyle diseases, low body and mind capacities, and reduced socialisation. At the society or national level, the country has to bear a significant burden of paying medical expenses of the students suffering from malnutrition and other diseases resulting from poor feeding (Williams et al., 2015). This study aims at assessing the prevalence of obesity, assess nutrition awareness, physical activity, and sleep patterns among Abu Dhabi children to devise strategies to best address the nutritional problems determined within the targeted population

### **Objectives and Hypotheses**

#### *Objectives of the study*

- To assess the prevalence of obesity in children in Abu Dhabi.
- To determine the dietary patterns of children in Abu Dhabi.
- To evaluate the awareness of proper nutrition in children in Abu Dhabi.
- To evaluate the level of physical activity of children in Abu Dhabi.
- To determine the prevalence of cardiovascular diseases and nutrition-related diseases and disorders among children in Abu Dhabi.

#### *The Hypothesis of The Study*

The study will adopt the following null hypotheses to guide the results.

- H1: There is no significant relationship between nutrition and the prevalence of obesity among children in Abu Dhabi.
- H2: Physical activity has no significant relationship with the prevalence of obesity among children in Abu Dhabi.
- H3: There is no significant relationship between nutrition and the prevalence of cardiovascular diseases.
- H4: The creation of awareness has no significant effect on the adoption of proper dietary practices among children in Abu Dhabi.

### **Significance of the Study/ Novelty Statement**

There is an increasing prevalence of obesity, cardiovascular diseases, and nutrition-related diseases, which presumably result from physical inactivity, increased intake of fatty foods, urbanization, and high income (Al Rufaye, 2019). The disorders can lead to severe complications and even death. This puts a strain on the government and the society at large. Researching and reflecting on nutrition as a major topic would provide an opportunity to address some of the imminent health and social concerns that continue to thwart numerous lives, especially in Abu Dhabi. Most of the existing studies which have explored a related area have been focusing on the nation at large or the Emirate region in general. This is the first study to narrow down its scope specifically to children in Abu Dhabi, which creates the opportunity to gain a deeper understanding of the population.

## Literature Review

Nutrition is a significant topic that underscores a healthy living and proactive life. Understanding the dynamics and developing a holistic view of food and the patterns in which people consume them is, therefore, an indispensable responsibility in fostering healthy families, communities, societies, and future generations. Through access to necessary nutrients, the body can manufacture chemicals that bolster its protection against diseases and foster growth and development.

Nutrients are chemicals derived from the foods that people eat. Once the food is metabolised, the nutrients are absorbed by the body to carry various functions. Proper nutrition leads to good health, normal development, and high quality of life (Brownell & Walsh, 2017). On the contrary, poor nutrition is associated with malnutrition, undernutrition, and overnutrition, which causes stunted growth, chronic diseases, cardiovascular diseases and other nutrition-related disorders (Ng et al., 2011, p. 7). Research shows that low fruit and vegetable intake causes high risks of cancer, while a low intake of dietary fibre causes weight gain (Thompson & Amoroso, 2014). In this section, the focus is on theories and empirical studies that form the basis of this research.

## Theoretical Review

This study is grounded on two theories, including the family systems theory and the agency-structure sociological theory. Developed by Dr Murray Bowen, the family system theory posits that it is difficult to understand individuals in isolation (Russell, 2019). According to the theory, human behaviours can exhibit much complexity when assessed in isolation compared to when assessed through families as the smallest social fabrics. Since a family system is highly interdependent, and individuals greatly interconnect with each other, none of the individuals can efficiently be understood in isolation (Russell, 2019). Every family has specific rules, norms, and practices that cause the members of the family to think, develop emotions, behave in some predictable way, and maintain the same behavioural patterns that are consistent with the system.

