Socio-demographic characteristics, body image, self-esteem and their associations with overweight and obesity among Emirati adolescents living in Abu Dhabi, UAE

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Abbreviations

ADFCA	Abu Dhabi Food Control Authority
BMI	Body Mass Index
BMIC	BMI Categories
BS	Body Shape
BSQ	Body Shape Questionnaire
CDC	Centres for Disease Control and Prevention
DALYs	Disability Adjusted Life Years
DWP	Department for Work and Pensions
EU	European Union
GCC	Gulf Cooperation Council
HBSC	Health Behaviour in School-aged Children
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IOTF	International Obesity Task Force
MENA	Middle East and North Africa
NHANES	National Health and Nutrition Examination Survey
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
RSE	Rosenberg Self-Esteem
SD	Standard Deviation
SE	Self-Esteem
SES	Socio-Economic Status
UAE	United Arab Emirates
UI	Uncertainty Interval
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

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Abstract

Introduction: The UAE youths' frequency of being more obese is twice to be thrice greater than the published international standards. The United Arab Emirates schoolchildren/youth (ages 10-18) are said to be 1.8 times more obese than those in the United States, according to statistics from the First United States National Health and Nutrition Examination Survey. According to World Health Organisation report, the UAE has been classified as the second highest for obesity rates in the world. As a result of these obesity statistics among the youths, there are associated diseases, which tend to plague the UAE adults later including cardiovascular diseases, diabetes, hypertension and others, Immanuel, and Cynthia (2017).

There is a dearth of research on obesity in the Gulf Cooperation Council (GCC) countries and the UAE in particular. In addition, there is quasi absence of quality and frequency of health and obesity awareness campaigns about the risks engendered by obesity, as excess adiposity is a key independent risk factor for the future development of many diseases such as heart disease and diabetes. Population studies using representative samples need to accurately and effectively estimate the psychosocial, social, economic, and lifestyle factors that lead to obesity and their impact on public health, especially on adolescents.

Specific aims: The study aims to investigate the association between socio-demographic characteristics, body image, and self- esteem, specificly:

a. To explore determinants of Obesity/BMI among adolescents in the UAE/Abu Dhabi.
b. To explore the relationship between socio-demographic factors and BMI among adolescents in Abu Dhabi, UAE.
c. To explore the associations of body image and self-esteem with BMI among adolescents in Abu Dhabi, UAE.
d. To examine the effect of various socio-demographic factors on body image and self - esteem amongst adolescents in Abu Dhabi, UAE.

e. To investigate whether body image and self-esteem mediates the relationship between socio-demographic factors and BMI.

Methods: Using a cross sectional study design, a random representative sample of adolescents' (N=1,181; 48.8% males) aged 14-17 years was recruited from public and private schools in Abu Dhabi, during the academic year 2011-2012. Participants completed a questionnaire collecting socio-demographic, Health Behavior in School-aged Children (HBSC), Rosenberg Self-Esteem Scale (RSE), and Body Image Satisfaction Questionnaire (BSQ) data. Body mass index-derived estimates of obesity were calculated using international cut-off: the World Health Organization (WHO).

Results: The overall prevalence of Overweight and Obesity (30.4%) was about three times higher than the prevalence of Underweight (9.4%). Multivariate regression confirmed that BS was positively associated with adolescents' overweight and obesity, also it was the most significant superior predictor in the BMI regression model. SE was negatively associated with adolescent overweight and obesity. Moreover, Dieting, Parent's obesity, Watch TV, and Often Fell Lonely were identified as positive correlates of adolescent obesity, where, Parent's Education, Excellent Health, Breakfast, Physically Activities, and Monthly Income were identified as negative associate of adolescent obesity. In addition, BS, and SE mediate the association between most of socio-demographic factors and BMI.

Conclusions: This study confirms a high prevalence of overweight and obesity among adolescents aged 14-17 years in Abu Dhabi. Our findings revealed adolescents with high BMI were those who were dissatisfied with their body shape, and had low self esteem. It is necessary to plan actions aimed as reinforcing and increasing self-esteem, focusing on the adolescents' with overweight and obesity problems. This is the first study in Abu Dhabi that estimates the relationship between BMI and socio demographic factors through the mediations of BS and SE, as it has contributed to the body of existing knowledge and a better understanding of mediating affect from UAE culture. One of the most important and strongest findings of this research is the

establishment of the first model in Abu Dhabi that contains most types of independent variables, including social, Eating-Dieting, psychological, physical, and economic, that can predict in highly accurate the BMI value of adolescents according to various criteria. However, there is still a huge lack of research on overweight and obesity in the United Arab Emirates, as this study only focus on adolescents aged 14-17 in Abu Dhabi, and before generalizing the results to the entire population, I recommend that other future studies will include all of these categories UAE population. Not just residents of Abu Dhabi. In addition, more mediation research in this area should be conducted to educate the people of the UAE on the importance of these studies.

Chapter 1
Introduction

1.1 Introduction and general background

This study aims to investigate the association between socio-demographic characteristics, body image, and self-esteem by exploiting a survey sample consisting of 1,181 adolescents, aged 14–17 years and living in Abu Dhabi, United Arab Emirates (UAE). In the context of the thesis, we will mention this sample as *adolescents*, which will generalize the result to this category of the study population, knowing that the actual category of adolescents according to the classification of the United Arab Emirates is as follows:

Females: from the age of 10 to the age of 18

Males: from the age of 13 to the age of 19

However, WHO defines 'Adolescents' as individuals in the 10-19 years age group and 'Youth' as the 15–24-year age group. While 'Young People' covers the age range 10-24 years.

WHO classification of age groups

Category	Age/years
Child	Below 18 years
Adolescents	Between 10 and 19 years
Youth	Between 15 and 24 years
Young	Between 10 and 24 years
Adult	More than 19 years

Source: WHO 2016

Furthermore, in this study, the age group (14-17 years old) was selected from the adolescents for several reasons, the most important of which are:

1. The age group among adolescents (14-17 years old) begins to become independent of their parents in many areas of life, especially the control of eating patterns to get rid of parental pressure, which in most Arab countries forces their children to have a lot of excess food, being obese, according to parents, is a positive indicator of a child's health.
2. At this stage, adolescents' (ages 14-17) begin to pay more attention to their body and weight, especially girls.
3. At this stage, adolescents (ages 14-17) also begin to feel the negative psychological aspects of being overweight or obese.

Adolescent health has become a focus of attention for policy makers and the research community, with many clinical trials being initiated and an emerging synthesis of evidence about interventions that target their health and nutrition. Given the global magnitude of nutritional issues in adolescents and the lack of cohesive guidelines, it is important to ensure that nutrition care recommendations are informed by the best available evidence, and measures should be taken to develop evidence-based nutrition recommendations (Lassi, et al., 2017).

Notwithstanding, there are over 1.8 billion young people in the world today, of which 88% live in low- and middle-income countries (LMICs) (WHO, 2016a). The economic and social wellbeing of any country will one day depend on its current adolescent population. Adolescents are considered a healthy age group who will eventually enter the work force and contribute to the economic productivity of any country. Adolescence is a

continuation of the foundation being laid for adequate growth and development. It is often perceived to be a period requiring less intervention and, thus, this period in life could very well be a missed opportunity worldwide for ensuring better outcomes for all individuals in the future. Unchecked malnutrition in adolescents leads to an adult life with health problems. The top five leading causes of mortality and years lost to death and disability for adolescents (disability-adjusted life years (DALYs)) contribute to 33% and 25% of the total burden, respectively (WHO, 2016b). Therefore, this thesis is focusing on adolescents as target population to ascertain their nutritional status and psychological wellbeing. The data in this study that explore potential factors associated with obesity prevalence were collected initially between January 2011 and March 2012, and involved the participation of 1,181 adolescents'. The findings revealed clear indicators that UAE adolescents are at increased risk of being overweight. Moonesar and Hickman (2017) found that obesity prevalence among UAE youth is twice that of the international level, and also noted that "the World Health Organization report, has classified the UAE as the second highest for obesity rates in the world".

As the UAE's political, economic and social landscape has changed at an unprecedented pace and scale over the last decade, this study aims to find out whether the 2012 findings are still pertinent, and whether the rate of youth obesity has abated over time or worsened, based on the recent literature findings on obesity in the UAE. As part of the evaluation of the recent literature, this study was compared alongside existing literature to identify potential limitations and gaps within the obesity literature in the Gulf region, and provides an assessment of any fresh insights that emerged with regard to the rise of youth obesity in the UAE and the measures taken by the government to tackle this issue.

Obesity is a growing societal and public health concern worldwide (Albuquerque *et al.*, 2017; White, 2017; Fox, Feng and Asal, 2019; Alruwaily *et al.*, 2020; Coates and Boyland, 2020; WHO, 2020). Obesity is a research area that has been extensively investigated and debated by academics, government officials and health experts. Moreover, as the pace and scale of obesity have reached pandemic proportions, currently affecting millions of people worldwide, obesity still generates interest and there is every reason to believe that the obesity problem is set to continue to put a huge social, economic and health burden on a country's resources (White, 2017; Purnell, 2018; Alruwaily *et al.*, 2020; Coates and Boyland, 2020; WHO, 2020). Uzogara (2016) supports the view that recent obesity trends are on the rise globally and have reached epidemic proportions in many countries, with serious health and socio-economic consequences. Moreover, the obesity epidemic has not spared any race, age, sex, ethnicity or economic group, although obesity prevalence may be higher amongst the most deprived groups in society (Uzogara, 2016; Fox, Feng and Asal, 2019; Department of Health & Social Care, 2020).

Obesity and overweight are no longer just a preoccupation for industrialised affluent countries; developing, middle-income or emerging economy countries are also affected by the epidemic (Albuquerque *et al.*, 2017; White, 2017; Fox, Feng and Asal, 2019; Alruwaily *et al.*, 2020; WHO, 2020). The International Obesity Task Force ([IOTF], 2020) estimates that obesity rates worldwide will increase significantly by 2025. Evidence from the United States of America (USA) suggests that obesity has continued its upward trend, with 35.1% of US adults aged 20 years and above reported to be obese, while 69% of US adults have excess body weight (overweight and obesity) (Uzogara, 2016). Similarly, obesity is one of the greatest long-term health challenges that the United Kingdom (UK) faces. According to the Department of Health & Social Care (2020),

"Today, around two-thirds (63%) of adults are above a healthy weight, and, of these, half are living with obesity. We have 1 in 3 children leaving primary school who are already overweight and 1 in 5 living with obesity". The rapid increase in the number of obese people in the UK is a worrying public health issue. Analysis by the government's Foresight programme shows that over half of the UK adult population could be obese by 2050. The economic implications are considerable. The National Health Service (NHS) costs attributable to overweight and obesity are projected to double to £10 billion per year by 2050.

With regards to the six Gulf Cooperation Council (GCC) countries (the UAE, Saudi Arabia, Qatar, Oman, Kuwait and Bahrain), obesity and overweight prevalence, as in the USA and the UK, is on the rise as over 30% of the population in these countries is classified as obese ($\geq 30\ kg/m^2$), and more than 60% have a weight range higher than normal ($\geq 25\ kg/m^2$) (Al-Haddad, Little and Ghafoor, 2005; AlNohair, 2014; Rabeea, Eldabi and Kamel, 2019). According to a study by the Global Burden of Disease (2017), the Middle East and North Africa (MENA) region had the second highest prevalence of obesity in women at 33.9%, with the USA being the most obese (36.2%). The majority of the countries within the MENA region are among those with the highest rates of obesity worldwide (Al Junaibi, 2013; Lessan *et al.*, 2020). The following table provides a clear picture of the obesity prevalence in the MENA region.

Table 1.1: Gender obesity caps in the MENA region in 1990 and 2016

	1990			2016		
	Male obesity	**Female obesity**	**Percentage point difference female–male**	**Male obesity**	**Female obesity**	**Percentage point difference female–male**
Egypt	9.7%	25.2%	15.5	22.7%	41.1%	18.4
Saudi Arabia	14.4%	28.5%	14.1	30.8%	42.3%	11.5
Tunisia	6.9%	19.6%	12.7	19.1%	34.3%	15.2
Yemen	2.9%	8.2%	5.3	12.0%	22.0%	10.0
MENA region	5.8%	14.3%	8.5	15.7%	26.0%	10.3
World	5.0%	8.6%	3.6	11.1%	15.1%	4.0

(Source: Costa-I-Font and Gyori (2018) based on data from the WHO Global Health Observatory)

In short, according to World Obesity (2020), all countries are significantly off track to meet the 2025 World Health Organization (WHO) targets on obesity. World Obesity (2020) estimates that on current trends, one in five adults worldwide are expected to have obesity by 2025. Low- and middle-income countries are experiencing the greatest rise and highest numbers, and these countries are unlikely to meet the WHO targets. In contrast, more than 1.9 billion adults were overweight in 2014. Of these, over 600 million were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese and over 38% of men and 40% of women were overweight. By 2025, global obesity prevalence is predicted to reach 18% in men and surpass 21% in women, with many countries experiencing much higher levels. Five countries—the USA, China, Brazil, India and Russia—account for around one-third of all cases of obesity in adults globally (World Obesity, 2020). It is worth pointing out that the rate of obesity in women is higher than that of men.

1.2 The research context

This section provides an overview of the association between socio-demographic characteristics, body image, and self-esteem amongst UAE adolescents. This information is relevant as it contextualises and positions this study on obesity within a relatively small, fast-developing country in the Middle East. The UAE population was 9,634,073 as of the 28th of February 2019, based on the latest United Nations estimates. Twelve percent of the population are UAE nationals, while the majority of the population are expatriates, consisting of more than 200 nationalities. Ninety-three percent of the population is urban and the median age in the UAE is 33.5 years.

The UAE has become a model of economic growth and a symbol of excellence in living standards, leading to fundamental changes in the population's lifestyle, dietary habits and patterns of physical activity in a relatively short time (Rabeea, Eldabi and Kamel, 2019). The UAE consists of seven states: Abu Dhabi, Dubai, Ajman, Fujairah, Ras al Khaimah, Sharjah and Umm al Qaiwain. Each of these states has its own identity and individual characteristics (some are more liberal in their attitudes to clothing, etc. than others), but they also share many commonalities (Drewnowski and Popkin, 1997; Rabeea, Eldabi and Kamel, 2019).

The UAE plays a leading role in initiating innovative and creative approaches to sustain economic growth and many major developments have taken place, transforming the UAE landscape nationwide in terms of construction and infrastructure, and encouraging innovation and entrepreneurship. In an age driven by social media and where family life, spiritual and social traditions are being invaded and eroded by technological gadgets, the UAE is trapped between 'Westernisation' and traditional Islamic values. Moreover, urbanisation and economic expansion have changed the perception of diet and

manners of work, whereby an inactive lifestyle has increased in the UAE. This dietary change includes the higher intake of sugar, fat and decreased consumption of dietary fibre, fruit and vegetables (Drewnowski, 2003). This is regarded as a 'nutritional transition', which is the fundamental aspect for many chronic systematic illnesses such as hypertension, stroke, coronary heart disease and diabetes. Such worldwide modification and nutrition transition with unpleasant health effects involves an expansion of the childhood and adolescents' obesity rate (Drewnowski and Popkin, 1997; Rabeea, Eldabi and Kamel, 2019). The nutritional behaviours and lifestyle of the population of Arab countries (Gulf States/Arabian Gulf) have also shifted drastically as an outcome of the increase in financial income from oil revenue (Musaiger, 1993). The UAE is a country that has accomplished great progress and development in a short time. The standard of living has improved, and luxurious lifestyles have also contributed to a change in patterns for UAE individuals with more fast food consumed; people are less active because of high technology and they are more dependent on household servants (Khadri, 2010; Rabeea, Eldabi and Kamel, 2019).

Recent theories on obesity causes suggest that environmental aspects are foremost in the fast-growing population obesity levels, rather than physical determinants like evolutionary genetic modifications (Swineburn *et al.*, 1999; Kumanyika *et al.*, 2020; Ward *et al.*, 2019). More specifically, social changes in modern environments appear to follow the observed increases in obesity rates over the same time period (Ball *et al.*, 2005). It is therefore considered that social factors play a great role in driving the prevalence of obesity. However, there is another debate in the literature, whereby few studies have examined the link between socio-cultural variables and obesity risk patterns associated with eating and physical activity. Possible socio-cultural (or socio-

environmental) aspects of obesity involve not only social situations such as economic and material assets, but also social standards concerning body weight, physical activity and eating, levels of social support for anti-obesity patterns, social resources, social and cultural customs, and values or prospects for what is essential in association with the function of food or the suitability of dynamic exercise (Ball *et al.*, 2006).

Empirical studies also indicate that obesity is influenced by ethnicity, with minority and migrant groups in Western countries displaying much greater obesity prevalence than the ethnic majority (Booth *et al.*, 2001; Rennie and Jebb, 2005; Wang and Beydoun, 2007). The origins of such ethnic differences in obesity patterns are inconclusive and still require in-depth research, while studies into the effects of certain essential socio-cultural roles on obesity are very limited.

1.3 Statement of the problem

There is a dearth of research on obesity in the GCC countries, and the UAE in particular. While in developed countries obesity has become widely viewed as a serious health risk, in developing countries, and particularly in the Middle East, the topic of obesity does not generate the same interest or concern, as 'big' is traditionally regarded as beautiful. In addition, there is a quasi absence of quality and frequent health and obesity awareness campaigns about the risks engendered by obesity. Thus, the UAE, like most other GCC countries, has fallen short in addressing the acute issue of obesity due to the lack of a clear anti-obesity programme, coupled with a strong cultural resistance to changing dietary habits, work patterns and inactive lifestyles. Due to the increasing prevalence of obesity and its immediate and long-term impact on health, including the predisposition to diabetes and cardiovascular abnormalities, adolescents' obesity should be considered as a serious concern for public health. Although the UAE demonstrates great optimism and

vision in continuously improving its citizens' well-being, productivity, quality and competitiveness as a vital aspect of nation building (Thawani, 2014), the growing trends of obesity have been overlooked (Rabeea, Eldabi and Kamel, 2019). It is necessary to assess the existing evidence on obesity, as there is currently little research within Abu Dhabi to analyse the trends of adolescents' obesity and the factors that cause the high rate. The UAE is undergoing a rapid change in the region, which will require a constantly refreshed and agile workforce that is well prepared to face the challenges ahead. A holistic programme and a proactive, strategic approach are needed to curtail and address obesity in all segments of the population, with a specific focus on child obesity. The approach must include initiatives such as changing sedentary lifestyles, while introducing effective economic measures to reduce the consumption of foods high in saturated fats and other energy-dense foods in order to prevent and treat obesity. Moreover, over the last three decades, UAE adolescents' have become overweight as the majority are adopting a more Westernised style of eating, which includes eating foods loaded with fat and sugar, and low in fibre (Siegler *et al.*, 2014). Health experts indicate that obese adolescents' are at a higher risk of remaining obese throughout adulthood (Siegler *et al.*, 2014; Rabeea, Eldabi and Kamel, 2019; Shah, Hagell and Cheung, 2019; Alruwaily *et al.*, 2020; Van Haute *et al.*, 2020).

1.4 Research objectives and questions

The overall aim of the research was to explore socio-demographic factors, self-esteem, body image and their associations with overweight and obesity in school-attending adolescents' aged 14–17 years residing in Abu Dhabi, UAE.

1.4.1 The research objectives

1) To explore the determinants of obesity/BMI.

2) To explore the relationship between socio-demographic factors and BMI.
3) To explore the associations of body shape perception and self-esteem with BMI.
4) To examine the effect of various socio-demographic factors on body shape perception and self-esteem.
5) To investigate whether body shape perception and self-esteem mediates the relationship between socio-demographic factors and BMI.

1.4.2 The research questions

1) Do body shape perception and self-esteem affect the BMI among adolescents in Abu Dhabi? Which stems from the following hypotheses:

   Null hypothesis (1): There is no statistically significant association between BMI and body shape perception.

   VS

   Alternative hypothesis (1): There is statistically significant association between BMI and body shape perception.

   Null hypothesis (2): There is no statistically significant association between BMI and self-esteem.

   VS

   Alternative hypothesis (2): There is statistically significant association between BMI and self-esteem.

2) Do the socio-demographic factors predict obesity (BMI) among adolescents' in Abu Dhabi?
3) Does self-esteem mediate socio-demographic variations in BMI among adolescents' in Abu Dhabi?

4) Does body shape perception mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?

1.5 The importance of this study

This study is imperative in view of the limited research on obesity in the Gulf region, where it is starting to reach alarming proportions. The motivation for undertaking this study is to raise awareness of the growing rates of obesity and its associated health risks. There is a paucity of research on the determinants of overweight and obesity in adolescents' in the UAE. The broad literature on obesity is mainly Western-oriented and is also under-researched in the GCC countries. In addition, the extant literature has focused heavily on overweight and obesity among adults, although childhood and adolescents' obesity continues to be a major public health concern in the UAE. There is a need for research related to socio-cultural or psychological factors to assess the obesity drivers and implement strategies to promote healthy weight awareness among adolescents'. Although many studies have investigated both causes and solutions to the childhood and adolescents obesity epidemic, there are still areas that remain to be explored further. This study aims to investigate the trends and the drivers that contribute to the obesity epidemic, focusing on the 14–17-year age group in Abu Dhabi, UAE**.** This study has several practical implications. Firstly, it will benefit and alert decision-makers to understand the source of adolescents' obesity problems and the causal factors. It will provide Abu Dhabi with an adequate strategic anti-obesity framework to respond to the challenges of delivering an effective health service in line with the UAE 2030 Vision. Secondly, it will help formulate an anti-obesity programme based on the findings of this study. Thirdly, this study will provide a platform for future research on the drivers of obesity, as it will expand the existing literature on obesity in the Middle East.