The familial cohesion emphasised by the family system theory suggests that an individual's demand for food, food choices, dietary changes, and approaches to other aspects of nutrition can never be understood at an individual level (Cole et al., 2000). Thus, to understand nutrition among children in Abu Dhabi, developing an approach that would aim at assessing the holistic family system would be necessary. The family systems can be understood from the five key concepts, including emotional triangles, differentiating of self, family protection process, as well as emotional cut-off and multigenerational transmission process (Russell, 2019).

The differentiation of self, which is one of the key concepts, refers to the sense of identity and ability to function independently. Students are dependent and are emotionally bound to the family and society in which they live and interact physically and emotionally. These, in reaction, affect the person's quality of life. Children's lives depend on their parents. Their parents affect their health outcomes by the way they transfer their emotions to the children (Sheikh-Ismail et al., 2009, p. 33). In agreement with the theory, Thompson and Amoroso (2014) reported that children consume that which is provided by their parents, which means that the life of the children is significantly correlated with that of the parents. The interaction between parents also affects their children (Dudley, 2017).

Sharara et al. (2018) argue that if parents seek out each other and discuss their children's health outcomes, they are less likely to suffer from nutrition-related diseases. The parent can prevent the triple effect (malnutrition, undernutrition, overnutrition) by discussing among themselves and other society members how to prevent their children and grandchildren from eating too much fat, sugar, and calorie dense food, and provide adequate nutritionally balanced food promptly. The children should not consume too little calories, be subjected to insufficient nutrients, or consume too much to make them obese. The extent to which such projections are possible can only be understood by examining families and their structures.

The second theory considered for this study is the agency-structure sociological theory. According to the theory, human behaviours and actions are greatly controlled by an interaction of various social standards and values, power, and meaning (Loyal, 2012). The nexus among the different facets of society creates a structure that compels individuals to behave and act in a manner consistent with the structure. Generally, various structures within the society influence individual behaviours, including socioeconomic stratification, institutions and social networks, and the community or

professional standards (Loyal, 2012). Anthony Giddens, who is one of the initial proponents of the theory, mentioned that maintenance and adaptation of structures are achievable through agencies (Loyal, 2012). Individuals who are perceived as agents are expected to behave and act in a manner that is consistent with the structure. Thus, any social problem or issue can be understood by examining the competing views between structures and agents both at macro and micro perspectives.

Therefore, the agency-structure theory suggests that questioning students and their families to understand the triple effect among children in Abu Dhabi might be abstract, thereby failing to give the wider perspective of the issue as per the social structure. It calls for the need to examine the structure at each of the three mentioned levels in order to uncover the holistic issues that are related to nutrition. Thus, sticking to the familial structure theory to develop the study framework might be a potential limitation that might inhibit the holistic view of the problem.

## Empirical Review

### *Nutrition Awareness and Intervention*

Numerous researchers have examined the creation of nutritional awareness and intervention as a strategy to combat the triple effect of nutrition. Alkerwi et al. (2015) carried out a study to examine the link between nutritional awareness and quality. After collecting data from 1,351 participants aged between 18 and 69, they calculated scores on energy density, recommended compliance, and dietary diversity (Alkerwi et al., 2015). From the results, it was evident that people who attribute high importance on their food choices and gaining the related knowledge are less likely to focus their diet on foods with high energy density and more likely to diversify their diets and adopt adequate dietary recommendations. Therefore, they concluded that creating nutritional awareness can significantly and directly improve diet quality (Alkerwi et al., 2015). From the conclusion, it is evident that creating awareness is a palpable proposition that can significantly assist people in adopting healthy nutritional practices.

In essence, people must be aware of food categories in the market and understand how they might impact their health or holistic life before making an informed purchase. Gamburzew et al. (2016) found that a marketing intervention aimed at making less expensive foods with good nutritional value more visible and attractive in the market can significantly improve individual's food purchasing behaviours, especially among people with deprived income. The researchers had initially created a marketing intervention of the inexpensive food products and assessed customer awareness about them. From the study, creating a market awareness can significantly improve food choices at affordable costs.

Making appropriate food and dietary choices are essentially significant in ensuring healthy and sustainable growth of young children, Black et al., (2015) examined how integration of proper nutrition impact child development interventions. After examining cases of children aged between zero and five years, they found that children who have adequate nutrition and are well nurtured have the greatest opportunity to develop long-life sustainable health and have the best chances to thrive in their learning efforts. They further found that sustainable adult health is deeply rooted in the diets during early childhood, right from conception to age five. Consistent with this finding, Barker et al. (2018) held that parents' nutritional status before conception significantly reflects on the growth, development, and health of their young ones. Therefore, developing interventions that would improve parents, especially women's nutrition, before and after conception and lactation, is critical in exacerbating sustainable health in future generations.

### *Determinants of Healthy Eating*

The factors that influence what people, especially students, buy and eat are complex psychosocial issues that are relative to time, place, and the individual. Pescud et al. (2018) developed a framework for healthy and equitable eating in which they argued that various factors influence what people eat and how food is distributed across various social sects. They found that policies and psychosocial factors such as housing, employment, transport, education, environmental systems, as well as urban planning, are significant determinants of eating patterns. From their finding, it can be argued that people who have safe and comfortable houses, are protected from conditions that might jeopardise their food access and consumption, are well educated, have a reasonable income, and live in places

which emphasise availability and accessibility of healthy food options generally have healthy eating habits.

Arcila-Agudelo et al. (2019) also examined the determinants of healthy eating patterns among children and adolescents in the City of Mataro, Spain. After carrying out a cross-sectional study encompassing 1177 participants aged between 6 and 18 years who live in the targeted area, the researchers found that factors such as mothers' educational level, regular physical activity, and children's level of education positively influenced healthy eating patterns. Interestingly, they also found that children whose parents have higher disposable incomes are more likely to adopt unhealthy eating practices. This seems to be practical mostly among rich Emiratis who spend much time at work leaving their children with maids who know less about healthy diets and pays little attention on what children eat (Arcila-Agudelo et al., 2019). As a consequence, children grow with little knowledge about their food choices as well as their general environment. As a response to this income-related problem, it can be projected that awareness creation can be an effective mediating factor critical in ensuring that wealthy families use their resources to opt for healthier food options.

In addition, the iniquities that exist in healthy eating practices need to be addressed. Friel et al. (2017) developed a framework of the key determinants of healthy eating equities or iniquities. According to them, the core mechanisms of healthy eating depends on accessibility, availability, acceptability, and affordability of healthy foods. Ensuring healthy eating patterns demands that all these four mechanisms are grouped and improved in tandem with each other for better nutritional outcomes.

Instead of attributing healthy eating determinants to a purely external factor, Chansukree and Rungjindarat (2016) contended that various intrinsic factors drive eating patterns. They found that factors such as intentions, self-efficacy, perceived benefits, and outcome expectations significantly influence food choices. Dudley (2017), also argued that individual tastes and preferences are innate. Taste and choice can be learned or unlearned. People tend to like food depending on a pleasant feeling and satiety. Students tend to quickly learn to like foods with high levels of fats and sugar, foods offered as rewards, and foods added with salt (Chansukree & Rungjindarat, 2016). Practical experiences also have a great impact on what students eat. The fact that there are no culinary classes in UAE public schools means that students are unable to learn how to prepare meals, which can potentially lead to unhealthy practices.

### *Prevalence of Obesity*

Obesity is a medical condition that results from excess body fat. Medics suggest that person might be considered obese if the body mass index is 30 or more (Williams et al., 2015). Obesity and overweight stem from the consumption of excess calories, sedentary lifestyle, lack of enough sleep, and endocrine disruptors, among other factors. According to Williams et al. (2015), obesity increases the risk of cardiovascular diseases, type 2 diabetes, obstructive sleep apnoea, osteoarthritis and depression. It can be prevented by eating controlled portions of a balanced meal, which may contain vegetables, fibre, and low fatty foods. Physical activity increases energy expenditure; therefore, it helps manage body weight (Ekelund et al., 2016). Medications can also be administered, but they work best if they are combined with other factors like proper diet and exercise. Surgery is the last resort where stomach volume is decreased to reduce the number of nutrients absorbed in the body. Obesity remains a major problem in UAE across demographics.