The findings of this study intend to have wider implications in the Gulf countries. This research will provide a platform for future researchers by expanding the existing literature within the Gulf region. Future researchers can benefit from the results of this study by undertaking research in GCC countries and comparing the influencing obesity factors. The findings of the study aim to support decision-makers to put the scourge of obesity at the top of their agenda.

This study's findings will benefit the UAE youth through being aware of the detrimental effects of poor health choices, and will provide them with the knowledge to make better health choices. Adopting healthy lifestyle behaviour could improve the quality of life and in turn decrease the economic burden on society. Research indicates that obese children are more likely to be obese adults (Belon *et al.*, 2016; Gies *et al.*, 2017; Tran *et al.*, 2019; Abduelmula *et al.*, 2020; Lauren *et al.*, 2020). A holistic approach to fighting obesity through lifestyle changes can be addressed with education and by reducing sedentary lifestyles and poor nutrition.

Key stakeholders interested in this topic:

- Decision makers and government policy makers.
- Future researchers will also benefit from the extensive literature on obesity and overweight.
- The study findings will benefit the key stakeholders (nutritionists, clinicians, health experts and educationalists) to understand the source of the problem of adolescents' obesity in the UAE, and enable them to target the main obesity predictive factors and consider the recommendations for how to respond to the challenges of addressing obesity prevalence.

Chapter 2
Literature Review

2.1 Introduction

This chapter critically evaluates the relevant literature on obesity drivers, focusing on the association between socio-demographic characteristics, body image and self-esteem. The literature review was initially conducted over the period from January 2010 to March 2012. This was then compared with the prevailing literature to explore changes over time in order to identify potential limitations and gaps.

2.2 The epidemiology of obesity: the big picture

Obesity is a growing societal and public-health concern worldwide. The pace and scale of obesity have reached pandemic proportions, currently affecting millions of people worldwide (Purnell, 2018; Fox, Feng and Asal, 2019; Department of Health & Social Care, 2020; WHO, 2020), whereby "Obesity and overweight trends have reached epidemic proportions in many countries" (Uzogara, 2016, p. 3). Obesity and overweight have long been recognised as a growing global health issue. The WHO (2020) states that overweight and obesity represent a rapidly growing threat to the health of populations in an increasing number of countries. In addition, according to the WHO, obesity ill-health problems are now so common that they are replacing more traditional problems such as undernutrition and infectious diseases as the most significant causes of ill-health. In April 2020, the WHO published the following alarming facts:

- Worldwide obesity has nearly tripled since 1975.

- In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese.
- 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese.
- Most of the world's population live in countries where overweight and obesity kills more people than underweight.

The US National Centre for Health Statistics (2020) released data stating that the average American has become heavier over the last two decades. Most parts of the world have witnessed a rise in obesity and overweight in recent decades. In China, obesity rates have risen significantly since 2002, when 29% of adults were overweight, driven by the country's recent rapid economic growth that has brought about major changes to lifestyle, diet and physical activity. A study by Ma *et al.* (2020) concluded that the prevalence of overweight, obesity and abdominal obesity has increased markedly among Chinese adults during the past two decades. Currently, over half of adults in China, or more than half a billion people, are now overweight (WHO, 2020; BBC, 2020). In Mexico, obesity is the leading public health concern and has been on the rise for the past 30 years. A national survey conducted in 2018 found that 36.1% of adults had obesity (BMI $\geq$ 30 kg/m^2), with a substantially higher prevalence in women than in men (40.2% vs. 30.5%) (Barquera and Rivera, 2020). In England, obesity is one of the greatest long-term health challenges. Around two-thirds (63%) of adults are above a healthy weight, and of these, half are living with obesity (Public Health England, 2021). In addition, the growing obesity rates indicate that more than half the population is now overweight in 34 out of 36 Organisation for Economic Co-operation and Development (OECD) countries, and almost one in four

people is obese. Average rates of adult obesity in OECD countries have increased from 21% in 2010 to 24% in 2016.

The inhabitants of the Arabian Gulf have also grown heavier in recent years, caused partly by the rise of an American-style culture of lavish lifestyles, cars, air conditioning, and fast food Alruwaily *et al.*, (2020). Three of the six member states of the GCC are among the top 15 countries with the highest body mass index (BMI) worldwide. Kuwait ranked third, while Qatar and the UAE respectively took 8th and 11th place, and the USA came in at 17th (Scott, 2015). A recent study conducted by Ward *et al.* (2019) published in the New England Journal of Medicine estimated that by 2030, nearly half of all adults in the USA will have obesity, with a prevalence not below 35% in any state, while nearly one in four will have severe obesity, with a prevalence higher than 25% in 25 states. In England, updated data from the National Child Measurement Programme are equally alarming—rates of severe obesity in children aged 10–11 years have increased for the fourth consecutive year, reaching a new high of 4.4% in 2018–2019 (vs. 3.7% in 2014–2015). Furthermore, the prevalence of obesity has increased in children aged 4–5 years to approximately 10%, while remaining at around 20% in those aged 10–11 years (The Lancet Diabetes & Endocrinology, 2020).

According to Purnell (2018, p. 7):

> Obesity is now recognised as a chronic or non-communicable disease. Recent research has clarified the physiology of weight regulation, the pathophysiology that leads to unwanted weight gain and maintenance of the obese state even when reasonable attempts in lifestyle improvement are made, and the adverse health consequences of generalized and central obesity.

The definition of obesity has been reviewed by the IOTF (2020) and the WHO (2020), taking into consideration the differences in ethnicity. The higher prevalence has

been reflected in the wider definition of obesity resulting in 1.7 billion people in the world being classified as overweight (IOTF, 2020; WHO, 2020).

Many researchers on obesity (Nicklas *et al.*, 2001; Belon *et al.*, 2016; Gies *et al.*, 2017; Romieu *et al.*, 2017; Purnell, 2018; Al-Salameh *et al.*, 2019; Tran *et al.*, 2019; Ward *et al.*, 2019; Lauren *et al.*, 2020) have suggested that about 70% of obese adolescents grow up to become obese adults (Harvey and Patterson, 2009; Perry Hoelscher and Kohl, 2015). Thus, identifying the factors that influence childhood and adolescent obesity are critical for the development of effective prevention and treatment programmes.

Research findings suggest that multiple factors contribute to obesity and weight gain, in particular the interplay of genetic and behavioural factors (Purnell, 2018; Ward *et al.*, 2019; Dai *et al.*, 2020; Panuganti,; Van Haute *et al.*, 2020; WHO, 2020). Moreover, the scale and pace of globalisation and urbanisation have led to high levels of demotivation in physical activity and increased sedentary behaviour patterns associated with the complex nature of the world of work and modes of transport (Albuquerque *et al.*, 2017; White, 2017; Fox, Feng and Asal, 2019; Alruwaily *et al.*, 2020; Coates and Boyland, 2020). The rate of obesity has tripled since 1975. In 2016, 1.9 billion adults internationally were overweight or had obesity. Dai *et al.* (2020) conducted a study entitled "The global burden of disease attributable to high body mass index in 195 countries and territories, 1990–2017: An analysis of the Global Burden of Disease Study", using the modelling framework in the Global Burden of Disease Study (2017) to examine the global deaths and disability-adjusted life years (DALYs) attributable to high BMI. They found that globally, in 2017, high BMI caused 2.4 million (95% UI 1.6 million, 3.4 million) deaths and 70.7 million (95% UI 49.1 million, 94.9 million) DALYs in females, and 2.3 million (95% UI 1.4 million, 3.4 million) deaths and 77.0 million (95% UI 49.7 million, 108.2

million) DALYs in males. Dai *et al.* (2020) conclude that high BMI remains a major global health challenge. Popkin *et al.* (2020, p. 4) echo the same view, indicating:

> the prevalence of individuals with overweight/obesity is at an all-time high and is increasing across the globe. This is true not only in higher income countries but also in low- and middle-income countries with high levels of undernutrition leading to the double burden of malnutrition. Few low- and middle-income countries have a prevalence of individuals with overweight/obesity less than 20% among their adult populations.

This view is confirmed by the WHO (2020) stating that obesity is global with high prevalence in both developed and developing countries. According to Van Haute *et al.* (2020), although obesity may be associated with many high-income countries, the increase in obesity rates appears to be faster in Asia. As of 2014, about 5.1% of the adult Filipino population were classified as obese, representing a 24% relative increase in the number of obese Filipino adults.

To conclude, obesity is a topical and multidimensional term that is understood, explained and interpreted from several perspectives (Guillaume, 1999; Bellizzi, 2002; Bray and Champagne, 2005; Pingali, 2006; Fielden, Sillence and Little, 2011; Solmi and Morris, 2015). Moreover, obesity and overweight have become a common global health challenge, and the top priority for all the key stakeholders concerned is how to tackle this epidemic. To stand a chance of fighting this growing health issue, a holistic approach and a full understanding of the related health behaviours, beliefs, biological mechanisms, genetic factors and psychological causes is needed.

2.3 Defining obesity

The term ‘obesity’ is derived and originated from the Latin word *obesus*, which means ‘fat’ or ‘plump’. The term was first used in 1651 and appeared in Noah Bigg’s medical book “Mataeotechnia Medicinae Praxeos” (Obesity Therapy, 2007).

There is a plethora of definitions of obesity and overweight in the literature providing similar explanations. Many consider that obesity is more than the condition of being overweight and reflects fat stored as energy, which the body does not use. Brockmann *et al.* (2017, p. 481) define obesity as, "a complex trait, determined by many genes and influenced by environmental factors". Obesity adversely affects a person's physical health, resulting in many degenerative diseases that are linked directly or indirectly to obesity; hence, it can also have an adverse effect on a person's mental health **(**Scott, 2015; Belon *et al.*, 2016; Purnell, 2018; Lauren *et al.*, 2020). Purnell (2018, p. 3) states:

> Overweight and obesity occur when excess fat accumulation increases risk to health. It is the point at which health risk is increased that is most important because body weights and fat distributions that lead to expression of co-morbid diseases occur at different thresholds depending on the population.

Obesity has also been referred to as a condition that cuts short life expectancy, and leads to increased health problems as well as harmful effects on health from high levels of excess body fat (Haslam and James, 2005; Popkin *et al.*, 2020). In other words, obesity is a consequential meaningful damage to health that occurs when there is an increase in the size or number of cells in a person's body, taking into consideration that a normal-sized person has between 30 and 35 billion fat cells. When a person puts on weight, these cells first increase in size and later in number, where one pound of body fat represents about 3,500 calories (Micheal, 2004; Perry, Hoelscher and Kohl, 2015; Nuttall, 2015; Feldman *et al.*, 2019; Lauren *et al.*, 2020; Popkin *et al.*, 2020; Harvard T.H. Chan School of Public Health, 2021).

Furthermore, obesity conventionally has been defined as a weight at least 20% above the WHO (2020) ideal weight, which is when specific height, gender, age and

anatomy are taken into consideration. A slightly obese person might have 20–40% extra over the estimated ideal weight of the WHO; a fairly obese individual is 40–100% over the WHO estimated weight; and extremely or morbidly obese is 100% over the ideal weight. The recommended WHO conventional measurement called the BMI has been introduced as a guideline for obesity; this involves the use of a formula that works by dividing an individual's weight in kilograms by their height in metres squared. It can also be worked out by multiplying the weight in pounds by 703, and dividing by the height in inches. Again, a division is necessary by height in inches (Beers and Berkow, 2004; Perry, Hoelscher and Kohl, 2015; Feldman *et al.*, 2019; Lauren *et al.*, 2020). Body fat can be measured by waist measurement and BMI. Using the waist circumference**,** obesity is defined as a waistline of 35 inches or higher for women, and for men a waistline of 40 inches or higher. In simple terms, obesity refers to excess body fat.

According to the WHO (2020), the BMI is used as a measurement that relates weight and height for classifying overweight status; people are overweight or pre-obese when their additional weight or BMI score is between 25 kg/m^2 and 30 kg/m^2, which corresponds to 10% over normal weight, and obese when their additional score is greater than 30 kg/m^2, while excessive or morbid obesity is defined as a BMI of 40 kg/m^2 or higher**.** In addition, Encyclopaedia Britannica (2021) defines obesity as "corpulence or fatness, excessive accumulation of body fat, usually caused by the consumption of more calories than the body can use". Using the Centers for Disease Control and Prevention (CDC) growth chart (Ogden *et al.*, 2010; Purnell, 2018), overweight has been described by the US CDC as at or above the 95th percentile of BMI for age; and at risk of overweight as being between the 85th and 95th percentiles of BMI for age.

For the purpose of this study, obesity is simply viewed as an excess of body fat.

Another name for body fat is adipose tissue, and adiposity is the state of having body fat. There are various ways to quantitatively measure excess body fat in order to define obesity in individuals. In adults, adiposity is commonly assessed using the BMI (weight/height^2; kg/m^2), which is the international standard for the assessment of obesity in adults and correlates with body fat (r = 0.7–0.8). However, determining obesity for children and adolescents' (aged 0–18) is more complex since growth and maturation alters the weight and height over time (Puhl and Brownell, 2001; Bray, 2004; Nuttall, 2015).

In summary, the extensive and diverse range of definitions of obesity and overweight suggests that providing a definition that reflects a holistic and universal view, and which captures or encapsulates what constitutes obesity and overweight remains a grey area. The miscellaneous definitions demonstrate generic recurrent themes and similar explanations of what obesity and overweight mean, albeit worded differently. The definitions highlight the diversity of understanding of obesity and overweight measurements. This view is supported by Kuczmarski (2000, p. 70), who stresses that "Definitions of overweight have varied widely and there has not been a simple uniform definition. Numerous publications based on the recommendations of expert committees have struggled with developing working definitions of weight status". Thus, obesity is an ongoing battle for certain individuals. Although its aetiology is quite simple in terms of gain and loss of calories, the cure is a complicated web of biology, psychology and culture (Stern and Kazaks, 2009).

Thus, obesity is an overarching term that refers, with some nuances in meaning, to overweight, weight gain, and excessive fat accumulation, excess body fat, abnormal or excessive fat accumulation. The terms 'obesity' and 'overweight' are often used interchangeably; however, these terms are distinct (Kuczmarski, 2000; Puhl and

Brownell, 2001; Bray, 2004; McCarthy, 2006). Both overweight and obesity are determined by the BMI calculation. Overweight is defined as a BMI of 25 or more, and obesity is defined by a BMI of 30 or more. Although, the range of terminology describing obesity appears to be confusing, all the terms used have common and often overlapping features that are key to the understanding of obesity. The NHS views obesity as "a term used to describe somebody who is very overweight, with a lot of body fat" (NHS Choices, 2020). Similarly, the WHO (2020) defines overweight and obesity as "abnormal or excessive fat accumulation that may impair health". Moreover, the WHO (2020) states that "Obesity is a condition in which there is excessive accumulation of body fat, to the extent that health is likely to be compromised''. As can be seen, although the definitions may differ in the wording, they use to define obesity, their explanations are similar in many ways regarding the use of key terms. Overweight and obesity are clinical terms used to describe excess body fat (Department of Health, 2020).

2.4 Classification of obesity

Body fat can be measured in several ways, and each body fat measurement method has strengths and weaknesses. BMI is the most common and is a long-established, internationally used indicator of an individual's health risk. It is a simple measurement of weight for height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of their height in metres (kg/m^2) (WHO, 2020). According to Aronne (2002, p.1), "BMI has replaced percentage ideal body weight as a criterion for assessing obesity for several reasons. BMI correlates significantly with body fat, morbidity, and mortality, and it can be calculated quickly and easily in a busy clinical setting". Table 2.1 illustrates the BMI classification proposed by the WHO (2020).

Table 2.1: WHO's BMI classification

Classification	BMI (kg/m^2) cut off points
Severely underweight	Below 16
Underweight	< 18.5
Normal weight	18.5–24.99
Overweight	25–29.99
Obese Class I	30–34.99
Obese Class II	35–39.99
Obese Class III	< 40

(Source: WHO, 2020)

However, Baniissa *et al*. (2020) classify the BMI categories (BMICs) upon the percentiles, as seen in Table 2.2.

Table 2.2: BMI classification categories I

Category	BMI range
Underweight	BMI < 5th percentile
Normal weight	5th percentile ≤ BMI < 85th percentile
Overweight	85th percentile ≤ BMI< 97th percentile
Obese	BMI ≥ 97th percentile

Moreover, the WHO (2020) and others classify the BMICs upon the standardised score of the BMI, as seen in Table 2.3.

Table 2.3: BMI classification categories II

Category	BMI range
Underweight	z-score < – 2SD
Normal weight	– 2SD ≤ z-score < 2SD
Overweight	2SD ≥ z-score < 3SD
Obese	z-score ≥ 3SD

The BMI, despite its universal use, has many detractors because it has several limitations when used as an indicator of the percentage of body fat mass. As a result, some have called for the BMI to be scrapped and replaced by a body fat measurement fit for the 21st century. Nuttall (2015, p. 7) strongly argues that:

> It is time to move beyond the BMI as a surrogate for determining body fat mass. Alternatively, if BMI continues to be used, the categories and definitions should be changed to reflect the current distribution of BMIs in the general population. A better means than the BMI for estimating percent of body fat and its relationship to mortality and various morbidities clearly would be desirable.

Nuttall (2015, p. 7) makes a point that, "Clearly, obesity, as determined by BMI, is not a monotypic, age-invariant condition requiring a general public health 'preventative' approach. A BMI-determined categorisation of an individual should not be used exclusively in counselling or in the design of a treatment regimen". Waehner and Fogoros (2019, p. 1) echo this sentiment: "The BMI formula is so simple…however, it's that simplicity that makes it inaccurate because it only takes into account your height and weight".

In short, the BMI has advantages and disadvantages. The advantages of the BMI can be summed up as follows: it is simple, quick, effective and applies to adult men and women, as well as adolescents'. It is also a useful tool for quickly assessing weight classification. It is more accurate at approximating the degree of body fatness than weight alone. It is easy to measure and inexpensive. The BMI consists of standardised cut-off points for overweight and obesity: normal weight is a BMI between 18.5 and 24.9; overweight is a BMI between 25.0 and 29.9; and obesity is a BMI of 30.0 or higher. The BMI is also strongly correlated with body fat levels, as measured by the most accurate methods. Hundreds of studies show that a high BMI predicts higher risk of chronic disease and early death. In contrast, the BMI has also several disadvantages. Firstly, the BMI does not take into account body composition—whether or not the excess weight is fat or muscle—and so very muscular individuals often fall into the overweight category when they are not overly fat. Secondly, measuring the BMI for very short people or pregnant women is not appropriate. It is believed that excessive abdominal fat is more health

threatening than hip or thigh fat. Thirdly, indirect and imperfect measurement does not distinguish between body fat and lean body mass. In addition, the BMI is not as accurate a predictor of body fat in the elderly as it is in younger and middle-aged adults; while at the same BMI, women have, on average, more body fat than men, and Asians have more body fat than Whites (Medchrome, 2009; Harvard T.H. Chan School of Public Health, 2021). McCarthy *et al.* (2006, p. 2) argue that: "The fact that body mass index represents only a crude proxy for body fat and may produce a significant level of misclassification is universally accepted but widely ignored". McCarthy *et al.* (2006, p. 2) also state that:

> Although body mass index is simple to measure and has been a valuable tool in monitoring trends in obesity, it also has numerous disadvantages. Principally, it does not distinguish between increased mass in the form of fat, lean tissue or bone, and hence can lead to significant misclassification.

However, McCarthy *et al.* (2006, p. 2) suggest that in view of the absence of alternative measures, the advantages of BMI have outweighed its disadvantages.

There are alternative, so-called 'field methods' (Harvard T.H. Chan School of Public Health, 2021) that are worth mentioning and can be useful in clinics and community settings, as well as in large research studies:

- bio-impedance
- waist circumference
- waist-to-hip ratio
- skinfold thicknesses
- bioelectrical impedance

McCarthy *et al.* (2006) believe that bio-impedance offers the opportunity to move beyond BMI. Its advantages are that it is relatively inexpensive, portable, simple and rapid

to use. Its disadvantages are that it is less accurate than more sophisticated methods. They also suggest body fat centile curves as an alternative or addition to using BMI curves:

> The chief merit of the new curves is that they assess adipose tissue mass, the component of excess weight that is associated with comorbidities. They will also reduce misclassification in large-framed and/or muscular adolescents who are rated as overweight or obese by BMI. Additionally, the new curves will help focus medical attention on excess adiposity as distinct from overweight. (McCarthy *et al.*, 2006, p. 2)

In addition, there are more sophisticated methods, such as magnetic resonance imaging or dual energy X-ray absorptiometry, the so-called 'reference measurements' techniques, which are typically only used in research studies to confirm the accuracy of body measurement techniques (Harvard T.H. Chan School of Public Health, 2021). It is worth noting that each method of body fat measurement has strengths and weaknesses. It is beyond the scope of this study to review these in detail. Moreover, several methods cannot be used in children or pregnant women due to safety concerns, or are less accurate in people who are very overweight.

It can be argued that obesity, despite the considerable progress made to grasp the different facets and underlying causes, generates long-term distress and disabilities, reduces human capital, and increases disease burdens and healthcare costs globally. Obesity has a complex aetiology, incurring controversies within both scientific and media domains. Lean, Astrup and Roberts (2018, p. 361), in their study entitled "Making progress on the global crisis of obesity and weight management", conclude that "Obesity is best considered not just as a state of excess of body fat or BMI above an arbitrary cut-off, but as the disease process, of excess body fat accumulation that has interacting (epi-) genetic and environmental causes and multiple pathological consequences".