A study that was carried out by Garemo et al. (2018) on preschool eating habits of children in Abu Dhabi and how it related to their weight established that the prevalence of malnutrition, wasting, and overweight was higher among Emirati children when compared to non-Emiratis. According to the study, malnutrition and overnutrition are significant problems among Emirati children and is highly linked to lifestyle rather than genetics. A preceding study had also found that dietary and activity habits are poor among Emirati adolescents compared to non-Emiratis living in the country (Haroun et al., 2017). A related study by Al-Yateem and Rossiter (2017) that studies adolescents in Sharjah aged between 9 and 13 years found that only a third of the population has healthy eating behaviour. This suggests that the remaining population are more exposed to unhealthy eating behaviours hence exhibited higher chances of being obese. As a response to these findings, there is a need to create and amplify policies that aim at improving child health interventions and enhancing awareness on nutritional choices.

Another study by Razzak et al. (2017) that examined the extent to which obesity is prevalent among Emiratis showed that obesity is prevalent in UAE at a rate of 16-28.4%, and that adult females were more likely to be obese compared to their male counterparts (Razzak et al., 2017). They recognised that obesity generates a significant burden to society in terms of healthcare costs and reduced productivity.

The link between poor nutrition and dietary practices and obesity cannot be disassociated. There is a need to establish strong interventional approaches that focus on boosting healthy dietary practices as a way of reducing obesity cases and related impacts. The literature review analysed has cast much light on nutritional practices and patterns, how they affect various social constructs, and how well the related issues and concerns can be understood. However, none of the sources analysed have exclusively delved into malnutrition, undernutrition, and overnutrition among school-going children in UAE with specific reference to Abu Dhabi. The subsequent sections are efforts to address this gap.

## **Methodology**

### **Research Design**

A quasi-experimental research design was selected in performing the study that would provide responses to the outlined hypotheses. The main reason that underlies the selection of the design is the fact that it is interested in establishing causal-effect relationships among variables (Williams et al., 2015). Consistent with the goal of a quasi-experiment, establishing causal relationships between various independent variables, including nutrition and physical activities and dependent variables, including healthy eating, the prevalence of obesity, nutritional awareness and intervention, and cardiovascular diseases. The experimenter did not manipulate the independent variables and measured their effects on the dependent variable. Also, pre-existing groups were randomly selected for this study instead of creating new groups. For the case of this study, a group was a school with students playing the role of the group members to be studied.

### **Participants**

Generally, the study collected data from 1000 participants aged between 5 years and 18 years. To be selected for the survey, the prospective participant had to be a student aged above 5 years but less than 19 years, schooling in an institution within Abu Dhabi, and can willingly and rationally take part in the survey. Any potential respondent who did not meet any of the above criteria was disqualified. The participants were selected randomly from an international school in Abu Dhabi.

### **Data Collection**

The retrospective data collection approach was selected to examine the participant's nutrition and activity levels and how likely they relate with various outcomes, including healthy eating, obesity, nutrition awareness, and lifestyle diseases due to poor diet. Three different questionnaires were distributed to each of the selected participants. The first questionnaire was the Body Image Survey that is used to assess how the participants perceived their body image and efforts they adopt to attain the perceived or desired body image. The questionnaire was extracted from research done by the Centre for Disease Control and Prevention and the National Centre for Injury Prevention and Control (Dahlberg et al., 2005). The second survey was the International Physical Activity Questionnaire (IPAQ) used to assess the physical activities that students do routinely. It was first scientifically assessed and published by Booth (2000). The short format version of the IPAQ was adopted for this study. The questionnaire will be useful in collecting data for relating physical activity and dependent variables. The last questionnaire, named Rate Your Plate and has 25 items, was used to assess what people eat and the rate at which they eat. Created by Gans et al. (2000), the questionnaire was critical in relating nutrition, both at individual and family levels, and the dependent variables. Direct data on nationality, gender, date of birth, height, weight, BMI and BMI centile, BMI were all taken by a qualified nurse.