2.5 Childhood and Adolescents Obesity

The WHO (2020) has recognised obesity as a disease since 1948, highlighting the massive public health problem caused by obesity prevalence. Childhood and Adolescents' obesity is a global public health concern. A study by Fields *et al.* (2020) found that two-thirds of US adults and nearly one-third of US adolescents are overweight or obese. Focusing on the Gulf region and the UAE, as it has been indicated that the highest prevalence of overweight and obesity among adolescents' in the world might be in the Middle East, these outcomes were reported by Kerkadi, Hassan and Tayeb (2009). This same study further reported—using CDC measures—that among girls aged between 1 and 8 years in Saudi Arabia, the prevalence of overweight and obesity was 12.7% and 6.7%, respectively.

Scott (2015, p. 3) clearly distinguishes between overweight and obese, arguing that "the terms overweight and obese are used to describe different levels of excessive body mass". Defining obesity in adults is usually accomplished by measuring their BMI. In children and adolescents', however, this is not so easily done because certain factors such as age, growth rate and puberty have considerable influences on the rates of fat deposition and removal. This has made creating an overarching standard for all ages that define being overweight and obese very difficult (Guillaume, 1999). Childhood obesity poses a substantial health risk, which research suggests can run into adulthood. In other words, childhood obesity is believed to continue into adulthood and to be a risk factor for several long-term health problems (Freedman *et al.*, 2005; Caballero, 2007; Solmi and Morris, 2015; Feldman *et al.*, 2019; Tran *et al.*, 2019; Abduelmula *et al.*, 2020; Kumanyika, 2020; WHO, 2020). Sahoo *et al.* (2015, p. 3) state that "Childhood obesity can profoundly affect adolescents' physical health, social, and emotional well-being, and

self-esteem. It is also associated with poor academic performance and a lower quality of life experienced by the child".

Research evidence indicates that the growing prevalence of obesity and overweight in children and adolescents' is alarming given its positive correlation between childhood and adult obesity (Fielden, Sillence and Little, 2011; Clark *et al*., 2020; Fields *et al.*, 2020; Shah *et al.*, 2020). Feldman *et al.* (2019, p. 1) conducted a study entitled "Unravelling complexity about childhood obesity and nutritional interventions: modelling interactions among psychological factors", where they conclude that:

> childhood obesity represents one of today's most serious threats to children's health and quality of life. Childhood obesity is associated with a lifetime of health concerns, ranging from increased health care costs to placing additional stressors on family dynamics. Despite global awareness of this issue, prevalence of overweight and obese children (ages 2–19) has risen 47.1% worldwide over the 33 years between 1980 and 2013.

According to Fielden, Sillence and Little (2011), obese children (ages 2–19) are more likely to become obese adults and experience increased health problems. Childhood obesity can be seen as a developed world health issue, a result of economic wealth, the abundance of cheap food, sedentary lifestyle and lower levels of physical activity. However, as Tran *et al.* (2019, p. 7) point out, the "Childhood obesity epidemic has been expanding in both developed and developing countries". According to the WHO (2020), 381 million children under 20 years of age were overweight or obese in 2016. Over the past four decades, the prevalence of excess weight in both male and female adolescents has been substantially increasing (from 4% to over 18%) and the prevalence of obesity and overweight has increased in the paediatric population (Wang and Lobstein, 2006).

The CDC (2020) defines childhood overweight and obesity as "a BMI at or above the 85th percentile and below the 95th percentile for children and adolescents' of the same age and sex. Obesity is defined as a BMI at or above the 95th percentile for children and adolescents' of the same age and sex". Figure 2.1 illustrates the percentage of countries with higher obesity prevalence in boys than girls by age group, and country income group.

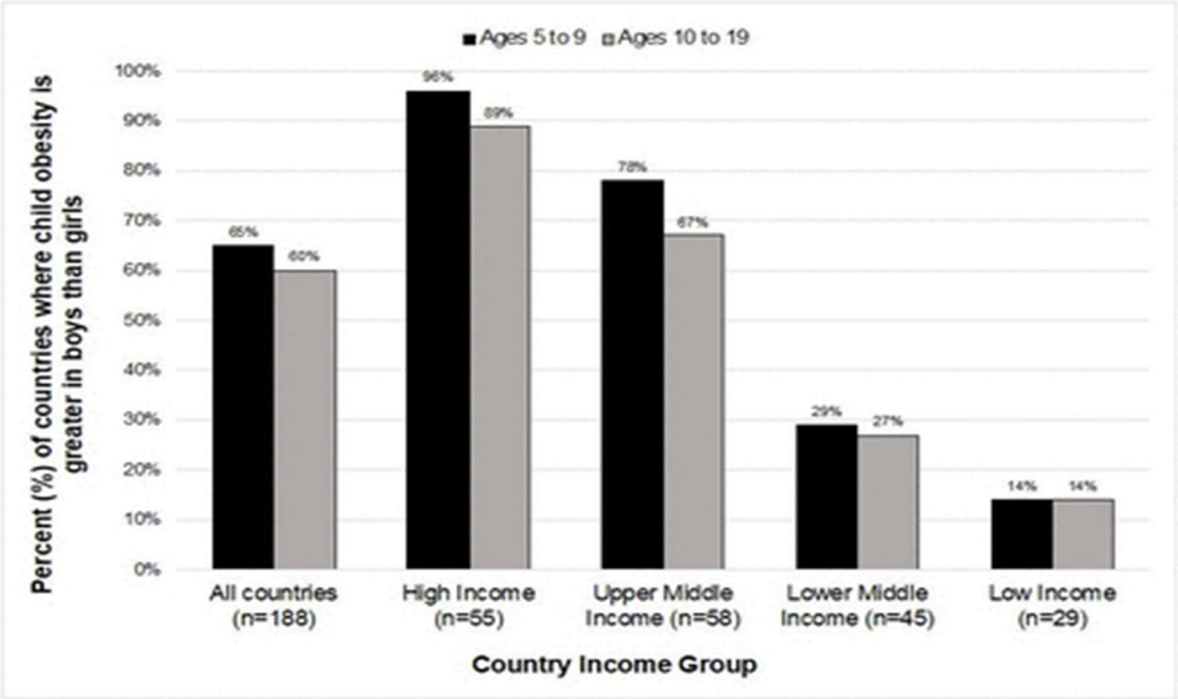


Figure 2.1: Countries' obesity prevalence by child gender and country income group (Source: Shah *et al*., 2020)

Figure 2.1 highlights the obesity rates among children aged 10–19 years, this same trend was observed for 112 (60%) countries. This trend existed in the vast majority of high income and upper-middle income countries, but was not observed among lower-middle- and low-income countries. In 44 of 88 (50%) of these high and upper-middle income countries, the prevalence of obesity in boys was almost two-fold greater than girls when comparing within age group, for example, Singapore, Denmark and Canada (Shah *et al.*, 2020).

Hoor *et al.* (2017, p. 36) indicate that:

> Although overweight and obesity in children and adolescents' is seen as a global health challenge, to solve such a health issue, we need full understanding of the related health behaviours (and underlying beliefs), and understanding of the biological mechanisms that cause or can prevent the issue. However, for overweight and obesity, drawing a full picture of the exact problem (and the subsequent solution) is difficult.

Researchers state that childhood obesity and overweight differ in a number of ways to that of obesity and overweight in adults. The BMI varies during childhood in a different way to adolescents, and the causes and consequences of obesity in childhood differ to those in adulthood (Clark *et al.*, 2020; Fields *et al.*, 2020; Shah *et al.*, 2020). Numerous measures have been used to define obesity and overweight in children and adolescents'. For adolescents', the BMI is age- and sex-specific, and is often referred to as BMI-for-age. A adolescents's weight status is determined using an age- and sex-specific percentile for the BMI rather than the BMICs used for adults.

A study conducted by Richardson *et al.* (2020) investigated how the genetic influence of being overweight at different stages of life contributed towards their disease risk. The findings of this study concluded that "Obesity in childhood is known to have a detrimental impact on various health conditions and disease risk in later life including coronary heart disease, type 2 diabetes and cancer" (Richardson *et al.*, 2020) However, there is little research evidence into whether being overweight as a child directly influences the risk of these diseases or whether they can be reversed through lifestyle changes, particularly as those who are obese in early life tend to remain obese as adults (Richardson *et al.*, 2020). In the same vein, Hobbs *et al.* (2020) examined the prevalence of adolescents with elevated weight or obesity, arguing that it is challenging to determine for public health due to associated comorbidities. This study investigated associations

between parental adiposity, physical activity, fruit and vegetable consumption, and child adiposity and moderation by both child aged (10 – 18) years and parent gender, using cross-sectional nationally representative data from the New Zealand Health Survey over the periods 2013/2014–2016/2017. Their findings are highly relevant for those wishing to understand the complex relationships between child–parent obesity factors, revealing that family environments should be a key target for obesity intervention efforts and showing how future public health interventions should be differentiated to account for both maternal and paternal influences on child adiposity.

It should be noted that there is still considerable variation in the use of terminology to classify child obesity. This appears to result from a recognition by most researchers of the negative stigmatising aspects of the obesity label and according to Perez *et al*. (2009) a lack of consensus on the threshold level at which the BMI denotes health risks in children and adolescents'. However, it results in inconsistency in terminology in the literature, and therefore the terms 'obese' and 'overweight' are found to be both used to represent the ≥ 95th percentile for BMI; likewise, both 'overweight' and 'at risk for overweight' are used interchangeably for the BMI classification ≥ 85th and < 95th, or for a broader categorisation of all children and adolescents' ≥ 85th BMI percentile. For consistency of terminology, the term 'obese' will be used for the higher percentile category and 'overweight' will be used for the lower percentile category, unless noted otherwise. According to Wang and Lobstein (2006), currently our understanding of the global circumstances of obesity in children and adolescents' is limited due to a number of factors. The two main challenges are the lack of comparable representative data from different countries, and the use of varying criteria for defining obesity among different countries and researchers. This methodological problem of inconsistency between

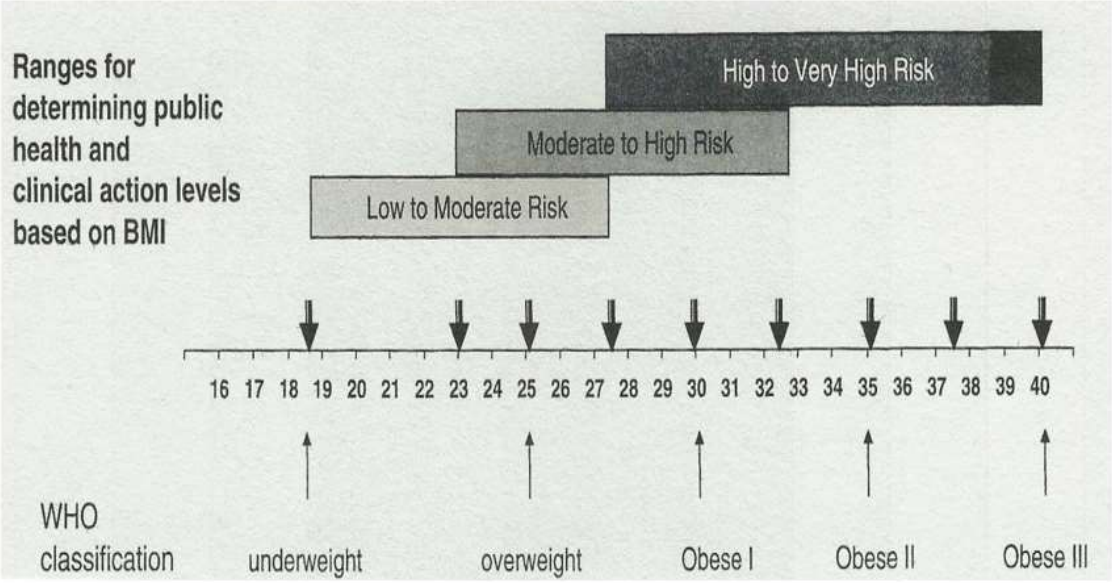
classifications of childhood obesity is a major obstacle in studying global secular trends for younger age groups.

According to the International Diabetes Federation (2019), the UAE's type 2 diabetes rate is among the top five countries in the world. Yach, Stuckler and Brownell (2006), Malik and Bakir (2007) and Yousef *et al.* (2008) point out that being overweight or obese is one of the primary risk factors for type 2 diabetes, and that the UAE ranked the second highest worldwide for diabetes prevalence in 2007. That is more than double the global average of 6.4%. Further, more than half of all children aged (5 to 18) years in the UAE are obese and in danger of developing type 2 diabetes, and hence heart disease (Baxter, 2009).

2.5.1 Measuring childhood obesity: choosing the cut-off point

Research of childhood obesity has discovered that the criteria utilised to investigate obesity in children and adolescents' differ globally (Neovius *et al.*, 2004; Chinn, 2006). The WHO and the IOTF (developed in 1994 to address the worldwide expansion of obesity) suggested that a standardised international criterion was essential to observe the obesity outbreak across different countries in order to develop healthy worldwide population health behaviours for both adolescents' and adults. Attempts to find an appropriate obesity method to measure body fat and the development of a set of age- and gender-specific cut-off points for describing obesity failed to agree on the meaning of overweight for adolescents, and many have indicated that BMI $\geq$ 85th and $<$ 95th percentile should be utilised to categorise adolescents as overweight, or "at risk for overweight" (Saelens, 2002; Nelson, Chiasson and Ford, 2004). Today, the WHO's (2003) categorisation for obesity in adults is looked at by utilising BMI cut-off points for public health action across a range of low to moderate to high and very high risk of health issues

(see Figure 2.2). The range helps to deal with population-detailed differences in BMI when using the BMI as a proxy measure of adiposity. The recent standard describes obesity in adult populations at a BMI level of 30 kg/m^2.



Key: ↓ = suggested cut-off points for reporting population BMI distribution and specific action levels for populations and individuals.

Figure 2.2:Public health and clinical action based on BMI (Source: Crawford and Jeffery, 2005, p. 5)

Whilst there is no differentiation of weight categories in adults based on sex or age, these are important factors in the body composition of children. Scott (2015) points out that this discrepancy indicates caution should be taken when collecting and comparing national weight status data. Factors such as age, gender and sexual maturation affect the BMI of younger individuals. For the interpretation of individuals between the ages of 2 and 20 years old, BMI is measured relative to peers of the same age and gender, with weight classifications judged as shown in Table 2.4.

Table 2.4: How childhood obesity is measured using the BMI

Percentile ranking	Weight status
Less than 5th percentile	Underweight
5th percentile to less than 85th percentile	Healthy weight
85th percentile to less than 95th percentile	Overweight
Equal to or greater than the 95th percentile	Obese

Source: WHO (2020)

Furthermore, deciding cut-off points that might be internationally representative or act as a 'gold standard' for obesity is difficult due to the complexity in deciding a suitable reference (Burniat *et al.*, 2002). In contrast to Must *et al.* (1991) who published value (percentile) exclusively from a North American population, or Conde and Monteiro (2006) who indicated value based on merely Brazilian population data, the IOTF utilised an approach by pooling data from 2–18-year-old children gathered from six diverse countries, namely Brazil, the UK, the Netherlands, Hong Kong, Singapore and the USA. This great international cross-sectional analysis found standard cut-off points adapted for age and gender to describe childhood obesity and overweight (Cole *et al.*, 2000). In addition, there have been arguments in regards to whether it is suitable to utilise national or international reference data for describing paediatric obesity. For instance, the international reference has been suggested in the UK, although this may perhaps produce a clinical difficulty as the national reference consigns both overweight and underweight on a single clinical form, while the international reference does not include underweight. Therefore, in clinical training this can cause confusion by using two dissimilar charts (national reference data for underweight and international reference data for overweight). Another reason for using national reference data to observe the BMI is that the reference has come from the same statistical sets. However, the international reference data will initiate a global comparison of obesity, whilst the national BMI reference data are also safe, practical and adequately strong, and can be recommended for employment in clinical and national epidemiological research (Reilly, 2002).

In summary, the methods used to classify youth as overweight or obese is a polemical topic, as there is no universally accepted classification system for childhood obesity. Attempts have been made to establish BMI-based classification systems, although such systems are difficult to define with any precision. Firstly, the BMI percentiles used to define 'overweight' and 'obese' in 2–18-year-old children are not based on an increased risk of cardio-metabolic endpoints 10–13. Secondly, it is unclear whether a measure of general obesity and central obesity is the appropriate method to assess obesity-related cardio-metabolic risk. Overweight and obesity in 2–18-year-old children has been appraised using different terms, metrics and cut-off values. Although overweight refers to weight in excess of a weight standard, and obesity refers to excess body fatness, body weight is often used as an alternative measure or indicator of obesity because body fat is difficult to measure. A universal formula is not applicable in calculating obesity and overweight prevalence in 2–18-year-old children because of the differences in growth rates among boys and girls at each age (Nuttall, 2015; Perry, Hoelscher and Kohl, 2015).

According to Davison and Birch (2001), children's nutritional intake and physical activity patterns are shaped and influenced by parenting styles and other family characteristics. Davison and Birch (2001) suggest that the parents' nutritional awareness, the types of foods parents make available for their children, parental modelling of particular eating behaviours, and parent child-feeding practices are key determinants by which parents may shape children's dietary practices (Davison and Birch, 2001; Clark *et al.*, 2007). Similarly, variables including parental preferences of activity, movement pattern and encouragement influence their children's activity patterns (Davison and

Birch, 2001). Figure 2.3 presents the ecological Model of Childhood Overweight Predictors.

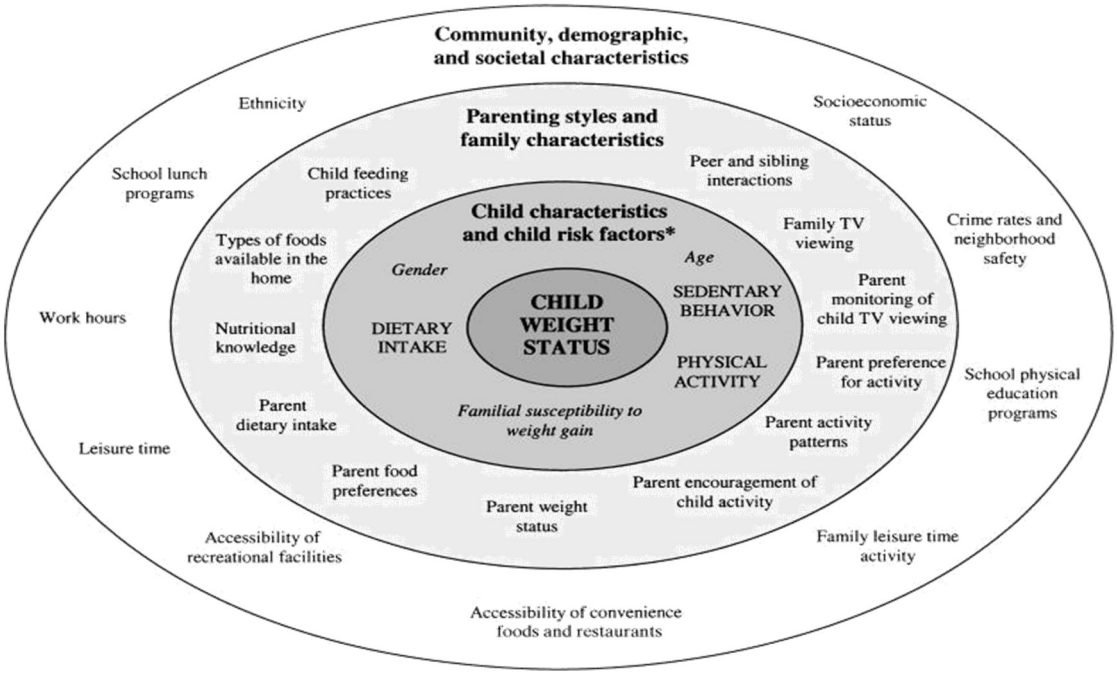


Figure 2.3: Ecological Model of Childhood Overweight Predictors (Source: Davison and Birch, 2001)

2.6 Obesity in developing countries

In developing countries, there is an increase in the rate of obesity that is three times what it used to be 20 years ago, with a prevalence of 10–25% for overweight and a prevalence of 2–10% for obesity in children below 18 years old. This could be attributed to an adoption of lifestyles that are similar to those in the West. The greatest risk has been observed to be in regions such as the Middle East, the Pacific Islands, Southeast Asia and China. It has been suggested that although there is a complex relationship between obesity and poverty, and it is poverty that leads to underweight and malnutrition, poverty in middle-income countries leads to an increased risk of obesity (Hossain, Kawar and Nahas, 2007).

Countries in the Middle East have witnessed a general pattern of increase in obesity, but there is a marked difference, especially between rural and urban populations. In Egypt, Galal (2002) suggested a prevalence of 40% overweight and 45% obesity among women, and of 45% overweight and 20% obesity among men in the urban dwellers. In rural areas, the prevalence was 30% overweight and 21% obese for women, and 28% and 6%, respectively, among men. Jackson, Rashed and Saad-Eldin (2003), in a study of female adolescents in Egypt, indicated that 35% of the girls were overweight and 13% were obese. Jackson, Rashed and Saad-Eldin (2003) further state that there was a higher prevalence of overweight in urban girls than in rural girls, as well as a higher prevalence in girls with a more prominent socio-economic status (SES) than in those with a lower SES. Further studies conducted by Salazar *et al.* (2006) using the CDC cut-offs for BMI indicate that 12.1% of Egyptian adolescents (7% boys, 18% girls) were overweight, while 6% of boys and 8% of girls were obese.

Using the BMI, Mokhtar *et al.* (2001) report that in Tunisia, 9.1% of adolescent girls were at risk of becoming overweight with a BMI of the 85th percentile or more, although Ghannem *et al.* (2001) also note greater rates of prevalence among adolescents in Tunisia, where 16% of girls and 11% of boys were overweight. Gross and his colleagues (2009) looked at the prevalence trend of obesity among Israeli adolescents between 1967 and 2003, reporting that the prevalence of obesity tripled between 1967 and 2003, and obesity increased from 1.2% to 3.8%.

In Lebanon, Sibai *et al.* (2003) conducted a cross-sectional survey of a representative sample of 2,104 persons using the IOTF cut-off points. They reported that the prevalence of childhood overweight and obesity was higher generally for boys than for girls at 22.5% for overweight and 7.5% for obesity, while it was 16.1% and 3.2%,

respectively, for the girls. Another study among children who had not reached puberty (aged 6–8 years) in Lebanon carried out by Jabre *et al.* (2005) also shows that the prevalence of overweight and obesity based on the IOTF cut-off points was 26% in boys and 25% in girls for overweight, while it was 7% in boys and 6% in girls for obesity. Iran is one of the seven countries with the highest prevalence of childhood obesity. Kelishadi *et al.* (2003) revealed a high prevalence of overweight exhibited in adults aged 20 years and above in Teheran city, and when compared with many Western countries, the prevalence of obesity was 14% in men and 30% in women (Azizi *et al.*, 2003).

The prevalence of obesity has also increased in developing countries (Dehghan, Akhtar-Danesh and Merchant, 2005). WHO available data on the prevalence of obesity and overweight from 191 countries around the world has illustrated different prevalence rates of overweight and obesity by region, with a noticeable increased prevalence rate in the Middle East, Central and Eastern Europe, and North America (James *et al.*, 2001). In India, a study based on the CDC cut-offs conducted by Sidhu, Marwah and Prabhjot (2005) suggested that the prevalence of overweight among boys aged 10–15 years was 9.9%, and 12.0% in girls aged 10–15 years, while 5.0% of the boys and 6.3% of the girls were obese.

Indeed, in a number of developing countries in Latin America and the Caribbean, the Middle East and North Africa, and the region of Central and Eastern Europe, levels of overweight and obesity are rising to the same levels as those seen in the USA (Adallay *et al.*, 2009). Further, data from the National Health and Nutrition Examination Survey (NHANES) (CDC, 2003) show that in Chile, the increase exceeded even that in the USA. Indeed, between 1979 and 1997, overweight among 6–18-year-olds increased more than three-fold, from 4% to 14%, while 6 year old children showed more than twice the

prevalence of overweight between 1987 and 2000, from 12% to 26% in boys and from 14% to 27% in girls. Far more alarming, (Yan *et al*., 2012) report that nearly 215 million Chinese were shown to be affected by overweight; about 22% of these were adults, while 5% of them were children aged between 0–6 years, and 7% were aged 7–17 years. The prevalence of adult overweight has increased by almost 40%. From 1992 to 2012 the prevalence of obesity increased two-fold, especially in the rural areas of China that account for over 60% of the total population of the country, where the prevalence rose two or three times over the same period of time (Wu *et al.*, 2009). Furthermore, Ji and Cheng (2009) report that 7.73% of Chinese youth were overweight and 3.71% of them were obese; these represent an estimated 21.37 million Chinese children of whom 13.43 million were boys and 7.94 million were girls. Cho *et al.* (2009) report that the rates of prevalence of obesity in children in Seoul, Korea, increased 10 times from 1.7% to 7.9% in boys, and 4.5 times from 2.4% to 10.9% in girls, according to the Student Standard Physical Examinations of Seoul City from 1979 to 2002.

Masoodi *et al.* (2010) summarise the above by suggesting that throughout the world obesity is rising in urban populations. For example, in China and Indonesia the prevalence of child and adult obesity was twice as great in urban areas as it was in rural areas. Masoodi *et al.* (2010) further reflect on the latter and note a higher prevalence of overweight and obesity in the urban area of Srinagar, India, with one in every four persons being either overweight or obese.

A similar study conducted in southern Brazil (Terres *et al.*, 2006) amongst adolescents aged between 15 and 18 years indicates that 21% of the sample were overweight and 5% were obese. In Argentina, Adallay *et al.* (2009) note that the prevalence of overweight and obesity was 52% and 17%, respectively, among adults with

a mean age of 42 years and children whose mean age was 15 years. Martinez *et al.* (2001) report that the prevalence of overweight and obesity was 10.9% and 2.2%, respectively, with a higher prevalence in boys than in girls. Still within the Southern American data, Salazar *et al.* (2006) state that the prevalence of overweight and obesity were 19.8% and 7.9%, respectively, using the CDC cut-offs, with 18% of boys and 21% of girls being overweight, and 11% of boys and 9% of girls being obese. Others such as Kain *et al.* (2005) note that Chilean 6 year olds presented an increase in the prevalence of overweight from 0.7% in 1987 to 2.2% in 2003, but obesity had not increased since 2000.

Despite malnutrition, obesity is also reported to be an emerging problem in some African countries. Indeed, childhood obesity is now on the increase in some of these African countries, together with the long-established burdens of wasting conditions such as HIV/AIDS and other chronic infectious diseases (Williams and Fruhbeck, 2009). The South African Demographic Health Survey (Steyn *et al.*, 2006) suggests that obesity had affected approximately 30% of women and 10% of men. Armstrong *et al.* (2006) indicate that the prevalence of obesity and overweight within South African children aged 3–16 years was found to be 3.2% and 14.0%, respectively, for boys, while it was 4.9% and 17.9%, respectively, for girls. Furthermore, in the North West Province of South Africa, Kruger, Kruger and Macintyre (2006) suggest that 7.8% of schoolchildren aged 10–15 years were overweight or obese. In Cameroon, Kamadjeu *et al.* (2006) indicate that women who lived in the urban areas aged 15 years or above showed a prevalence of 29% overweight and 20% obesity; the men had a prevalence of 21% overweight and 7% obesity. Comparing females under the age of 35 years with those aged 45–54 years, the obesity rates ranged from 12% to 41%, respectively, while men in these age categories showed a prevalence of 13% and 16%, respectively. Finally, in Gambia, Siervo *et al.*

(2006) also claim that the prevalence of overweight among women aged 35–50 years was extremely high, with 34% of them pre-obese and 50% obese.

To sum up, Fox, Feng and Asal (2019, p. 55) suggest that the economic development and modernisation theory has been associated with driving obesity and positive economic, social, cultural and political changes "interacting synergistically with one another [to] produce a 'virtuous circle' of increasing living standards, social mobilisation, democratisation". However, little attention has been paid to the socio-cultural and belief components that need to be included in any future health education and prevention programme designed to curb this non-communicable health problem that has been manifested during the last few decades in both developing and developed countries. Hence this research will be addressing the obesity and link it to the economic, social, and demographical composition within the adolescent age group in the UAE.

2.7 Obesity in the Middle East

In the Middle East, the 'cultural globalisation', 'Westernisation' or 'Americanisation' of lifestyles has played a part in driving up the obesity rate (Robertson and Lechner, 1985; Ram, 2004; Samara, 2019; Abduelmula *et al.*, 2020; Alruwaily *et al.*, 2020). The WHO (2020) state that over 30% of the population in the Middle East is obese. Kuwait's obesity rate is believed to be triple the world average, while the UAEs was measured as being double the global number. Studies into why this is such a problem in the Middle East (Awofeso, Al Imam and Ahmed, 2019; Samara, 2019; Abduelmula *et al.*, 2020) suggest that one of the drivers causing the obesity rise in the Middle East is rapid economic growth and urbanisation, leading to a lifestyle that is completely detached from the indigenous and traditional lifestyle. There have been changing traditional dietary patterns, with increasing consumption of highly processed foods and beverages containing less

nutrient-dense diets, replacing or supplementing traditional plant-based diets, and a simultaneous increase in sedentary behaviours and reduction of physical activity across all ages (Romieu *et al.*, 2017). According to Badran and Laher (2011, p. 3), the prevalence of obesity in the Arab World:

> has increased at an alarming rate during the last three decades, and this appears to be more pronounced in women. The prevalence of obesity parallels increased industrial development, [and] is related to the significant growths in incomes resulting from the rich deposits of oil reserves and the resultant impact on rapid urbanisation and improved living conditions.

An article by Bell (2019) published in the Arab News reports that a UK study says excess weight causes more cases of four common types of cancer than smoking. Physicians say the report has serious implications for GCC countries facing an 'obesity explosion'. The finding ought to set alarm bells ringing worldwide, and especially in the Gulf region. Bell (2019) goes on to say that while obesity-related cancer is well-documented, the latest study—led by Cancer Research UK—shows that being overweight is more likely than being a tobacco smoker to be a cause of bowel, kidney, ovarian and liver cancers.

Similarly, a study conducted by Barry, (2017) entitled "Rising Obesity Rates in the Gulf States Create an Opportunity for Health-Positioned Beverages" argues that:

> obesity is a growing concern in many nations in the Middle East, especially in the area surrounding the Persian Gulf. In the countries of the GCC nearly a third of adults are now obese and diabetes and other weight-related diseases are becoming serious public health issues. While there are a number of reasons for this, including sedentary lifestyles and heavy consumption of fried and fatty foods (fast food spending grew more in the United Arab Emirates from 2010-2015 than in any other country), beverages play a large role.

Figure 2.4 shows the obesity rates in GCC countries:

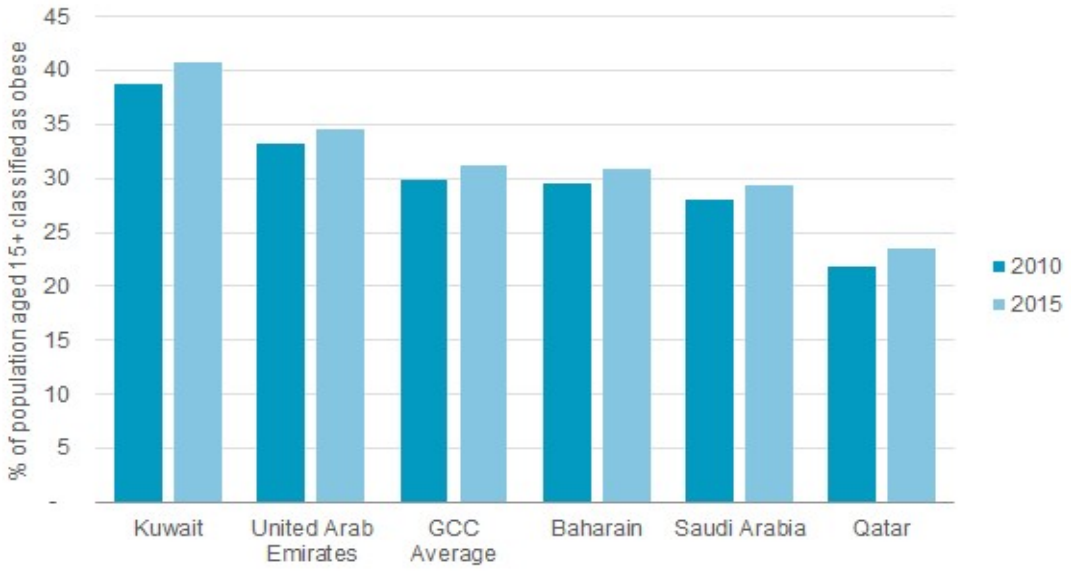


Figure 2.4: Obesity rates in countries of the GCC (Source: Euromonitor International, 2017)

According to Fox, Feng and Asal (2019), 'cultural globalisation' or 'Westernisation' may encourage the consumption of fast foods like McDonalds to appear more 'modern'. This trend may be less related to economics, but rather driven by the cultural appeal of Western lifestyles, which can contribute to obesity as people abandon local cuisines for Western-influenced diets (Pingali, 2006). These 'world systems theory' accounts place the explanation for countries' widening waistlines largely on factors external to the country—i.e. international trade regimes that have allowed the entry of transnational food corporations into emerging economies driving the increased consumption of unhealthy foods and ideational lifestyle diffusion (Fox, Feng and Asal, 2019)

2.8 Obesity in the UAE

The UAE is located in the Arabian Gulf, and is a member state of the GCC along with Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. The total surface area of the UAE is about 83,600 square kilometres, of which 97% can be described as desert (EIU, 2015).

Abu Dhabi, the capital, occupies approximately 87% of the total surface area while Dubai, the second largest area, covers 5%. Thus, the UAE is a relatively small, fast-developing country. The demographics of the UAE are one of the most diverse in the world. The UAE population averaged 0.09 million in 1960, while the population was 9,634,073 as of the 28th of February 2019, based on the latest United Nations estimates. A total of 93% of the population is urban, and the median age is 33.5 years (Worldometer, 2020). The latest estimates suggest around 12% of the population are UAE nationals, while the majority of the population are expatriates of more than 200 nationalities worldwide.

Research on obesity in the Gulf countries, and in particular the UAE, is not prolific, as demonstrated by the limited publications (Badran and Laher, 2011; AlBlooshi *et al.*, 2016; Alhubaishi *et al.*, 2019; Samara, Tanggaard Andersen and Arja, 2019; Abduelmula *et al.*, 2020). Abusnana *et al.* (2018) argue that with the rapid urbanisation and high standard of living as a result of massive oil revenues in GCC countries, obesity has become a major and growing health problem for the region. Arabian Gulf countries share similar cultural, social and environmental characteristics, and have experienced similarly rapid economic development since the oil boom (1973–1981) (Musaiger, 1993). Obesity has reached epidemic proportions in the Gulf countries, with small populations and high-income from oil revenues. According to figures from the WHO (2020), the prevalence of obesity in Gulf countries among children and adolescents ranges from 5% to 14% in males, and from 3% to 18% in females. In adult females, there is a significant increase of obesity with a prevalence of 2–55%, and in adult males of 1–30%. Abusnana *et al.*'s (2018) findings suggest that based on figures from the WHO (2015), over 25% of Emirati men and 40% of the women were obese. Obesity rates in this country doubled

from 16% to 34% compared to the year 2000, and severe obesity (BMI > 40 kg/m^2) rose dramatically from 2% to 11%. According to Abusnana *et al.* (2018, p. 1):

> While a number of international guidelines for the management of obesity are already available in [the] public domain, local guidelines for the UAE and the region, which are structured and individualised for the management of obesity, are sorely needed to help the family physician to provide affordable treatment for the patient at the point-of-care and to reduce the burden on the local healthcare system.

AlBlooshi *et al.* (2016) conducted a study entitled "Increasing obesity rates in school children in United Arab Emirates" involving a considerable sample size of 44,942 children (3–18 years of age) attending public schools. The researchers adopted the IOTF, WHO and CDC reference methods to identify overweight, obesity, and extreme obesity. Their findings confirm a steady rise in obesity in children aged 3–18 years. The rising rate of extreme obesity is also alarming, especially among boys. AlBlooshi *et al.* (2016) attribute the rise of obesity to socio-economic changes in the UAE. Baniissa *et al.* (2020) conducted a similar study aimed to evaluate the prevalence and predictors of obesity among adolescents aged 13–19 years in the UAE. The result showed an alarming total of 34.7% participants who were overweight/obese (BMI ≥ 85th percentile. Al Junaibi *et al.* (2013) investigated the prevalence and determinants of obesity in childhood and adolescence, and their association with blood pressure in Abu Dhabi, involving a sample of 1,541 students (grades 1–12, aged 6–19 years). Their findings reveal that the prevalence of childhood obesity was high across the age spectrum in the UAE and that older age, male gender, lack of dairy intake and higher parental BMI were independent determinants of childhood obesity in this population. According to Alhubaishi *et al.* (2019), "In nations of the GCC, the prevalence of overweight adults has been reported to be 35% amongst males, while the prevalence of obesity has been reported to be 40%

amongst females". Al Hammadi, and Reilly (2019) examined the recent prevalence of obesity among school-age children and adolescents in the GCC states, which already have among the highest prevalence of adult obesity and type 2 diabetes in the world. An extensive literature review was conducted: 392 studies were identified and 41 full-text reports were screened for eligibility, 11 of which were eligible from three of the six GCC countries. Al Hammadi and Reilly's (2019) findings indicate that the obesity prevalence among school-age children and adolescents' appears to have reached alarming levels in the GCC. Their findings also suggest that there are a number of major gaps and limitations in obesity surveillance in the GCC states. More national surveys of child and adolescent obesity prevalence are required. Moonesar and Hickman (2017) found that UAE youth (aged 10–18) were 1.8 times more obese than those in the USA, according to statistics from the 1st UN NHANES. Moonesar and Hickman (2017) indicate that the UAE has been classified as the second highest for obesity rates in the world by the WHO. The researchers conclude that these obesity statistics among the youth come with associated diseases, which tend to plague UAE adults later in life such as cardiovascular diseases, diabetes, hypertension and others. Another more recent study by Osman *et al.* (2020) examines the clinical correlations and genetic associations of metabolic syndrome in the UAE, and whether its high prevalence may be linked to modifiable and genetic risk factors in the local population. The conclusions of their study show associations between metabolic syndrome and contributing clinical factors, and specific genetic and metabolic risk factors, providing an insight into their links to disease development.

Ng *et al.* (2011) review the literature in this area—i.e. the prevalence of overweight, obesity and nutrition-related non-communicable diseases in Bahrain, Kuwait, Qatar, Oman, Saudi Arabia and the UAE—and further suggest that overweight

and obesity rates were high in Kuwait, Qatar and Saudi Arabia, and especially among 30–60 year olds (70–85% among men; 75–88% among women), with lower levels among younger and elderly adults.

Moreover, data from the WHO's (no date) Global InfoBase indicate that the prevalence of obesity has reached 26% in men and 40% in women in the UAE, and 26% in men and 74% in women from Saudi Arabia. Still focusing on the UAE, Al-Haddad, Little and Ghafoor (2005) show that when compared with international standards using the CDC cut-off values, 10-year-old male children had 1.7 times the rate of overweight, and for 18 year olds the rate was 1.9 times. Female children aged 10 and 18 years when compared with international standards had 1.8 times the rate of overweight. With regards to 14-year-old males, obesity was 2.3 times more when compared with international standards, and at 18 years of age it increased to 3.6 times the rate. Meanwhile, for female children aged 14 years, the rate of obesity was the same as that of males, which was 2.3 times more than the international standards. Female obesity at 18 years of age was 1.9 times more than the international standard, with almost half the rate of obesity among males at the same age. Generally, there was a 2–3 times higher rate in the frequency of obesity among youth than the currently published international standard.

According to a report by Euromonitor (2020) about the UAE, the UAE government has responded to the high obesity rate with taxes and awareness-raising. It has identified the need to educate consumers about healthier food and drink options, and is enforcing stricter laws. The conclusion that can be drawn from the above analysis is that the prevalence of obesity among adults, children and adolescents appears to have reached alarming proportions in the GCC states. Moreover, there is a knowledge gap in terms of the research applicability and awareness of the health risks of obesity. There is

also a dearth of research on obesity monitoring in the GCC states. The multifaceted nature of the terms 'obesity' and 'overweight' suggests that a single definition cannot adequately capture all the nuances of the concept. Moreover, obesity invokes different interpretations and perceptions for different people. In the GCC countries' cultural and traditional values and mind-sets, being big is not necessarily frowned upon but viewed as *Mashaa Alah* (: ما شاء الله, mā shāʾa llāhu), an Arabic phrase meaning 'God has willed' or 'as God willing', expressing appreciation, joy, praise or thankfulness for an event or person.

2.9 Aetiologt of Obesity

Over the last decades, adolescents' obesity has been doubled. With no adequate intervention strategies, most obese adolescents remain obese in adulthood. Obesity risk factors among adolescents are similar to those among adults and may raise the NCDs prevalence. Hormonal disorders, such as hypoactive thyroid gland or hyperactive adrenal glands, may result in overweight and obesity but are seldom the cause. Weight gain in adolescents which is caused by hormonal disorders are usually short and most often have other signs of the underlying disorder. Obese adolescent who has short stature with high blood pressure should be tested for the hormonal disorder. Ethnicity play a vital role, some adolescents are at greater risk of obesity than others based on their genetic variations. Furthermore, obesity among adolescents instigates poor self-image, that may profound their social isolation.

The 'initiatives/interventions to curb this public health' has been addressed by the addition of the following paragraph.

The interventions to curb this public health issue should begin early, targeting adolescents at increased risk for long-term obesity and its complications. The health care team, adolescents, and parents should mutually agree on treatment goals.

Health care providers should:

- Be aware of racial/ethnic and sex differences in the perception of obesity that may influence these goals and the realities of time and money in advice about meal planning.
- Consider cultural, individual race/ethnicity and family SES and preferences
- Consider cultural and gender preferences regarding advice about physical activity.
- Consider the benefits of comprehensive lifestyle interventions including behavioral modification.

Obesity continues to cause a number of health disorders worldwide and has emerged as a global challenge, affecting indiscriminately both developed and developing countries and being rampant across all ages, populations, ethnic groups and SES (Rabeea, Eldabi and Kamel, 2019; Shah, Hagell and Cheung, 2019; Alruwaily *et al.*, 2020; Van Haute *et al.*, 2020). Researchers have investigated, analysed and identified several obesity determinants that drive weight gain. Firstly, some authors attributed the difficulty of achieving and maintaining weight loss to environmental and societal changes. Changes in dietary habits have led to an energy imbalance between calories consumed and calories expended, an increased intake of energy-dense foods that are high in fat and sugars, and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanisation (Lean, Astrup and Roberts, 2018; Rabeea, Eldabi and Kamel, 2019; Shah,; Alruwaily *et al.*, 2020;

WHO, 2020). Secondly, other researchers have attributed rising obesity rates to factors related to globalisation processes, economic wealth, modernisation and women's changing role in society that is likely to impact on changes in underlying behavioural patterns. Obesity is a complex epidemic that is triggered by multiple interactions between behavioural, environmental and genetic factors, as well as societal, socio-economic, cultural and psychological factors.