### **Research Procedure**

The data collection process began by briefing the participants of the goal of the research, why their involvement is critical to the achievement of the goals of the research, and the efforts that are in place to foster privacy and confidentiality of personal information. They were then supplied with a

consent form, which, upon signing, confirmed that the participants were willing to consciously and truthfully take part in the survey. All the participants signed the consent form. The three questionnaires were then distributed to each of the participants at their respective schools. It took between 30 and 45 minutes for each participant to complete filling the surveys. The qualified nurse played a critical role in assessing participants and their BMI levels. Upon collection, the data from the survey were summarised into excel tables and converted into .sav files for SPSS analysis. Using questionnaires that are scientifically devised and approved and ensuring the consent of participants provided sufficient validity and reliability of the study.

### Data Analysis

The data summaries were imported into the Statistical Package for the Social Sciences version 26 (SPSS v26) for descriptive and inferential analyses. Measures of central tendency, including mean and standard deviation, were used to describe various participant characteristics, including gender, age, nationality, weight, and weight. Multivariate regression analysis was then undertaken to establish the relationships that might exist between the independent variables and the dependent variables, as stated in the hypotheses at a significance level of 95%. The null hypothesis was only to be rejected if  $p > 0.05$ .

## Results

### Descriptive Statistics

This study focused on assessing the prevalence of obesity, assess nutrition awareness, and physical activity among Abu Dhabi children. A total of 1000 students, including 398 females and 602 males recruited from an international school in Abu Dhabi, took part in the survey. Thus, 39.8% of the respondents were females, while the remaining 60.2% were males. All the participants were aged between 5 and 18 years. The main focus of the descriptive statistics was on the weight of the respondents. Analysis of the BMI centile results in Table 1 showed that 512, equivalent to 51.2% of the participants, had a healthy weight.

Table 1: Classifying Participants by Weight

| BMI CENTILE     | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid           | 66        | 6.6     | 6.6           | 6.6                |
| Healthy Weight  | 512       | 51.2    | 51.2          | 57.8               |
| Obesity         | 149       | 14.9    | 14.9          | 72.7               |
| Overweight      | 232       | 23.2    | 23.2          | 95.8               |
| Severe Thinness | 3         | 0.3     | 0.3           | 96.2               |
| Thinness        | 28        | 2.8     | 2.8           | 99.0               |
| Very Thinness   | 10        | 1.0     | 1.0           | 100.0              |
| Total           | 1000      | 100.0   | 100.0         |                    |

23.2% of the respondents were overweight, while 14.9% were obese. 6.6% of the participants did not provide any data that could help in calculating BMI, while the remaining 4.1% were thin, very thin, or severely thin. Thinness point to a possibility of undernutrition while overweight and obesity might be related to overnutrition. Both of the cases might suggest malnutrition.

Characterising weight by gender generated some fuzzy results. Generally, more male participants were obese (18.4%) compared to female (9.5%). Interestingly, the number of females that exhibited overweight (27.8%) was more than the comparative males (20.1%). 56.5% of female participants had healthy weight while the rate was 47.7% for males. The percentages were calculated by dividing the respective weight counts by gender-based totals, as presented in Table 2. The data suggest that the triple effect of nutrition was likely more impactful on the female than male participants.