Prior research suggests that obesity is driven by complex hormonal and neurological pathways that influence satiety, and through other factors such as food abundance, environment, the marketing of unhealthy foods and urbanisation, while the indulgence in sedentary behaviours and reduction in physical activity also play important roles (Romieu *et al.*, 2017, Bentley, Ormerod and Ruck, 2018, Samara, 2019). The aetiology of overweight and obesity is very complex. Reilly *et al.* (2007) state that a complicated interaction between genetic and environmental factors results in the development of overweight and obesity

2.9.1 Environmental/behavioural factors

Reilly *et al.* (2005) indicate that there is an independent association between the risk of obesity and birth weight, parental obesity, sleep duration and television viewing. Other risk factors such as excessive energy intake, wealth, large portions of food, fast-food, junk food, soft drinks and confectionary consumption have all been reported to be related to obesity, in addition to a genetic tendency (Blumental, *et al.*, 2002; Stettler *et al.*, 2002; Hui *et al.*, 2003; Krebs and Jacobson, 2003; Nicklas *et al.*, 2003; Treuth *et al.*, 2003; Yanovski, 2003; Agras *et al.*, 2004; Bray, Nielson and Popkin, 2004; Garipagaoglu *et al.*, 2009). Other studies note that having a working mother, the level of education of

parents, poor parenting, long duration of television watching, playing computer games, and insufficient physical activity also play a part in the development of obesity in childhood.

According to Pérusse and Bouchard (2000) and Bouchard (2009), obesity is a multifactor disease caused by genetic and environmental factors. Family traits are also responsible, which means for parents who are obese, their 2–18-year-old children are at a greater risk of becoming obese. There is some evidence that the body's response to changes in environmental factors, such as diet and physical activity, can be influenced by genetic factors (Balaban and Silva, 2004). Many other studies have also recognised that obesity is a multifactor disorder influenced by genetic, behavioural, environmental and cultural factors.

Vanhala *et al.* (2009) also suggest that obesity is a multifactor disorder in which there is an interaction between environmental and genetic factors. They further state that the modern obesogenic environment is responsible for the recent rapid increase in childhood overweight and obesity. Insufficient physical activities, changes in dietary habits and socio-demographic and environmental factors have been extensively related to higher weight in children and adults. According to most of the preceding studies, it has been concluded that adolescents are protected from obesity by physical activity, whereas spending hours watching television predisposes a child to obesity. In short, despite the fact that the most significant components of the BMI are genetic factors, environmental factors account for the remaining 10–50% of the variance in BMI. Activity, as well as a difference in diet, is more important than the actual amount of food eaten in many lifestyle changes that have occurred over the last 20 years (Department for Work and Pensions [DWP], 2008).

2.9.2 Demographic factors

Even though researchers are concerned with SES as one of the risk aspects for obesity and overweight, there is little evidence on the SES correlates of overweight and obesity risk factors, especially in Saudi Arabia and the Gulf countries in general (Al-Hanawi *et al.*, 2021), and it is important to understand the SES differences in overweight and obesity risk factors. It has been remarked that overweight and obesity risk factors are extremely varied in their distribution across different socio-economic groups, and their prevalence patterns rapidly change as societies develop. While some literature exists on the behavioural determinants of overweight and obesity in the Gulf countries (Al-Hanawi *et al.*, 2020), little is known about the corresponding socio-economic correlates of overweight and obesity risk factors.

Other aspects such as demographic features (age, gender and ethnicity) add to the prevalence of overweight and obesity. In the UAE, considering students from grades 9 to 12 in private and public schools (aged 13–19 years), Baniissa *et al.* (2020) found BMI differences due to gender, as the male participants in their study were more likely to have a higher BMI compared with the female participants; moreover, they showed that adolescents in public schools (low SES) were more likely to have a higher BMI compared with those in private schools (high SES).

Furthermore, the link between obesity and SES might differentiate by sex, age or race (Zhang and Wang, 2004; Kumanyika *et al.*, 2008). For instance, a great difference was discovered among 4,010 California adolescents in the USA with a mean age of 14.5 years according to age, sex, race and SES group in the prevalence of overweight. Apart from lower parental education, boys, older age children and American Indians were more prone to be overweight because of their biological and behavioural characteristics

(Kumanyika *et al.*, 2008). NHANES data between 1971 and 2002 for children and adolescents aged 2 to 18 years demonstrated that the occurrence of overweight was dissimilar according to SES, gender, age and ethnicity. However, NHANES data indicate that while not all low SES groups were at higher risk of being overweight, ethnicity, sex and age dissimilarities also exist whilst taking into consideration overweight. For instance, among low SES, White adolescent children were linked with being overweight, whilst high SES Black adolescent children were more overweight. For that reason, even though White adolescent children with low SES may be at risk of overweight and request further attention, the higher SES Black group should also be targeted (Zhang and Wang, 2004). Similarly, lower SES strata were recognised as being at a greater risk of obesity among the UK population (Jebb *et al.*, 2004; Stamatakis *et al.*, 2005).

In a longitudinal study of 6,928 adults over 34 years, the inhabitants of Almada county in California displayed an ethnicity difference in gaining weight. Black adults were heavier throughout life than their White counterparts, while African-American women and men weighed 4.96 kg ($p < 0.001$) and 2.41 kg ($p = 0.006$) more than White women and Black men (Baltrus *et al.*, 2005). Furthermore, a great dissimilarity in the percentages of obese individuals were looked at amongst various races in a national US population between 2003 and 2004. Almost 30% of Non-Hispanic Whites were obese compared to 45% Black and 36.8% Mexican Americans (Ogden *et al.*, 2006). In the same way, Asian 4–18-year-olds were four times more prone to be obese when compared to White adolescent children of a similar age between a national sample of UK residents (Jebb *et al.*, 2004). The quality of diet was discovered to be dissimilar according to ethnicity and age, established from the National Health and Examination Survey (NHES) 1999–2002 taking into account 1,521 American pre-schoolers aged 2–5 years old.

Fundamentally, in general, diet quality considerably reduced with increased age ($p < 0.001$) and improved with family income ($p < 0.001$). However, certain ethnic groups had better diet quality than others, which was associated to their cultural background. Mexican-American adolescent children from lower income families had considerably better diet due to their conventional diet consisting of a large proportion of fruit and high-fibre vegetables compared to non-Hispanic White adolescent children (Kranz, Findeis and Shrestha, 2008).

According to Makansi *et al.* (2018):

> In order to involve Emirati parents in future interventions, it is important to recognize potential challenges. For example, half of the parents in our study reportedly did not have higher education. These parents may lack the knowledge needed to guide the eating habits of their adolescent children.

Moreover, their results:

> indicated that subgroups of the adolescent population, defined by demographic and lifestyle factors, may require different intervention approaches. As an example, given the social restrictions on female lifestyle, schools become an important setting for socializing among Emirati girls. This may lead to a stronger influence of school social norms among females. On the other hand, social norms in boys' schools might be diluted, as they tend to have more opportunities to socialize outside school. It is also possible that girls are generally more responsive to peer influence than boys.

Research exploring these concepts in Emirati adolescents remains relatively scarce.

2.9.3 Sedentary activity

Rey-Lopez *et al.* (2007) claim that the development of children and adolescents becoming overweight is affected by an increase in sedentary behaviour, in addition to overeating. Rideout, Roberts and Foehr (2005) argue that because media are ubiquitous to American society, a typical youth spends a quarter of the day watching television and videos, using print media, playing video games, using computers and listening to CDs, MP3 players,

tapes and the radio. Thus, media use and the incorporation of the messages promoted by the media have been examined as risk factors for both obesity and eating disorders. Placing emphasis on television viewing, Flodmark *et al.* (2004) found that as children spend a significant amount of their lives watching television, they are at a risk of becoming obese. They hypothesise that three mechanisms are involved, namely, the displacement of physical activity, increased calorie consumption while watching or caused by the effects of advertising, and reduced resting metabolism, with the reduced resting metabolism being the major factor.

The Henry-Kaiser Family Foundation (2004) demonstrates that there is strong evidence for the role of the media in childhood obesity, because children view about 40,000 advertisements a year, most of which are for sugared cereals, confectionary and fast food. Coon and Tucker (2002), while examining the effect of television on the pattern of consumption in children, argue that exposure to food advertisements significantly increases the likelihood of children selecting or requesting the advertised product. Batch and Baur (2005) also suggest that television viewing exposes children to food marketing, increases opportunities for snacking on high-energy foods and drinks, decreases opportunities for physical activity, and reinforces sedentary behaviour.

Vanhala *et al.* (2009) show that several lifestyle and physical activity factors remain independent risk factors for child's overweight in Finland. For example, the risk of being overweight increased as the number of hours spent watching television increased. Watching television for more than one hour per day tripled the risk of being overweight compared to the children who watched television for less than half an hour a day. In France, the situation was not encouraging because there is a high level of sedentary behaviour in children who spent an average of 25 hours a week viewing television or

playing video games (Hancox and Poulton, 2006). Girls spent less time than boys in sports, which were different according to gender. There was thus a significant link between sedentary behaviour and overweight that was stronger with obesity than with overweight.

2.9.4 Physical activity

Physical activity plays a significant role in daily energy expenditure and it is easy to manipulate. Thus, it serves as an important part of many weight-loss programmes. McDonald (2007) indicates that physical activity reduces drastically through childhood, particularly among girls. In addition, the reduction in the provision of physical education in schools and in the number of children who walk or cycle to school led to a reduction in physical activity.

Strong *et al.* (2005) suggest a reduction in the body fat percentage in overweight children and adolescents who participated in exercise programmes, as well as evidence indicating that active children have lower body fat proportions than their inactive peers. Moreover, Stevens *et al.* (2007) and Treuth *et al.* (2007) observed that there is an inverse relationship between the levels of physical activity and overweight or obesity status during childhood and adolescence, and therefore one of the factors needing attention in the rapid rise in obesity is reduced levels of physical activity and the rise in sedentary behaviour. For instance, there is a reduction in school pupils participating in school sports and in pupils walking to school, while a larger number are watching television and playing computer games. Similarly, Batch and Baur (2005) argue that in Western societies sedentary behaviour contributes to the development of obesity in both children and adults.

Likewise, Dishman, Washburn and Heath (2004) indicate that physical inactivity is a prominent risk factor for developing overweight and obesity, arguing that although there are moderate relationships between the levels of physical activity and weight status, it has been shown that there is a link between low levels of physical activity and high weight gain over time. The Australian Physical Activity Guidelines suggest that adolescents aged 12–18 years must exercise every day for at least 60 minutes and limit inactive activities such as television, games and computers to not more than two hours a day to keep them healthy (Spinks *et al.*, 2007). Correspondingly, the American Physical Activity Guidelines (Donnelly *et al.*, 2009), American Association of Pediatrics (American Academy of Pediatrics, 1992), WHO (2009) suggest at least 30 minutes (adults) and 60 minutes (children) of reasonable physical activity daily, and decreasing the time spent inactive (television, video games) to less than two hours to avert gaining weight.

The 'built environment', which is described as neighbourhoods, roads, buildings, food source and facilities in which individuals live, work, educate, eat and play can affect adolescent's weight by shaping both their eating habits and their physical activity (Sallis and Glanz, 2006). Environmental modification (obesogenic environment) has decreased occasions for physical activity (Swinburn, Egger and Raza, 1999). For instance, the lack of pavements, long distances to school and busy streets discourage walking and biking to school, and other forms of outdoor activity among children and adolescents (Sallis and Glanz, 2006).

In short, physical activity by children and adolescents has been found to be influenced by the macro-environmental level such as the transport system, road safety and city, and access to public parks (Khadri, 2010), and at the micro-environmental level

by the entrance and accessibility of television, electronic games, smartphones, social media and computers in the home environment, which has expanded the time in inactivity. Even though children and adolescents spend a lot of their time away from home in school, the family and home environment remain the essential place that affects both their diet and physical activity (Spurrier *et al.*, 2008).

2.9.5 Dietary factors

Diet is a vital factor in controlling weight conditions (Kontogianni *et al.*, 2010). Nearly 15% of children and adolescents have a diet where almost 40% of the energy derives from fat. In addition, children and adolescents are consuming much less fruit and vegetables when compared to the recent diet recommendations. A study of food consumption by children and adolescents who ate five or more different kinds of fruit and vegetables a day was conducted, and the outcomes displayed that 25% of the vegetables were French fries (Bin Zaal, 2006). Caloric and nutrient needs for adolescents aged 11–19 years fluctuate extensively as a consequence of observed differences in growth rates (Newman and Taylor, 1992) and differing levels of physical activity. Certain attention has concentrated on calcium, iron and zinc (Hertzler, 1983). Child feeding observations that are in charge of what and how many children and adolescents' consume food can also have an effect on their food preferences (Hertzler, 1983). Child feeding methods that persuade children and adolescents' to eat certain foods might enhance children's dislike for that food (Bin Zaal, 2006). Many of the meals or foods that parents encourage their children and adolescents to eat are fruit and vegetables they would like to see consumed more often and in larger portions (Stanek, Abbott and Cramer, 1990).

Amongst several environmental factors that affect human eating behaviour are those ranging from the nature of food itself to the societal setting, including increased energy

density as observed by Levitsky (2002), where humans provided with food whose energy density is increased by the addition of fat do not reduce the total amount that is eaten to make up for the increased energy taken in, hence resulting in weight gain. On the other hand, Osterholt, Roe and Rolls (2007) report that reducing the energy density by the addition of water or air to food will not result in compensatory overeating and weight will be lost.

Dietary factors include eating high-fat, energy-dense foods and drinks, consumed in greater quantities but less satisfying than other foods. They generally contain twice as many calories as carbohydrates and proteins. There has also been a decrease in the consumption of fruit, vegetables and unprocessed foods as a result of the advertising and marketing of high-density, processed and convenience foods with high sugar, salt and fat content, coupled with disorganised eating habits, informal meal times and not taking into account the amount of food eaten (DWP, 2008).

Batch and Baur (2005) state that dietary intake leading to the increased prevalence of obesity in recent decades may have partly resulted from the increased consumption of high-fat foods or sweetened drinks. In young children, parental influence on food selection is strong. In older children and adolescents', peer influence becomes more important. Less desirable meal patterns, such as frequent snacking, also appear to be related to established obesity. As far as dietary factors are concerned, Kontogianni *et al.* (2010) suggest that in order to find the link between dietary factors and childhood obesity, there is a need to consider energy intake data and eating patterns instead of food composition with regard to body weight and dietary fat content, although the macronutrient composition of diets has been thoroughly investigated. Other behaviours such as eating fewer meals per day, skipping breakfast and having infrequent family meals

have also been connected to overweight in children and adolescents.

Haines *et al.* (2006) report that dieting is not effective in preventing weight gain, although dieting is often publicised as a solution to the rising obesity epidemic. In contrast, recent data suggest that dieting may actually be associated with an increased risk of obesity among children and adolescents, and the BMI has been positively correlated with dieting behaviours among both children and adolescents. Neumark-Sztainer *et al.* (2004) also explain that a mind-set rather than an actual set of behaviours is more appropriately represented by self-reported dieting, as dieters may not have reduced their actual caloric intake, even though they feel that they are doing so; considerable differences have not been found between dieters and non-dieters with regard to their caloric intake. In addition, Norton *et al.* (2006) show that greater dietary variety leads to increase in food consumption when provided at a meal. Lyles *et al.* (2006) also note that people with a high BMI appear to eat a greater variety of foods than lean people.

With regards to social facilitations, Levitsky (2005) explains that the amount eaten at a meal is increased in proportion to the number of people present. This increase in food eaten is pronounced when in the presence of friends rather than strangers. Similarly, Briefel and Johnson (2004) confirm that social facilitation can result in higher energy consumption when people eat outside the home, and especially in fast food outlets, which has been an increasing trend over the last 30 years in the USA and other countries.

Conversely, increased energy intake and reduced energy expenditure are described by Atkin and Davies (2000) as the major causes of obesity. They state that a plausible explanation is the interaction between genetic and environmental factors. Moreno *et al.* (2000) agree that because a diet rich in simple carbohydrates and lipids is a risk factor for

obesity, the total caloric content and composition of the diet is also important. Ma *et al.* (2005) show that children and adolescents are at risk of being overweight or obese due to their dietary patterns, with these dangerous eating habits including skipping breakfast, eating fast food and a high consumption of soft drinks. Therefore, dietary habit amongst the adolescent population is an important factor to consider in such studies.

2.9.6 Psychological factors

Obesity is sometimes linked to significant psychosocial drivers. Many individuals who have obesity also struggle with issues related to their mood, self-esteem, quality of life, body image, self-criticism, negative core beliefs, binge eating, and so forth (Carpenter *et al.*, 2000; Sarwer and Polonsky, 2016). This emotional distress likely plays a role in treatment-seeking, but also can impact successful treatment. For these reasons, most multidisciplinary obesity treatment teams include mental health professionals who can assess and treat these issues in patients as needed (Sarwer and Polonsky, 2016). Moreover, chronic stress contributes to the development of overweight and obesity in an obesogenic environment. De Henauw and Blundell (2006) investigated the relation between stress, food intake and physical activity, and report that changes in people's lifestyles have encouraged the development of overweight and obesity. In the Western world, a sedentary lifestyle has become the norm, resulting in a reduction in physical activity. They also indicate that a common feature of the developed world is the increasing amount of stress associated with work, home and school life, where everything is a challenge. Additionally, considerable pressure has been put on the regulation of food intake as never before, due to the unlimited availability of highly palatable foods, a situation that is now apparent worldwide. Tsigos and Chrousos (2006) show that the potential role of chronic stress as a promoting factor for the development of overweight

and obesity in the obesogenic world environment is currently receiving increasing attention.

It can be observed in many cultures that people's perceptions of themselves and others are mainly influenced by body weight due to stigmatisation and discrimination as a result of obesity, which is widespread and becomes recognised early in childhood. Major areas of life including education, employment, healthcare and social interaction are affected by obesity, particularly for women. Depression, low self-esteem and impaired quality of life could destroy the psychological well-being of a person and interfere with the maintenance of treatment, thus lowering the effectiveness of weight-management processes (Williams and Fruhbeck, 2009).

There is also an association of depression with obesity as a major risk for women, but men are said to be at a reduced risk of becoming depressed (Carpenter *et al.*, 2000). Similarly, there is a high risk of suicide attempts by obese women and a decreased risk of suicide attempts by men. This was confirmed by Magnusson *et al.* (2005) in a study of over 1 million Swedish men with increasing BMI. In addition, Onyike *et al.* (2003) report that the USA NHANES III survey revealed a higher risk of depression in obese women, with women who are obese being twice as likely to become depressed compared to women of normal weight, and those who were severely obese were at a five-times-greater risk when compared to normal weight women. This is corroborated by Wadden *et al.* (2006), who found that a quarter of women who were severely obese had a mood disorder.

Williams and Fruhbeck (2009) state that obese men and women were four times more likely to have clinical anxiety than normal weight men and women, and seven times more likely to be clinical depressed when compared to their normal weight peers. It is

also obvious that many obese girls and those undergoing treatment suffer from depression. Richardson *et al.* (2003) and Franko *et al.* (2005) state that in adolescence, depression is associated with later weight gain and a two-fold increase in the risk of subsequent obesity.

2.9.6.1 Self-esteem and obesity

Overweight and obesity have a major influence on both physical and psychological health (Dehghan, Akhtar-Danesh and Merchant, 2005). The connection between being overweight and physical health like cardiovascular disease, diabetes and hypertension is frequently illustrated (Freedman *et al.*, 2007), while the association between obesity and psychological well-being is notorious. Research has shown that there is an association between obesity and the psychological prospects of health such as depression (Erickson *et al.*, 2000), health-related quality of life (Fallon *et al.*, 2005; Swallen *et al.*, 2005), socialisation (Strauss and Pollack, 2003), body image (Skemp-Arlt *et al.*, 2006) and increased levels of loneliness, sadness, nervousness, self-worth or self-esteem (French *et al.*, 1995; Strauss, 2000, Franklin *et al.*, 2006). Statistics regarding 17,557 high school adolescents enrolled in the National Longitudinal Study of Adolescents Health (1994) in the USA indicated that overweight adolescents were more prone to be socially isolated (Strauss, 2003). Many studies have reported a strong connection between obesity and self-esteem, and discovered reduced levels of self-esteem in obese children (French *et al.*, 1995; Strauss, 2000; Franklin *et al.*, 2006; Stern *et al.*, 2007; Kristjansson, Sigfusdottir and Allegrante, 2008). In contrast, other research did not find any connection between BMI and self-esteem, and indicated normal levels of self-esteem among obese children (Ozmen *et al.*, 2007). Strauss (2000) also researched the links between obesity and self-esteem utilising the Self Perception Profile for Children on a sample of 1,520 American

children aged 9–10 years from the National Longitudinal Survey of Youth, and followed up over a four-year period until 13–14 years of age. There were no dissimilarities found in self-esteem between obese and non-obese children among pre-adolescents (aged 9–10 years). However, there was a decrease of self-esteem over a four-year period among the 13–14 year olds, particularly among obese Hispanic girls and obese White girls (Strauss, 2000). Similarly, Strauss (2000) argues that early adolescence is a significant period for the growth of self-esteem and the significance of the psycho-social outcomes of childhood and adolescent obesity should be accentuated. It is a time that features the most important psychological changes, particularly at the early adolescence stage (11–14 years of age), where they mostly focus on body change, body image and appearance (Khadri, 2010).

As mentioned earlier, there is little research on obesity and its effects (Al-Hanawi *et al.*, 2021), especially in the Arab Gulf countries, with the recent studies by Radwan *et al.* (2019) and Khalaf, Hashmi and Omari (2021) being the few researchers that deal with this topic. Their separate studies include samples of adolescents and adults to examine the relationship between self-esteem and obesity perception through BMICs. Self-esteem has been shown to be an important mediator of the relationship between rated weight and observed weight, and may help to increase the understanding of published research findings on the relationship between socio-demographic variables, weight perception and unhealthy practices.