Table 2: Weight by Gender

| BMICENTILE * GENDER Crosstabulation | Female     | Male       | Total       |
|-------------------------------------|------------|------------|-------------|
|                                     | 21         | 45         | 66          |
| Healthy Weight                      | 225        | 287        | 512         |
| Obesity                             | 38         | 111        | 149         |
| Overweight                          | 111        | 121        | 232         |
| Severe Thinness                     | 0          | 3          | 3           |
| Thinness                            | 3          | 28         | 28          |
| Very Thinness                       | 0          | 10         | 10          |
| <b>Total</b>                        | <b>398</b> | <b>602</b> | <b>1000</b> |

The participants were of different nationalities. Out of the 1000 participants, 426 were Emiratis. Participants whose origins were UK, USA, Canada, India, and Egypt were 149, 80, 38, 35, and 31, respectively. Thus, Emiratis presented 42.6% of the total participants. Out of the participants who were obese, 62.8% were Emiratis. Thus, the triple effect of nutrition is more impactful among Emiratis than all other nationalities combined. Generally, the greatest percentage of the participants were either the healthy weight, obese, or overweight. Cases of thinness were trivial across nationalities.

Table 3: Weight by Nationality

| BMICENTILE BY NATIONALITY | Healthy Weight | Obesity | Over-weight | Severe Thinness | Thinness | Very Thinness | (blank) | Grand Total |
|---------------------------|----------------|---------|-------------|-----------------|----------|---------------|---------|-------------|
| Algeria                   | 10             | 0       | 0           | 0               | 0        | 0             | 0       | 10          |
| Australia                 | 3              | 0       | 7           | 0               | 0        | 0             | 7       | 17          |
| Bangladesh                | 0              | 7       | 0           | 0               | 0        | 0             | 0       | 7           |
| Canada                    | 28             | 0       | 10          | 0               | 0        | 0             | 0       | 38          |
| Comoros                   | 3              | 0       | 3           | 0               | 0        | 0             | 0       | 7           |
| Egypt                     | 21             | 3       | 7           | 0               | 0        | 0             | 0       | 31          |
| France                    | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| Germany                   | 0              | 0       | 3           | 0               | 0        | 0             | 0       | 3           |
| Greece                    | 3              | 0       | 10          | 0               | 0        | 0             | 0       | 14          |
| India                     | 28             | 3       | 3           | 0               | 0        | 0             | 0       | 35          |
| Iran                      | 0              | 3       | 3           | 0               | 0        | 0             | 0       | 7           |
| Iraq                      | 0              | 3       | 0           | 0               | 0        | 0             | 0       | 3           |
| Ireland                   | 3              | 0       | 0           | 0               | 0        | 0             | 3       | 7           |
| Jordan                    | 21             | 0       | 3           | 0               | 0        | 0             | 0       | 24          |
| Malawi                    | 0              | 0       | 3           | 0               | 0        | 0             | 0       | 3           |
| Netherlands               | 3              | 0       | 0           | 0               | 4        | 0             | 0       | 7           |
| New Zealand               | 3              | 0       | 3           | 0               | 0        | 0             | 0       | 7           |
| Oman                      | 7              | 0       | 14          | 0               | 0        | 0             | 0       | 21          |
| Pakistan                  | 10             | 3       | 0           | 0               | 0        | 0             | 0       | 14          |
| Philippines               | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| Russia                    | 3              | 0       | 0           | 0               | 0        | 0             | 3       | 7           |
| Saudi Arabia              | 0              | 3       | 10          | 0               | 0        | 0             | 3       | 17          |
| South Africa              | 3              | 3       | 7           | 0               | 0        | 0             | 3       | 17          |
| Sri Lanka                 | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |

| BMICENTILE BY NATIONALITY | Healthy Weight | Obesity | Over-weight | Severe Thinness | Thinness | Very Thinness | (blank) | Grand Total |
|---------------------------|----------------|---------|-------------|-----------------|----------|---------------|---------|-------------|
| Sudan                     | 7              | 0       | 10          | 0               | 0        | 0             | 0       | 17          |
| Thailand                  | 3              | 0       | 3           | 0               | 0        | 0             | 0       | 7           |
| Tunisia                   | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| Turkey                    | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| UAE                       | 170            | 94      | 97          | 3               | 24       | 10            | 28      | 426         |
| UK                        | 97             | 21      | 21          | 0               | 0        | 0             | 10      | 149         |
| USA                       | 59             | 3       | 10          | 0               | 0        | 0             | 7       | 80          |
| Venezuela                 | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| Zimbabwe                  | 3              | 0       | 0           | 0               | 0        | 0             | 0       | 3           |
| Grand Total               | 512            | 149     | 232         | 3               | 28       | 10            | 66      | 1000        |

### Inferential Statistics

Multivariate regression analysis generated various results from the collected data.

Table 4: The Summary of the Model

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .750 <sup>a</sup> | .563     | .554              | 5.62074                    |

a. Predictors: (Constant), nutrition, physical activity, awareness creation

The multiple correlation coefficient ( $R = 0.563$ ) in Table 4 shows that there is a good level of prediction between the dependent variables and the independent variables. The R square ( $R^2 = 0.563$ ) shows that the independent variables can explain 56.3% of the variabilities within this study dependent variables.

Table 5: Nutrition and physical activity vs. Obesity

| Model 1           | Coefficients <sup>a</sup>   |            |                           |        |       |
|-------------------|-----------------------------|------------|---------------------------|--------|-------|
|                   | Unstandardized Coefficients |            | Standardized Coefficients |        |       |
|                   | B                           | Std. Error | Beta                      | t      | Sig.  |
| (Constant)        | 87.250                      | 6.127      |                           | 13.668 | 0.000 |
| Nutrition         | -.169                       | 0.065      | 0.177                     | -2.721 | 0.015 |
| Physical Activity | -.122                       | 0.045      | 0.259                     | -3.882 | 0.000 |

Dependent Variable: Obesity

From Table 5, nutrition significantly affects the prevalence of obesity ( $p < 0.05$ ). However, the effect is negative ( $B = -0.169$ ). The Beta value means that unit increase in nutritional patterns would reflect into 0.169 units reduction in the prevalence of obesity. On the same note, Physical activity negatively ( $B = -0.122$ ) and significantly affects the prevalence of obesity ( $p < 0.05$ ).

Table 6: Nutrition vs. cardiovascular diseases

| Model 1    | Coefficients <sup>a</sup>   |            |                           |        |       |
|------------|-----------------------------|------------|---------------------------|--------|-------|
|            | Unstandardized Coefficients |            | Standardized Coefficients |        |       |
|            | B                           | Std. Error | Beta                      | t      | Sig.  |
| (Constant) | 65.971                      | 9.552      |                           | 17.396 | 0.000 |
| Nutrition  | -.258                       | 0.047      | 0.264                     | -5.342 | 0.001 |

Dependent Variable: Cardiovascular Diseases

Nutrition and cardiovascular diseases were also related at a significance level of 95%. Results, as indicated in Table 6, show that nutrition levels negatively and significantly affect the prevalence of cardiovascular diseases among children in Abu Dhabi ( $p < 0.05$ ;  $B = -0.258$ ). For every unit of positive adjustment in nutrition and dietary patterns, the prevalence of cardiovascular diseases decreases by 0.258 units.

Table 7: Creation of Awareness vs. Dietary Practices

| Model 1            | Coefficients <sup>a</sup>   |            |                           |        |       |
|--------------------|-----------------------------|------------|---------------------------|--------|-------|
|                    | Unstandardized Coefficients |            | Standardized Coefficients |        |       |
|                    | B                           | Std. Error | Beta                      | t      | Sig.  |
| (Constant)         | 59.782                      | 5.285      |                           | 10.325 | 0.000 |
| Awareness Creation | .387                        | 0.087      | 0.502                     | -2.461 | 0.025 |

Dependent Variable: Dietary Practices

The last test was on the effect of creating awareness on dietary choices on dietary practices. The result shows that creating awareness of nutrition and dietary choices positively and significantly affects dietary practices ( $p < 0.05$ ;  $B = 0.287$ ).