> The relationship between self-esteem and misunderstandings about weight gain may also have clinical consequences, as some people who misunderstand that they are overweight may eat unhealthy diets, which can promote eating disorders or obesity. In overweight individuals, the relationship between increased self-esteem and misunderstandings, because normal weight perpetuates unhealthy and obesity-promoting eating behaviours.

2.9.6.2 Body image and obesity

Body image is a vital psychological factor linked with body weight. Over-emphasis on

thinness among adolescents can cause unhealthy dieting habits and eating disorders, whereas the underestimation of body weight might add to the danger of the development of overweight and obesity (Bin Zaal, 2006).

Body image concerns have been recently increasing and have clear effects on people of most ages, especially on adolescents and youth (Heron *et al*., 2013). These effects include, but are not limited to, dissatisfaction about body shape, eating disorder, low self-esteem, depression, and the use of unhealthy weight control behaviours (Burrowes, 2013).

Interestingly, food availability has been observed as a significant factor that affects weight and obesity (Alharballeh and Dodeen, 2021). It is also one of the factors that affect eating patterns and lifestyles, which influence the energy that people intake and expend (Hamadeh, 2019).

The globalisation of Western media has been implicated in a shift towards the thin body ideal and body image dissatisfaction in non-Western societies (Omori *et al.*, 2017). However, it is unclear how cultural ideals and socio-economic factors may counteract the internalisation of the thin-body ideal, hereafter called 'the desire for thinness'. Additionally, little is known about how body shape preferences, not just the desire for thinness in size, may also be affected by media icons among women in Western and non-Western societies (Khaled *et al.*, 2018).

According to Alharballeh and Dodeen (2021), among the youth in the UAE, 36.7% are dissatisfied with their body image, with a higher level of dissatisfied body image for men than with women, and a strong correlation between body image and BMI/weight categories.

In Western countries, where thinness is thought of by many to be the ideal, adolescent girls and young women feel great pressure to be thin (Williams and Fruhbeck, 2009). However, the constraint and pressure for thinness is not worldwide, and fondness for an overweight or even obese figure has been observed in some cultural groups and societies (Bin Zaal, 2006). Researchers that have studied race or ethnic differences among adolescent females in the USA have repeatedly shown that African-American girls were less prone to believe themselves as overweight, and were more satisfied with their body size and shape than White girls (Williams and Fruhbeck, 2009). Among Bahraini adolescents, one study reports the continuation of a vague body image that led many overweight or obese adolescents to fail to recognise themselves as such. Obesity during adolescence can cause low self-esteem and other psychosocial problems (Al Sendi *et al.*, 2003). The importance of the connection between weight and self-esteem has been revealed to be stronger for girls than for boys. Most studies of adolescent self-esteem have associated actual weight with physical appearance. In a meta-analysis of the relationship between weight and self-esteem, some studies indicate that for adolescents, apparent size was a better predictor of self-esteem than the actual body weight (Bin Zaal, 2006). Other observations have examined the input of parental approaches and beliefs about body weight, and propose that parental approaches and actions can cause further damage to adolescent self-esteem than that which is directly linked with body size (Hyman *et al.*, 2003). There is persuasive confirmation that our society discriminates against fat people. This is, above all, destructive to the psychological well-being of obese adolescents. Social discrimination continues into adult life. Additionally, overweight and obesity in adolescents is linked with less social achievement in later life (Bin Zaal, 2006). According to Dietary Restraint Theory, body dissatisfaction and weight concern may lead

to dieting and other restrictive behaviours, which in turn leads to hunger, followed by overeating. Moreover, lower levels of physical activity among both male and female adolescents have been shown to be predictive of body dissatisfaction (Haines *et al.*, 2007). According to Johnson and Wardle (2005), weight control is in the public eye as never before because concerns over levels of body dissatisfaction and excessive dieting among young women have risen, alongside a dramatic increase in the prevalence of obesity.

Rosen (2002) argues that 'body image distress', a condition whereby most obese people are dissatisfied and preoccupied with their physical appearance, has risk factors that involve binge eating and previous stigmatising experiences. In contrast, Williams and Fruhbeck (2009) are of the opinion that body dissatisfaction is not consistently correlated with obesity, except at the highest level of BMI. There are several ways in which body-image distress can be expressed, such as wishing to be thinner and the dislike of specific aspects of the physical appearance, especially the size and shape of the waist, stomach, thighs and buttocks—feelings that are similarly shared by many non-obese women.

Wardle and Johnson (2002) indicate that due to an individual's perception of their weight as imperfect, other factors such as depression may be more severely related to body image problems. The ONS Omnibus Survey in the UK indicates that only 75% of the overweight and 44% of the obese respondents correctly assigned themselves to those categories. Neumark-Sztainer *et al.* (2006) carried out a number of prospective studies that show body dissatisfaction to be predictive of binge eating behaviour through dieting, which in turn leads to obesity or a reduction in physical activity that is directly associated to obesity. Wertheim, Koerner and Paxton (2001) also report behaviour that may lead to hunger, followed by overeating, brought about by body dissatisfaction, which is associated to binge eating. Keery, van den Berg and Thompson (2004) indicate that

because body image plays a central role in adolescents' overall feelings of self-worth, the association between body dissatisfaction and binge eating may be mediated by negative effect.

Body image dissatisfaction can be frequent in pre-adolescent children. For instance, children as young as 6 or 7 years of age preferred a body figure thinner than they were (Collins, 1991), as corroborated by Franklin *et al.* (2006) who report the impact of obesity on self-esteem among 2,813 Australian children as young as 11 years old. Even though the above studies support a correlation between obesity and low self-esteem, there have been studies that indicated no association between obesity and self-esteem. For instance, Ozmen *et al.* (2007) indicate that being overweight did not have an important effect ($p = 0.075$) on depression and self-esteem ($p = 0.708$) among 2,444 Turkish adolescents aged 15–18 years. In addition, Mendelson and White (1982) found that self-esteem was not considerably dissimilar among normal and obese elementary school children aged 7 years old. These different outcomes could be because of dissimilarities in age, ethnicity and sex; thus, the effect of body mass on psychological well-being can differ by socio-demographic characteristics (Strauss, 2000; Huang *et al.*, 2007). For example, overweight girls ($r = 0.32$, $p < 0.001$) but not boys ($r = 0.001$, $p < 0.78$) were more depressed, among a school-based sample of 868 pre-adolescent children (mean age 8.4 years) attending public elementary school in Northern California (Erickson *et al*, 2000). A comparable outcome was achieved by Strauss (2000), where obese girls had considerably lower self-esteem when comparing them to boys. Furthermore, overweight adolescents and above all, overweight girls, reported greater body disappointment, lower self-esteem and lower body image compared to boys among 657 US adolescents aged 12–14 years (Huang *et al.*, 2007). Additionally, physical attractiveness was discovered

essential in relation to their sense of self-worth among 8–16 year old girls in the UAE, while boys' sense of self-worth was mostly influenced by their behaviour (Khadri, 2010).

2.9.7 Genetic factors

Genetics is considered to be a main risk factor of obesity because there have been regular observations of obesity in people whose parents or other family members are obese, linked to the fact that appetite and metabolism or the conversion of food into energy, including the storage and distribution of fat, are determined by genes. Lifestyle and eating habits also play an important role, with family members usually being disposed to having the same kind of habits (Bora, 2010).

Although obesity can result in a few cases from exposure to a long period of energy imbalance, for instance, through drug treatment, particular endocrine disorders or specific monogenic syndromes, a combination of both genetic (polygenic) effects and/or environmentally causing differences that lead to disparities in energy intake or expenditure are responsible for most cases of obesity. The level of the genetic component involved in individual variations in susceptibility can be defined using family studies.

Interestingly, Batch and Baur (2005) are able to establish with numerous studies that there is a strong genetic basis to the development of obesity. Obesity appears to be a polygenic disorder, with many genes currently linked or associated with a tendency to excess fat, as at least five single-gene mutations causing human obesity have been identified to be present in childhood. These are usually uncommon, and all are linked to severe and very early onset of obesity.

In a review that focused on the genetic contribution to childhood obesity, Bouchard (2009) states that although a tendency that mainly favours obesogenic

behaviours in an obesogenic environment is responsible for common forms of childhood obesity, parental obesity is responsible for childhood excess weight, with a defect resulting in impaired function in a gene resulting in about 5% of childhood obesity. On the other hand, Warden and Warden (2001) report that approximately 15 chromosomal loci related to weight, body fat and other obesity-related traits have already been identified in humans, and over 90 of these loci have been identified in animal models. Seven genes have been identified as the cause of obesity in humans and, in most cases, obesity results from the interaction of multiple genes, rather than from the action of a single gene.

Bingham *et al.* (2009) note that a genetic tendency alongside poor dietary and activity behaviours has also been associated with the increased rise of overweight in children and adolescents. With this evidence, overweight in adolescents and the associated cardiac risk factors have become serious public health concerns in the USA, France and Japan. For instance, the BMI in Blacks is influenced differently by genotype and environment than in non-Hispanic White adolescents. A combination of biological, social and environmental factors that may vary and interact differently by country, culture and race has been noted to be responsible for the increase in childhood obesity in the USA (Crawford *et al.*, 2001; French *et al.*, 2001; Freedman *et al.*, 2006). This study can be applied to the Gulf countries population.

2.9.8 Socio-cultural factors

Social and cultural norms play a role in attitudes towards weight in Arab countries, where rich high-fat food is an important part of the daily diet, and where ‘plumpness’ is considered a sign of beauty for women (Batnitzky, 2011). In addition, women tend to spend a large part of their time indoors, some involved in domestic and household roles,

and rarely participate in sports activities. Indeed, they tend to have limited access to active leisure-time activities. All these factors, including the hot climate and high prevalence of asthma, which themselves discourage outdoor activity, are possible reasons for high obesity in the UAE. As stated, until recently (Naik, 2004; Rguibi and Belahsen, 2006; Batnitzky, 2011) a larger body size for adult women was associated with cultural understandings of affluence, beauty and even fertility in much of the Arab world. In this regard, Banwell, Kinmonth and Dixon (2011) note that in countries where plump women represent wealth and status, girls are encouraged to put on weight once they reach puberty.

Therefore, obesity has different connotations because its aetiology (and in various parts of the world) is quite complicated, and excessive weight gain can occur at different times in people's lives, for different reasons and with different emotional and physical consequences. Hence, obesity is the result of a range of different social, cultural and biological factors, and this variety in turn has produced a wide range of research work and experiences (Thomas *et al.*, 2008).

In summary, there are several factors involved in the aetiology of obesity in the UAE. These include social, personal and behavioural factors and religious barriers, including low motivation, lack of social support and socio-cultural norms that restrict outdoor physical activities, particularly for women. It should also be noted that the prevalence of obesity in the Arab world can effectively be attributed—although not in totality—to the effect of culture and religion (see Batnitzky, 2011). Indeed, religion and culture are interwoven in most of the Arab world; it is almost impossible to separate one from the other, and the consequence of this for obesity has been highlighted in several studies (Greenberg, Cwikel and Mirsky, 2007; Berger and Peerson, 2009; Maddah and Solhpour, 2009) that reveal a positive relationship between body weight, eating habits

and socio-cultural backgrounds. For example, Abduelkarem (2005), Berger and Peerson (2009) and Maddah and Solhpour (2009) all show that social and religious factors, particularly in some conservative Islamic cultures, contribute to overweight and obesity among women as such culture imposes limitations on outdoor and leisure activities. There is a substantial lack of physical activity among the UAE population, and hence a high prevalence of obesity is widely observed while the lack of exercise is also exacerbated by religion, cultural and climate factors. On the other hand, the enhancement of social support for women, providing greater access to dieticians and nutrition information, and the increasing availability of culturally sensitive exercise facilities are some of the improvements that have been deemed necessary for a healthier lifestyle for the region (Ali, Baynouna and Bernsen, 2010).

The present research project is designed to investigate the role and/or influences of both lifestyle changes and the cultural dimensions of overweight and obesity that contribute to the current high prevalence among adolescents in the UAE. It examines the independent relationship of parental influence over adolescents's eating habits including parental perceptions of weight, attitudes over shape and body image, and/or involvement in supervising the food that their offspring consume. Parental behaviour and perceptions are thought to influence adolescents's weight, that is, parents who wish to spare their adolescents the negative social consequences of being overweight may impose limits on their children and adolescents's access to food (Costanzo and Woody, 1984; Johnson and Birch, 1994; Birch and Fisher, 1995, 1998; Lopez-Dicastillo, Grande and Callery, 2010; Saelens, Ernst and Epstein, 2000). However, parents who control their adolescents's eating habits may interfere with their adolescents's ability to regulate their own intake, ironically resulting in excess weight gain.

Obesity is known to be socio-culturally distributed and a number of mechanisms have been suggested by Ma *et al.* (2003), although it is likely that several factors contribute to an energy imbalance, such as increasing the overall energy intake in conditions of low levels of physical activity. Ball and Crawford (2005) propose that several factors may contribute to explain the socio-cultural variations in diet and physical activity, and ultimately the risk of obesity, and social relations vary within and between populations, linking social cultural factors to behaviours that influence energy balance components and weight outcome. However, culture seems to influence diet, shape, thinness, overweight and obesity, as demonstrated by the prevalence of eating disorders and the proportion of obesity across cultures. This is also demonstrated by socio-cultural changes that have considerable influence over dietary habits and the increasing rates of eating disorders, particularly in the Western world (Greenberg, Cwikel and Mirsky, 2007; Veltsista *et al.*, 2010).

Further, the relationship between culture and childhood obesity is placed under scrutiny by Caprio *et al.* (2008), who note that culture contributes to differences in childhood obesity in various ways in the USA, because body image development occurs in a cultural background; ethnic or cultural groups differ in their shared understandings as to the body image that is appreciated and that which is not appreciated. For example, for African-American women the apparent ideal body size is much larger than it is for White women, and African-American men are more likely to show a preference for a larger body size in women than non-Hispanic White men.

Generally, the socio-cultural environment is highly influential and most often deleterious in the area of body weight, that is, social norms usually promote either excessive thinness or overweight as the standard of beauty. Implicit in this perspective

are both a structuralist view, in which a social system is responsible for body image, and a poststructuralist view in which women are active participants in the social construction and reconstruction of the ideal body (Germov and Williams, 1999). In the Moroccan context, norms that promote a deleterious view of excessive thinness are more powerful than norms that view a larger body size negatively, whereby for lower and middle-class Moroccans it is better to be 'too fat' than 'too thin' (Batnitzky, 2011).

In non-Western countries, such as those of the Arab and Muslim world, eating disorders are still relatively rare. For instance, Islam dominates all walks of life in the UAE and Islam as a code of conduct shapes and influences Emiratis' behaviour. The Islamic faith places great emphasis on healthy eating and eating in moderation, avoiding excessive food consumption and waste. Thus, religion and spirituality can impact decisions regarding diet and food choices, and eating in moderation. The Quran (*Sûrat Al-A'râf* verse 31) says: "Eat and drink but waste not by extravagance, certainly He [Allah] likes not "*Al-Musrifûn*" [those who waste by extravagance]." This verse clearly suggests that extravagance and over indulgence in foods and drinks should be avoided.

This study suggests possible pathways through which the relationship between religious practice, cultural beliefs and social class might operate. For example, education might interact with the effects of cultural and religious beliefs and practices on health. Thus, there is a need to take cultural differences into consideration when public health professionals propose preventive approaches or activities to improve young children's and adolescents' weight status (Veltsista *et al.*, 2010).

2.9.9 Socio-economic status in relation to obesity

The definition of SES is complex and is typically measured by indicators of human capital such as income, education and occupation (Khadri, 2010). Children's SES results from their parents' characteristics such as education and income (Wang and Zhang, 2006). The relationship between SES and the occurrence and frequency of diseases is well established. A review of the literature indicates that the rate of death and morbidity from cardiovascular illnesses, diabetes and cancer is dissimilar across diverse socio-economic groups (Kaplan and Lynch, 1999). SES also plays a role in food selection and dietary behaviours (Ricciuto, Tarasuk and Yatchew, 2006; Turrell and Kavanagh, 2006). Higher SES is reported as a predictor for purchasing improved quality and healthier food (Van der Horst *et al.*, 2007). A 1999–2001 study in four German cities among 2,637 children aged two years established a connection between SES utilising the education, occupation and income of their parents and food ingestion. The key result was the impact of SES on food ingestion among children. Little parental education and low income was connected with a low intake of fresh fruit, cooked vegetables and milk (Sausenthaler *et al.*, 2007). The effect of SES can be seen in some developed countries where poorer children or those who live in rural settings are more at risk of obesity, whereas in countries undergoing economic transition childhood obesity is associated with a more affluent lifestyle and with living in urban regions. Joens-Matre *et al.* (2008) report that the obesity epidemic in China is a consequence of the change in SES as the country moved from being a developing country with inadequate food to a developed country with abundant food intake, sedentary lifestyle and other obesogenic factors in the environment.

Stamatakis *et al.* (2005) note that SES is significant in determining the risk of obesity in childhood, especially in wealthy societies where obesity is common among

children of the affluent, but becomes ever more prevalent as SES declines. According to studies conducted in Argentina by Adallay *et al.* (2009), decreasing SES and divorced marital status influence overweight and obesity negatively, while increasing physical activity has a positive impact. Popkin and Du (2003) also propose that several factors are responsible for the changes and they include income relation to the preference of consumption, lower prices of food and the media's promotion of dietary patterns. In short, obesity is not a 'choice'. People become overweight or obese as a result of a complex combination of biological and psychological factors combined with environmental and social influences (The British Psychological Society, 2019).

The conclusion that can be drawn from the obesity debate is that there is no clear-cut evidence about the precise causal drivers of obesity. Much of the broad research base on obesity identifies an amalgam of factors (Astrup, Hill and Rössner, 2004; Tyrrell *et al.*, 2016). These can be summed up as follows

1) Energy intake that exceeds energy expenditure: Often referred to as energy balance, this has a direct relation to the long-term gain or loss of mass body fat. A diet characterised by the higher intake of energy-dense foods that are high in fat and sugars but low in vitamins, minerals and other healthy micronutrients
2) Environmental, global, urban and industrial: A global shift in diet and lifestyle, and how people respond to an environment that promotes physical inactivity and the intake of high-calorie foods contributes to developing obesity.
3) Cultural, societal, social and socio-economic: Society, environment and family influence individual lifestyle. The work environment or a shopping outlet may lead people to choose transport instead of walking. People's work or school

environments, healthcare and home life can also influence how a person behaves on a day-to-day basis.

4) Genetics: Research states that genetic factors influence how people respond to a high calorie intake or changes in the environment. Gene variants have also been identified that increase hunger and food consumption. Family health history reflects the effects of shared genetics and environment among close relatives.
5) Psychological: The stigma of being obese often has a negative impact on individuals' health and well-being such as experiences of weight bias that may contribute to depression, anxiety, low self-esteem, reduced social support and social isolation.
6) Sedentary lifestyle: A lifestyle trend characterised by decreased physical activity levels due to the growing sedentary nature of many forms of recreation time, changing modes of transportation and increasing urbanisation.
7) Disease: Certain diseases can lead to a person becoming overweight or obese, with examples being Cushing's disease and polycystic ovary syndrome.
8) Medications: Certain medications such as antidepressants and steroids can lead to weight gain.
9) The food environment, and the marketing of unhealthy foods.

In addition, a range of drivers have been referred to, under different labels often overlapping in meaning, and used depending on the author examining the root causes of obesity. For instance, Harnack and Schmitz (2010) indicate diet and exercise, genetics, and socio-cultural and environmental factors as potential primary causes. Some associate obesity with the individual, rather than the wider environmental, societal and food system determinants (Lean, Astrup and Roberts, 2018; Rabeea, Eldabi and Kamel, 2019; Shah,

Hagell and Cheung, 2019; Alruwaily *et al.*, 2020). Others blame behaviours and dietary patterns Flint *et al.*, (2016). Others then suggest that the built environment can influence activity patterns (Greenwood *et al.*, 2008). In addition, socio-economic factors, smoking (Dare *et al.*, 2015), the presence of morbidities (Lyall *et al.*, 2017) is often cited as generating obesity. According to Clark *et al.* (2020), a number of other researchers and stakeholders have examined obesity from different perspectives. They focused on obesity aspects, in terms of the participant's patterns of physical activity, either through self-reporting (Cassidy *et al.*, 2016; Smith *et al.*, 2019) or objective measurement via wrist-worn accelerometer devices (Doherty *et al.*, 2017).

Some researchers argue that rather than holding the individual responsible for increased weight gain, obesity is the result of the prevailing 'obesogenic environment'. As Kopelman *et al.*'s (2007) report suggests, the technological revolution of the 20th century, changes in food production and food sales, motorised transportation, and shifts in work and home lifestyle patterns have stimulated conditions where individuals are more vulnerable to weight gain. These include, for example, the perceived and actual barriers of time, money and convenience that support convenience food consumption, limited access to healthy food, the relative cheapness of 'junk' foods and the promotion of food and drinks high in fat, salt and sugar. There has also been a simultaneous shift to more sedentary activities, from television viewing, video games and other screen-time opportunities, to a greater reliance on transport (Rice, Fauth and Reeves, 2011, p. 4).

However, many researchers provide only anecdotal data about obesity drivers to explain the causal impact for the worldwide rise in obesity. This view is supported by Fox, Feng and Asal (2019, p. 1), who argue that:

> Research on the relationship between economic development processes and health has identified several competing structural explanations for rising body BMI including globalisation processes, economic development and women's changing role in society that likely affect changes in underlying behavioural mechanisms. Previous research has not systematically tested these different explanations for the global rise in obesity. Thirdly, genes also may be an influential factor to a person's susceptibility to weight gain. Scientists consider that genes may play a part in increasing a person's likelihood of becoming obese.

In view of the global nature and spread of obesity, a greater understanding of the context-specific drivers of obesity is required in order to develop effective interventions that can have practical implications and applications in different and diverse social and cultural settings. To date, there have been only limited attempts to understand the drivers of obesity in specific world regions using standardised methods (Doherty *et al.*, 2017; Guo *et al.*, 2019; Clark *et al*., 2020) as there is no one-size-fits-all approach for implementing programmes to prevent and address overweight and obesity.

2.10 Impacts of obesity

The relevant literature reveals that at least 18 comorbidities are attributable to overweight and obesity (Taylor *et al.*, 2006; Djalalinia *et al.*, 2015). With more than 1.1 billion adults being overweight and a majority of them being clinically obese (Haslam and Philip, 2005), the WHO (2010) suggests that obesity has attained epidemic proportions and it is causing a major risk through the burden of chronic disease and disability globally. These diseases include type 2 diabetes, cardiovascular disease, hypertension and stroke, along with certain forms of cancer. Additionally, Kelishadi (2007) argued that about three-quarters of all deaths in developing countries may be as a consequence of non-communicable disease by 2020, with obesity resulting in chronic diseases and being responsible for syndromes such as insulin resistance or metabolic syndromes such as

hyperinsulinemia, hypertension, hyperlipidemia, type 2 diabetes mellitus (T2DM) and an elevated risk of atherosclerotic cardiovascular disease.

Wardle and Cooke (2005), Bingham *et al.* (2009), Iseri and Arslan (2009) and the NHS (2009) state that the impact of obesity is serious, with a large percentage of obese adults having at least one and a smaller percentage having two or more diseases associated with obesity (e.g. diabetes, hypertension, cardiovascular diseases and cancers). Moreover, Hossain, Kawar and Nahas (2007) found that diabetes is becoming a fast-growing disease of epidemic proportions that is likely to reach an alarming magnitude by 2030, the highest impact being in developing countries. Wang *et al.* (2010) indicate that with children, hypercholesterolemia, impaired fasting and hypertension along with the metabolic and physiological changes associated with obesity in childhood and adolescence, including diabetes itself, might be carried into adult life and subsequently lead to an increased risk of chronic disease, disability and possibly death.

According to Davidson, Kapeu and Veugelers (2010) and Seo and Sa (2010), there is a difference in the type of disease risk in children and adults because obesity is actually not an immediate or serious hazard to the child's health. Instead, its results are psychological, such as low self-esteem, not being accepted by peer groups, and not participating in social and sports activities. Kerkadi, Hassan and Tayeb (2009) and Stovitz *et al.* (2010) state that concerns arise when obesity that started in childhood is carried into adulthood.

Weight increase is responsible for the growing incidence of hypertension; most people with high blood pressure are overweight and hypertension is about six times more common in people who are obese than those who are lean (Poirier *et al.*, 2006). Obesity

is associated with high blood pressure, particularly where obesity is more pronounced in the abdomen where the blood pressure is highest. Muller *et al.* (1993) claim that the connection between obesity and rise in blood pressure is a consequence of changes in cardiac output and peripheral vascular resistance, and these are responsible for the impact of obesity, along with the mechanisms involved such as endothelial dysfunction, insulin resistance, sympathetic nervous system and substances released from adiposities. The relationship between obesity and hypertension has been explained by various mechanisms, and these include the retention of sodium due to renal structural changes that lead to a change in function of the nephrons due to increased arterial pressure, which leads to a vicious cycle of obesity, hypertension and renal injury with enhanced activity of the central nervous system in obese individuals (Sorof and Daniels, 2002). Kearny *et al.* (2005) estimate that about a quarter of the world's population of adults suffers from hypertension, and this is expected to increase by 50% by 2025, with similarities in prevalence between men and women.

The relationship between obesity and high blood pressure is complex, and factors such as race, gender, genes and hormones need to be taken into consideration, along with the fact that upper body obesity, particularly when there is increased visceral fat, is more connected with hypertension than lower body obesity (Wolk, Shamsuzzaman and Somers, 2003). Rosner *et al.* (2000) examine the difference in blood pressure between Black and White children and adolescents in relation to body size and indicate that irrespective of race, gender or age, there is a higher risk of increased blood pressure with higher BMI than children and adolescents with lower BMI in respect to systolic hypertension.

Sleep apnoea is a disorder that results from metabolic disorder and insulin resistance. Obstructive sleep apnoea occurs when air does not flow, even though

respiration is taking place. According to Vgontzas, Bixler and Chrousos (2003, 2005) there is a strong association between obesity, overweight, age and sleep apnoea. Obesity is responsible for inadequate respiration and pulmonary hypertension in patients suffering from obstructive sleep apnoea, resulting in an increase in sleep disturbance and disordered breathing in obese individuals (Frank, 2008). In a study of a group of people comprising both obese and lean people over the age of 40 years, among the former there was an increase in blood pressure, both systolic and diastolic, and thus an increase in the incidence of hypertension, due to the connection between obesity and sleep apnoea, where obesity has been observed to be a contributory factor. It is also seen as a mechanism that links overweight to hypertension (Poirier *et al.*, 2006).

Obesity is the most important risk factor for obstructive sleep apnoea. This has been established in several studies that have repeatedly shown the connection between body weight gained and the risk of obstructive sleep apnoea (Young, Peppard and Gottlieb, 2002). Furthermore, 40% of obese individuals suffer from sleep apnoea and 70% of patients who have obstructive sleep apnoea are obese (Peppard *et al.*, 2002).

The rate at which the prevalence of chronic, non-communicable diseases is growing worldwide is quite concerning. Each year, approximately 18 million people die from cardiovascular disease, which is a major contributory factor for diabetes and hypertension. The increasing prevalence of overweight and obesity that instigated a surge in the cases of diabetes and hypertension during the past two decades, along with underweight, malnutrition and infectious diseases are major health problems that pose a threat to the developing world (Hossain, Kawar and Nahas, 2007). Although there are various conditions that are related to obesity, type 2 diabetes is the most crucial, with about 171 million individuals suffering from it at the beginning of the century (Wild *et*

al., 2004). Moreover, Steven *et al.* (2006) report that there is a strong link between type 2 diabetes and obesity. Indeed, of several factors involved in the development of insulin resistance in obese individuals, the most critical factor in the emergence of metabolic disease is obesity.

According to the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2003), both genetic and environmental factors are responsible for insulin resistance, and recently the first step in the development of T2DM, cardiovascular disease and other conditions is thought to be insulin resistance. Moreover, type 2 diabetes brings serious complications and a reduction to life expectancy of 8–10 years. It has become one of the major diseases in the European Union (EU). There is a high risk of disability and premature death arising as a complication in patients with diabetes, from which 75% die from coronary heart diseases. The death rate of diabetic patients is twice the death rate of people without diabetes, largely due to deaths from heart attack or stroke; there is also a higher rate of amputation, which may be required due to peripheral vascular diseases (Astrup and Finer, 2000).

Hossain, Kawar and Nahas (2007) also state that about 90% of type 2 diabetes is attributable to excess weight, with the rise in the prevalence of type 2 diabetes closely associated with the increase in obesity. Due to obesity and the associated metabolic syndrome, almost 197 million people are suffering from impaired glucose tolerance in the world; by 2025, this number is expected to increase to 420 million. Likewise, Haslam and James (2005) predict an increase to 144 million people that have diabetes in developing countries. The WHO states that Southeast Asia and the Western Pacific region are the worst hit by the diabetes outbreak; India and China are said to be faced with the greatest challenges. The rate at which the prevalence of type 2 diabetes is increasing amongst

children and adolescents' in these countries is becoming extremely concerning and will possibly result in extreme consequences. Roglic *et al.* (2005) predict that there will be a rise in the number of children and adolescents' with diabetes by 2025, and a general increase from 150 million in 2005 to 220 million by 2010, and finally 300 million by 2025 (Williams and Fruhbeck, 2009).

Hannon, Rao and Arslanian (2005) also describe overweight and obesity as the most significant risk factors for developing T2DM in youths. They observe that there has been a proportional increase in the prevalence of overweight and type 2 diabetes. A large proportion of the recently diagnosed cases—approximately half of all cases in some clinics—among children is due to T2DM. There will be significant long-term implications for these people, the public health system and society as a whole, as a result of the growing rates of T2DM among children and adolescents.

Furthermore, an estimated 246 million people, which is about 80% of the population of developing countries, are afflicted with diabetes. In the Kingdom of Saudi Arabia, the Sultanate of Oman and the Kingdom of Bahrain, the prevalence of diabetes has reached 25% compared to that of other countries (WHO Eastern Mediterranean Regional Office of World Health Organization, 2007). In comparison, the WHO has estimated that about 73% of adult women and 66% of men in the UAE are overweight or obese, placing the country in the top five worldwide in terms of obesity; the prevalence of type 2 diabetes places the UAE among the top five countries in the world because about 13% of the population between 20 and 79 years of age has diabetes; this is twice the global average of 6.4%.

Moreover, the most common cause of death in obese people is myocardial infarction, a cardiovascular disease. Obesity is a major chronic metabolic disorder associated with

cardiovascular disease making it a contributory factor for cardiovascular death, and when combined with inactivity, obesity is responsible for about 60% of deaths due to cardiovascular disease. Obesity has a major impact on cardiovascular disease (e.g. heart failure, coronary heart disease and sudden cardiac death), and is linked with decreased general survival. This appears to be as a result of alterations in the cardiac structure and function as surplus adipose tissue accumulates even when there is no underlying organic heart disease or systemic hypertension Su *et al.*, (2009).

Furthermore, in the Western world, stroke is one of the main causes of disability and death, with the most effective treatment being prevention. Several studies have identified that the risk for stroke increases as the BMI increases (Kurth *et al.*, 2002; Song *et al.*, 2004), although some studies suggested that abdominal obesity and not general obesity is responsible for increased risk of stroke (Suk *et al.*, 2003). There is a definite increase in ischemic stroke with increasing BMI and a potential increase regarding haemorrhage stroke (Jood *et al.*, 2004; Song *et al.*, 2004). Despite the fact that stroke is more frequent in aged people, preventive measures have to be taken earlier in life. In a Swedish investigation, the connection between an increase in abdominal obesity defined by the waist–hip ratio and stroke was examined and indicated that an increased waist–hip ratio is a risk factor for stroke (Suk *et al.*, 2003).

Additionally, The National Cancer Institute (2004) found obesity and physical inactivity are contributory factors for about 25–30% of various major cancers including colon, breast (postmenopausal), endometrial, kidney and oesophagus. Some studies also report links between obesity and cancers of the gallbladder, ovaries and pancreas (Vainio and Bianchini, 2002).

In 30 European countries, the association between cancer and obesity was investigated by Renehan *et al.* (2008) who developed a model to estimate the number of cancers that being fat could be responsible for. Subsequently, they suggested that, in 2002, about 70,000 cases of cancer out of approximately 2 million cancer cases were a result of being overweight or **Error! Hyperlink reference not valid.**and by 2008 the number had increased to at least 124,000 (Health-Cancer, 2009). Likewise, in the USA, in 2002, approximately 41,000 new cases of cancer were estimated to be a result of obesity, corresponding to about 3.2% of all new cancers being linked to obesity (Polednak, 2003). According to a study by Calle *et al.* (2003), 14% of deaths from cancer in men and 20% of deaths in women were due to overweight and obesity.

Cui *et al.* (2002) and Vainio and Bianchini (2002) argue that the effect of obesity on breast cancer risk depends on a woman's menopausal status. Before menopause, obese women have a lower risk of developing breast cancer than women of a healthy weight. Friedenreich (2001) and Yoo *et al.* (2001) found that after menopause, obese women have 1.5 times the risk of breast cancer compared to women of a healthy weight.

Obesity as a risk factor for postmenopausal breast cancer, cancers of the endometrium, colon and kidney, and malignant adenomas of the oesophagus has been established by epidemiological studies. People who are obese are 1.5–3.5 times more prone to the risk of developing these cancers compared with normal-weight subjects. In Europe, between 15% and 45% of these cancers can be attributed to overweight (BMI 25.0–29.9 kg/m^2) and obesity. Furthermore, other types of cancer such as pancreatic, hepatic and gallbladder cancer were shown to contribute to the increase in the risk of obesity (Frank, 2008).

Several epidemiological studies have been used to investigate the relationship between the risk of colorectal cancer and obesity. The International Agency for Research on Cancer and the WHO were of the opinion that there is enough evidence that overweight and obesity increase the risk of colorectal cancer (Pischon, Nothlings and Boeing, 2008). In 2006, it was estimated that 217,400 men and 195,400 women were newly diagnosed with colorectal cancer within Europe, accounting for 12.8% and 13.1% of the total cancer incidence in men and women, respectively (Ferlay *et al.*, 2007). In the same year, 107,600 men and 99,900 women died of colorectal cancer, accounting for 11.3% and 13.3% of all cancer deaths in men and women, respectively (Pischon, Nothlings and Boeing, 2008).

2.11 The cost of obesity

There are several important economic and social impacts of overweight and obesity, including the burden of related chronic diseases due to disability and death. Some of the direct costs include prevention, diagnostic and treatment services related to overweight and obesity. Other direct costs are connected to income loss from reduced productivity, decreased opportunities, restricted activity, illness, absenteeism and premature death.

Indirect costs include adjustments to a wide range of infrastructures of many countries, which have been needed to cope with the reality of most of the population being overweight. The gradual increase in average population weights has required ergonomic alterations for large people, for example, the enlargement of turnstiles and seats in sports grounds. There are also significant consequences for transport safety standards due to obesity. Overall, the cost to society is considerable, accounting for up to 6% of the total direct health expenditure in Europe, and 1% or more of the gross domestic product in some countries (Williams and Fruhbeck, 2009).

In the USA, it was reported by Finkelstein, Fiebelkorn and Wang (2004) that obesity alone accounted for costs of $27–48 billion, half of which was borne by the federally funded Medicare and Medicaid programmes. These estimates were subsequently revised to $75 billion for obesity alone, of which $18 billion was borne by Medicare and $21 billion by Medicaid. Similarly, a study carried out by City University of New York and London Metropolitan University (2010) to compare the responses to childhood obesity in London and New York City (DiNapoli, 2009; Finkelstein *et al.*, 2009) indicates that with regards to direct and indirect costs, $147 billion a year (the equivalent of £738 million) was estimated to be due to the obesity epidemic; $6.1 billion (£3.73 billion) was accounted for in New York State due to adult obesity in direct and indirect costs, and $242 million (£147.7 million) for childhood obesity in medical costs. On the other hand, it was estimated that in England 9,000 premature deaths a year occur as a result of obesity, with more than 50% of the population predicted to become obese by the year 2050. Nationally, overweight and obesity accounted for £4.2 billion ($8.32 billion) in healthcare costs in 2007, and £15.8 billion ($31.3 billion) in losses to the wider economy. Obesity reduces the life expectancy of individuals; it is projected to reduce the average life expectancy of Americans by as much as five years in coming decades, reversing more than a century of public health progress.

In Canada, Janssen and Diener (2009) suggested the total cost of obesity to be estimated at $4.3 billion, that is, $1.8 billion in direct healthcare costs and $2.5 billion in indirect costs. This figure is suggested to underestimate the overall economic cost of excess weight in Canada as it does not include the costs for those who are overweight, but not obese.

In England, the National Audit Office (NAO) estimates that obesity accounts for 18 million sick days and 31,000 deaths each year, resulting in 40,000 lost years of working life. Deaths associated with obesity shorten life by an average of 9 nine years. The conservative estimates made by the NAO of costs in 1998 were £2.6 billion, predicted to rise to £3.6 billion by 2010. The impact of associated health problems costs the UK more than £45 billion a year. Further, the costs across 15 EU countries were estimated as €44 billion in 2002, and when this is extrapolated to the expanded EU (25 countries), where obesity was estimated to cost €41 billion per year, the combined cost with overweight reached €81 billion annually.

Similarly, Wang *et al.* (2010) report that a 1% point reduction in both overweight and obese adolescents currently aged 16–17 years in certain parts of the USA could reduce the number of obese adults by 52,821 in the future. As a result, lifetime medical care costs after the age of 40 would decrease by $586 million, and lifetime medical costs and quality adjusted life years (QALYs) would increase by 47,138.

Fry and Finley (2005) discuss the costs attributable to obesity in Spain and estimated them as $3.4 billion per year. Likewise, Emery *et al.* (2007) state in a study of individuals including normal weight, obese and overweight patients who had additional cardiovascular risk factors, that the costs for obese subjects averaged €2,500, twice the costs for normal-weight people, estimated to be only €1,263. After taking into account age, sex, SES, alcohol consumption and smoking, and the 100% reimbursement rate for chronic diseases (all else being equal), the extra cost of obesity, compared with normal weight, was estimated at between €506 for obese people and €648 for obese and overweight people with additional cardiovascular disease. Meanwhile, Swinburn *et al.* (2004) state that in the USA, it was estimated that the direct healthcare costs of obesity

accounted for 5.7% of total healthcare expenditure. Comparable figures are somewhat lower than this for other Western countries such as Australia (2%) and New Zealand (2.5%). These figures underestimate the full direct costs of weight-associated disease because they estimate the costs for the population with BMI 30 kg/m^2 and omit any burden of lesser forms of overweight (BMI 25–30 kg/m^2).

In addition, a Dutch study conducted by Seidell (1995) suggests that the costs attributed to BMI 25–30 kg/m^2 are three times the cost of BMI 30 kg/m^2. The direct costs of obesity are predominantly from diabetes, cardiovascular disease and hypertension. The indirect costs, which are far greater than direct costs, include workdays lost, physician visits, disability pensions and premature mortality, which all increase as BMI increases. Popkin *et al.* (2006) also suggest that the consequence of indirect costs can be greater than direct medical costs; these include decreased years of disability-free life and increased mortality before retirement, early retirement, work absenteeism and reduced productivity, and increased disability pensions as a result of chronic conditions related to obesity.

Frank (2008) quotes two studies (i.e. Colditz, 1999; Wang *et al.*, 2006) and describes the serious burdens of overweight and obesity to include premature mortality, morbidity associated with numerous chronic conditions, the negative impact on health-related quality of life, psychosocial burdens, poorer quality of life, loss of job opportunities and other disruption in life plans, as well as medical resources dedicated to treating all obesity-related fatal and non-fatal conditions, including severe financial implications.

Looking at the direct costs associated with obesity in relation to excess body weight, these include resources used within the health system such as the cost incurred by the surplus utilisation of ambulance care, hospitalisation, pharmacotherapy, radiological or laboratory tests and long-term care including nursing homes for diseases. Meanwhile expenses are also incurred from diseases that result from obesity; for example, fatal conditions like cardiovascular diseases and cancer, and non-fatal conditions such as osteoarthritis are all expensive.

In summary, obesity has negative medical, psychological and quality of life consequences, drains healthcare resources and reduces life expectancy. The wider costs to society and business are estimated to reach £49.9 billion per year (at today's prices) (Department of Health & Social Care, 2020; Nuffield Trust, 2020). In March 2020 to mark World Obesity Day, a call was made for more comprehensive solutions, treatment and shared accountability for addressing the global epidemic that is obesity.

2.12 Summary and gaps in the literature

The obesity and overweight literature have provided fresh insights and a rich foundation for a better grasp of the underlying contributing drivers. Much of the research on obesity demonstrates what is already known. However, there are several other grey areas regarding obesity that still require in-depth research, in particular the exact nature and type of the causal factors of overweight and obesity, and the interplay between them. The conclusion that can be drawn from the literature is that there is a consensus among authors and health experts past and present about obesity as a pandemic in its generic sense (Safaei *et al*., 2021). Many studies focus on defining obesity and identifying the contributing factors, and the health risks and costs of obesity. Bodyweight results from several factors such as poor nutritional choices, overeating, genetics, culture and

metabolism (Hruby and Hu, 2015; Fruh, 2017). Worldwide obesity has nearly tripled since 1975, with about 13% of adults being obese and about 39% of adults being overweight. Obesity is linked to many health complications and diseases such as diabetes, heart disease, certain types of cancer and stroke. Additionally, obesity is the leading cause of preventable death (Hurt *et al.,* 2010).

It could be argued that not much research has moved beyond the descriptive aspects of obesity, which makes it difficult to formulate any crystal-clear framework to exploit the literature effectively given the current fragmented perspectives, and particularly the obesity measurement tools that remain limited. Obesity rates are often attributed to different lifestyles and diets, and a sedentary life due to modernisation and globalisation, which vary significantly from one country to another. A direct correlation between the obesity rate of a country and its economic rank is debatable; however, wealthier countries tend to have the resources to implement programmes, campaigns and initiatives to raise awareness and educate people about healthy eating (World Population Review, 2020). Some regions of the world, such as Southeast Asia, have witnessed alarming increases in obesity rates within the past five years (World Population Review, 2020).

The contextual gap stems from the fact that studies on obesity are more Western-oriented. There is a dearth of studies on obesity in the Middle East, and particularly within the UAE setting where obesity is growing at an alarming pace. The conceptual gap stems from the fact that obesity is rampant and unabated, and evolves according to changes in terms of time and lifestyle. The methodological gap stems from the fact that there is no one best method to measure BMI.

Chapter 3
Methodology

This chapter presents a general overview of the methodology including the setting description and population description. The next section states the research questions, delves deeper into the research design and the rational for the methodology, and the methodological issues arising from collecting and analysing data from three survey questionnaires. The next section provides a detailed explanation of each data collection instrument including the setting, population and sample, data collection procedure, timeline and ethical considerations, presented separately and concisely for each survey instrument. The chapter concludes by explaining the ethical concerns.