## Discussion

The study aimed at testing four hypotheses to assess the prevalence of obesity and cardiovascular diseases as well as dietary practices among students in Abu Dhabi and how well nutrition, physical activities, and awareness creation can help to address or improve these conditions. This section discusses how the study's results respond to each hypothesis.

### Nutrition and Prevalence of Obesity

The first null hypothesis held that there is no significant relationship between nutrition and the prevalence of obesity among children in Abu Dhabi. From the results, the p-value is 0.015 ( $p < 0.05$ ). As such, the null hypothesis is rejected and the alternative adopted. Nutrition levels significantly affect the prevalence of obesity. This means that adopting approaches that would improve nutritional levels both at family levels and societal levels would significantly reflect the reduced prevalence of obesity among children schooling in institutions within Abu Dhabi.

### Physical Activity and Prevalence of Obesity

The second hypothesis was that physical activity has no significant relationship with the prevalence of obesity among children in Abu Dhabi. The results returned a p-value of 0.000 ( $p < 0.05$ ), leading to the rejection of the null hypothesis. Thus, physical activities strongly and significantly influence the prevalence of obesity among children in Abu Dhabi. As such, children should be encouraged to be involved in more physical activities is a significant step in reducing the prevalence of obesity.

### Nutrition and Prevalence and Cardiovascular Diseases

The third null hypothesis postulated that there is no significant relationship between nutrition and the prevalence of cardiovascular diseases. The regression for the two variables returned a p-value of 0.001 ( $p < 0.05$ ), showing that the relationship between nutrition levels and prevalence of

cardiovascular diseases is indeed significant; thus, reject the null hypothesis and adopt the alternative. The prevalence of cardiovascular diseases among school children aged 8-20 can significantly be reduced by encouraging good nutrition patterns, both at family and societal level.

### Creation of Awareness and Dietary Practices

The last null hypothesis held that creating awareness on nutritional choices and patterns has no significant effect on the adoption of proper dietary practices among children in Abu Dhabi. From the regression analysis, the relationship is significant ( $0.025=p<0.05$ ), as such, reject the null hypothesis. Creating nutritional awareness in schools within Abu Dhabi can significantly dietary practices among the children leading to more healthy and sustainable youths and future adults. The main limitation of the study is that the participants were selected from a single institution. With this, it is difficult to analyse the impact of different environments on the students' nutritional standards.

### Conclusion

The study has assessed the prevalence of obesity and cardiovascular diseases as well as dietary practices among students in Abu Dhabi, and how well nutrition, physical activities, and awareness creation can help to address or improve these conditions. The study shows that the triple effect of nutrition, including malnutrition, undernutrition, and overnutrition, exceedingly affects Emirati children, especially females, as compared to all students from other nationalities combined. Students preferred sodas, fast foods, and high sugary foods that have a negative impact on their health.

The result implies that there is a need to intensify efforts both at family and society levels to implement strategies that would bolster the health and holistic lives of the children. The study has shown that improving nutrition levels, encouraging the students to involve in more physical activities, and creating awareness, especially on food choices, can significantly reduce the prevalence of obesity and cardiovascular diseases and improve dietary practices. This can best be achieved by introducing nutrition education in schools.

As part of this study, it is recommended that schools take the leading role in integrating practical culinary classes and activities founded on scientific nutrition and physical education in their curriculum, and the education systems should establish ways to support and reinforce the educational programs. Agencies and organisations with interest in nutrition, diet, and healthy living should take an active role in creating awareness of food choices and assist families in accessing proper and affordable diets. Future research should delve into frameworks through which the recommendations can be attained.

### Author biography

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