3.1 Methodology overview

This study is aimed at determining the association between socio-demographic characteristics, self-esteem, body shape, overweightness and obesity among adolescents in Abu Dhabi, UAE.

3.1.1 Setting

The UAE is a federation of seven emirates, established on the 2nd of December 1971. The seven emirates or sheikhdoms are Abu Dhabi, Dubai, Sharjah, Ras Al Khaimah, Fujairah, Umm Al Quwain and Ajman. The capital city of Abu Dhabi, located in the emirate of Abu Dhabi, serves as the political centre of the country. The emirate of Abu Dhabi contains the most oil reserves and contributes the most funds to the national budget.

According to the GCC Statistical Centre (2014–2020), the UAE covers 71,024 km^2. It is located in the north-eastern part of the Arabian Peninsula, bordered to the south and west by Saudi Arabia, and to the north and east by Oman.

The population of the UAE is approximately 9.99 million (Blog, 2021), of which approximately 88.5% are expatriate residents of more than 200 nationalities and 11.5% are citizens (Edarabia, 2021).

The study was conducted in the city of Abu Dhabi. In the 2012 census, the population of Abu Dhabi was approximately 3.23 million people, accounting for more than one-third (34.7%) of the total population of the UAE (Blog, 2021).

3.1.2 Population

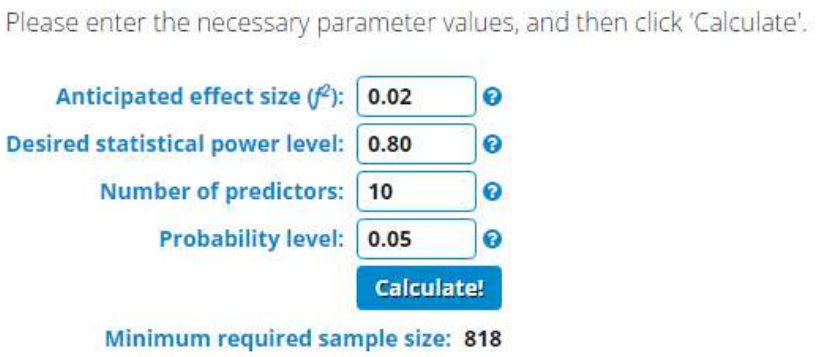
The population of the study consisted of Emirati children in public and private schools in the city of Abu Dhabi from the ages of 14 to 17 years old, and distributed in grades nine to twelve. Public and private schools in the UAE when the data were collected were segregated by gender. According to the Abu Dhabi Education Council, 12,468 Emirati adolescents (14–17 years old) were enrolled in Abu Dhabi secondary public and private schools in the 2011–2012 academic year. The number of male students was 6,503 (52%), and 5,965 (48%) were female.

3.1.3 Study Sample and Sampling Procedure

The participants (Study Sample) were selected from entire population (Grade 9 to Grade 12 secondary schools), using a two-stage stratified cluster sampling approach. Strata 1 were female schools and Strata 2 were male schools. In stage two, a cluster sampling approach for each stratum was performed by randomly choosing 35 clusters (Private and Public schools) from each stratum, thereby obtaining 70 randomly selected clusters

(Private and Public schools). A simple random sample was obtained from each selected cluster (school).

The total number of participants included in the overall study was 1,331 students, of which **1,181** completed all the requirements of the study surveys. There were 576 (48.8%) males, and 605 (51.2%) females. The sample size was chosen upon "A-priori Sample Size Calculator for Multiple Regression"; (https://www.danielsoper.com/statcalc/calculator.aspx?id=1). This calculator will tell us the minimum required sample size for a multiple regression study, given the desired probability level, the number of predictors in the model, the anticipated effect size, and the desired statistical power level. Traditionally, the significance level is set to 5% and the desired power level to 80%. Hence, the following were obtained:



3.1.4 Selection criteria of the participant

3.1.4.1The inclusion criteria

The selection criteria in this study included Emiratis male and female students who attended secondary public and private schools in Abu Dhabi and were between the ages of 14- and 17-year-old.

3.1.4.2The exclusion criteria

All Emiratis students who were below 14 years and those who were above 17 years old were excluded from the study. The rationale for this exclusion was due to the fact that they a below and above the required age bracket. Non-Emiratis were also excluded from this study because they are known to have different dietary habits, lifestyles compared to Emirati nationals. In addition, adolescents were only excluded if they had acute or chronic illnesses or if their parents did not give approval for their involvement in this study.

3.1.5 Study approval and ethical considerations

The study received ethical approvals from:

- London Metropolitan University of Research Ethics Committee (Appendix I)
- Abu Dhabi Education Council (ADEC) (Appendix II)
- UAE Ministry of Education (Abu Dhabi Educational Zones) (Appendix III)

Moreover, parental and school approval with an information sheet were given to the parents and guardians, participants (male and female) and school principals (Appendix IV).

This study employed London Metropolitan University's research guidelines, and the British Psychological Society (BPS) and American Psychological Society (APA) ethical codes, especially those related to informed consent, confidentiality, avoiding possible harm, and avoiding deception and discomfort. The ethical considerations covered participant briefing, measures to assure that the participants understood the

purpose of the research, the role of the participants in the study, possible alternatives to participation (right to withdraw), and legal rights.

Prior to conducting the research study, both female and male schools were visited on scheduled programmes. Access to the schools was granted from the education authority in Abu Dhabi, in coordination with the Abu Dhabi Food Control Authority (ADFCA) school inspection unit.

The research obtained an official letter of approval from the Abu Dhabi Education Council stating that the data were for research purposes. The Abu Dhabi Education Council provided a full list of private and public schools with students' details such as gender, age and nationalities included. The ADFCA provided transportation and time scheduling for each school visited and helped with the school visits.

Pre-review visits with the schools' head teachers were conducted a day before the visit in order to organise the process within their schools. The researcher received the final approvals from all the contacted schools. Consent was obtained from all parents or guardians of the children through a parental consent letter, which was carried home by the children and returned back to the school the next day. The letter contained all the relevant information about the research study for parents to gain a full understanding of the study before providing their consent. A child information sheet was included with the parental consent letter.

To maintain confidentiality, all sensitive issues pertaining to participant attributes (i.e. height, weight, meal types consumed, and so on) were kept electronically in a password-protected file. The paper versions of the completed surveys used during the data gathering were kept in a folder stored in a locked filing cabinet accessible only by

the researcher. No participant was identified by name on paper or electronically to maintain anonymity

3.2 Research design

The aim of the quantitative study was to investigate relationships among psychological factors (body shape perception and self-esteem) and weight (overweightness and obesity). Physical measurements of weight and height provided data to calculate the BMI and three quantitative data collection instruments—the Health Behavior in School-aged Children (HBSC), the Rosenberg Self-Esteem (RSE) scale, and the Body Shape perception Satisfaction Questionnaire (BSQ)—collected data related to psychological factors

A quantitative methodology was used because statistical analysis enhances objectivity, reduces bias and serves to maintain neutrality during the investigation (Clark, 1998). The objectivity of quantitative methods is assessable using parametric and standard tests, which allow researchers to focus on variables that are relevant to the research questions (Mircioiu and Atkinson 2017).

The research methodology that was adopted in this research is illustrated in Figure 3.1 below.

The next section presents each survey instrument as a separate section, along with the participants, setting, data collection procedure and data analysis method corresponding to each for clarity. At the end of the methodology section, the method integrating the analyses of each data collection tool is presented.

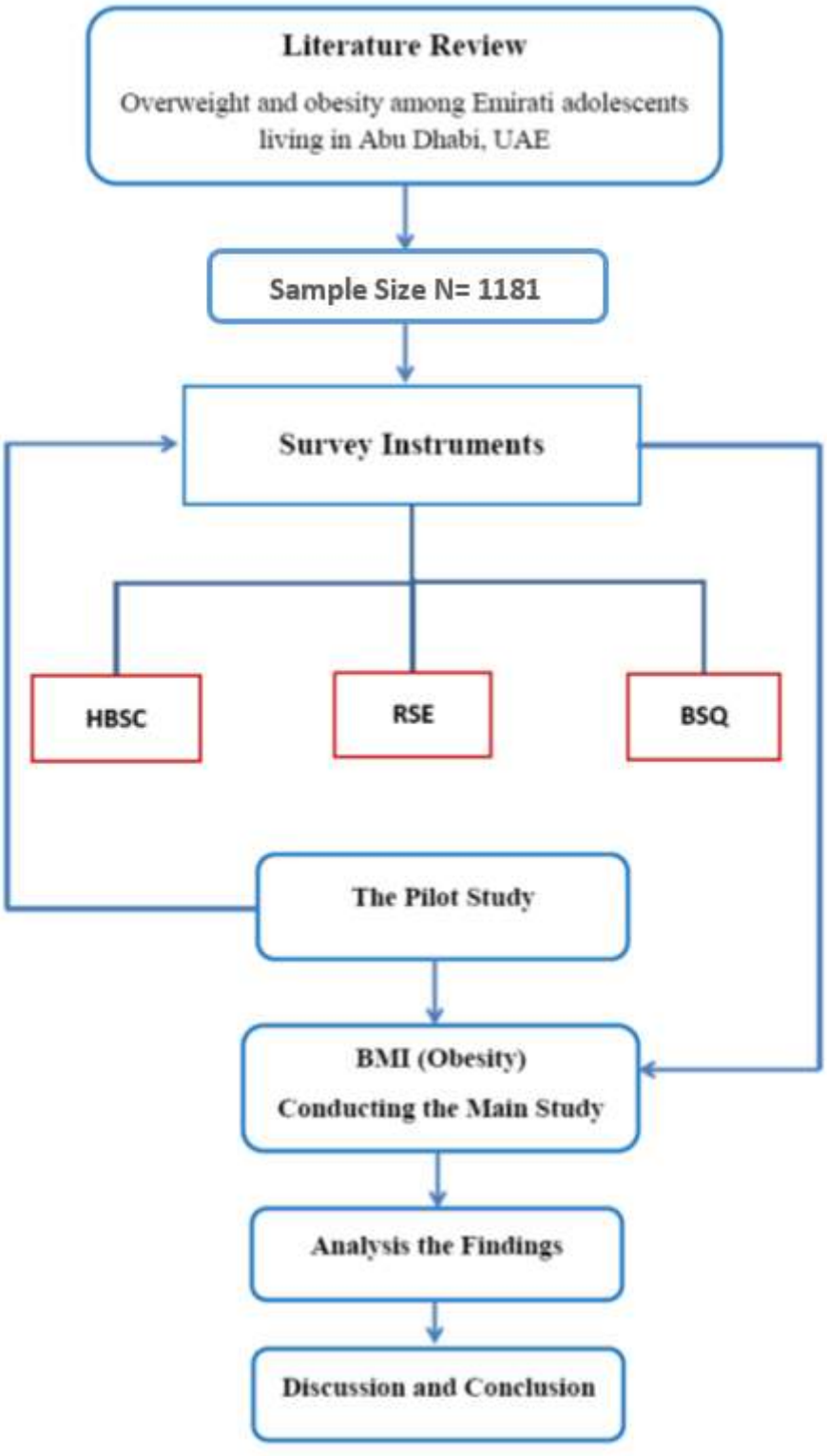


Figure 3.1: Research Methodology Diagram (study framework)

3.3 HBSC survey

3.3.1 Description of the HBSC survey instrument

The HBSC focuses on the health behaviours of school-aged children (Currie, 2008). The study used the version that was previously translated into Arabic (see appendices VII and VIII), with the validity and reliability checked in Palestine by Al Sabbah (2008).

The HBSC survey contained three sections, in addition to the height and weight measurements used to calculate the BMI. The first part was a series of demographic items including age, residence, gender, grade, parents' educational level, size of family, SES indicators and perceptions of parents' body shape. The aim in this section is to present in a similar manner across different countries to ensure that the results are comparable.

The second section asked the student questions about their fitness-related behaviours including when they ate, what they ate, and so on. The items in this section were considered elective items to be customised to be applicable to the county of the study.

The third section asked questions related to physical activity and weight management, such as how often they engaged in physical activities, what, if anything, they did to control their weight, and so on. The items in this section were national items, developed by a national research team to focus on adolescent health problems prominent in the country of the study.

The HBSC questionnaire has been used across 43 countries including the UAE (Al-Matroushi, 2005). The survey takes a broad perspective account and gathers information on a wide range of aspects of young people's health and well-being, as well

as the social contexts within which they are growing up (Currie *et al.*, 2008). According to Landis and Koch, 1977, the HBSC questionnaire indicated a substantial overall reliability (frequency $r = 0.73$, duration $r = 0.71$).

The aim was to provide a rigorous, systematic statistical base for describing cross-national patterns in terms of the magnitude and direction of differences between subgroups. Analyses for age and gender take account of the effect of the survey design on the precision of the estimates presented. Statistical significance was used as a guide to aid interpretation and, in particular, to avoid the over-interpretation of small differences.

3.3.2 BMI calculation and collection

3.3.2.1 BMI calculation

BMI is an anthropometric index of weight and height defined as the body weight in kilograms divided by the height in metres squared (Keys *et al.*, 1972):

$$\text{BMI} = \text{weight (kg)} / \text{height (m)}^2$$

The BMI is the commonly accepted index for classifying adiposity in adults and it is acceptable for use with children and adolescents.

In the current study, the BMI was classified according to Table 2.1 and Table 2.2 by the WHO and Baniissa et. al. (2020) considering the age and sex adjustements as follows:

Table 3.1.a: BMI classification categories for girls aged 14 – 17 years

Age	Category	BMI range	BMI range values
14	Overweight	85% ≤ BMI < 97%	23.3 ≤ BMI < 27.1
	Obese	BMI ≥ 97%	BMI ≥ 27.1
15	Overweight	85% ≤ BMI < 97%	24 ≤ BMI < 27.9
	Obese	BMI ≥ 97%	BMI ≥ 27.9

16	Overweight	85% ≤ BMI < 97%	24.5 ≤ BMI < 28.4
	Obese	BMI ≥ 97%	BMI ≥ 28.4
17	Overweight	85% ≤ BMI < 97%	24.8 ≤ BMI < 28.8
	Obese	BMI ≥ 97%	BMI ≥ 28.8
n%: stand for n^{th} Percentile; which is taken at midage. Source: WHO, BMI-for-age (5-19 years), 2007.			

Table 3.1.b: BMI classification categories for boys aged 14 – 17 years

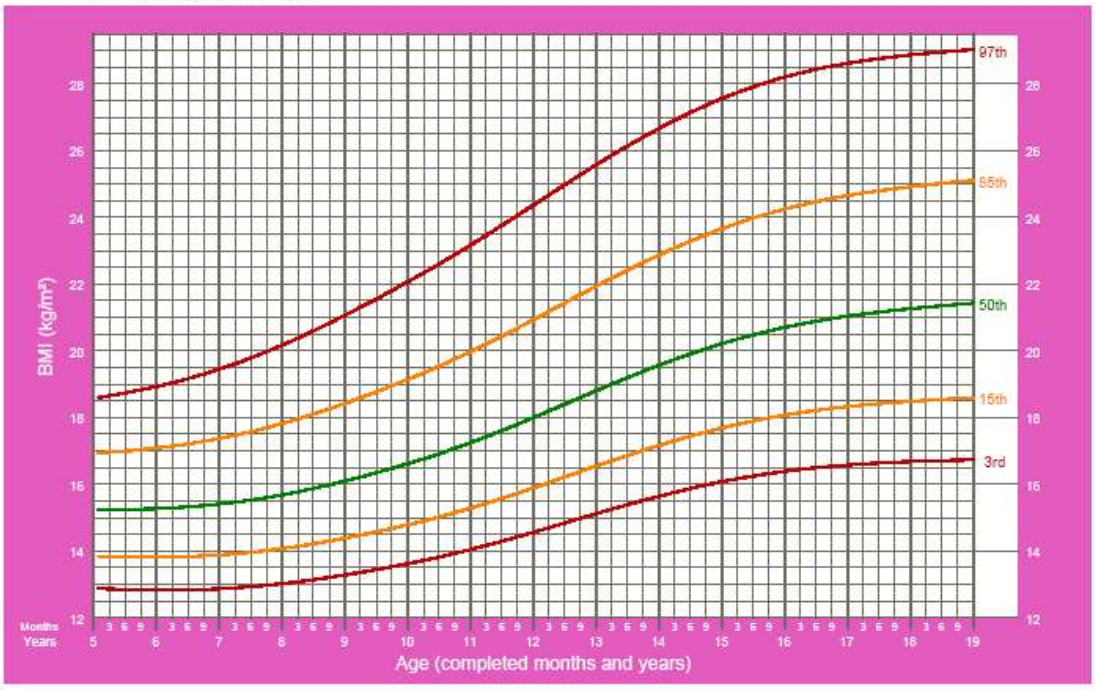
Age	**Category**	**BMI range**	**BMI range values**
14	Overweight	85% ≤ BMI < 97%	22.4 ≤ BMI < 25.8
	Obese	BMI ≥ 97%	BMI ≥ 25.8
15	Overweight	85% ≤ BMI < 97%	23.2 ≤ BMI < 26.8
	Obese	BMI ≥ 97%	BMI ≥ 26.8
16	Overweight	85% ≤ BMI < 97%	24 ≤ BMI < 27.7
	Obese	BMI ≥ 97%	BMI ≥ 27.7
17	Overweight	85% ≤ BMI < 97%	24.7 ≤ BMI < 28.4
	Obese	BMI ≥ 97%	BMI ≥ 28.4
n%: stand for n^{th} Percentile; which is taken at midage. Source: WHO, BMI-for-age (5-19 years), 2007.			

In summary, the categories shown in Tables 3.1.a and 3.1.b were the categories used to determine weight as expressed by the BMI as overweight or obese in the study, which obtained from the Percentiles Charts below.

BMI-for-age GIRLS

5 to 19 years (percentiles)

World Health Organization

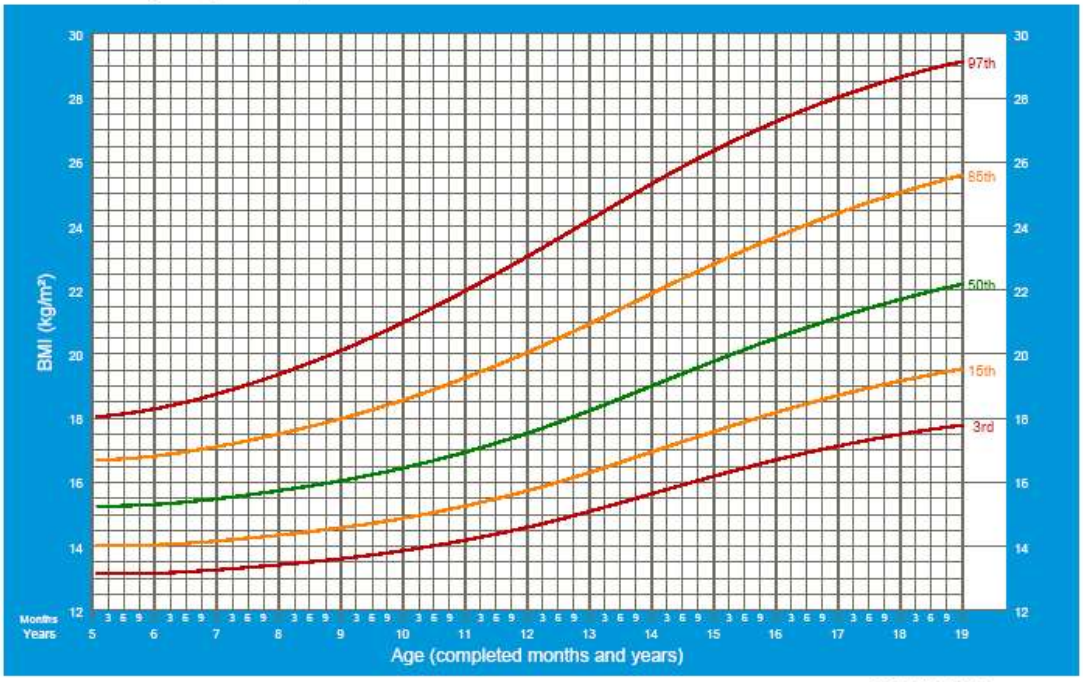


2007 WHO Reference

BMI-for-age BOYS

5 to 19 years (percentiles)

World Health Organization



2007 WHO Reference

3.3.2.2 BMI collection

The first part of the HBSC survey required the height and weight measurements of the student to be written at the top of the survey so that the measurements could be used to calculate the BMI. All anthropometric measurements were carried out during school time according to standardised guidelines from the WHO (1995).

The height of each participant was measured, in a standing position, to the nearest 0.01 cm, where the researcher used a portable studio-meter that was attached to a 'Seca' weighing scale. The student was told to take his/her shoes off, place his/her back against the scale, put the heels together and head in the upright position. A movable headboard was lowered or raised in order to measure the participant's exact height.

The participant's weight was measured to the nearest 0.01 kg using an electronic portable scale (Seca). To ensure correctness in measurement, the scale was checked for a zero reading before each weighing and calibrated with a known weight on the morning of each data collection. Furthermore, both weight and height measurements were carried out individually by one person to avoid interpersonal error and each measurement was taken at the same time. The students recorded the height and weight at the top of their surveys.

3.3.3 Analysis of the HSBC tool

A basic requirement for any scoring system of health factors is the interpretability and consistency across samples (Danielson *et al*., 2008). In previous studies, the scoring of the HBSC has been based on the raw summation of item scores. This scoring system achieved high reliability but enabled measurement at the ordinal scale level only (Haugland, 2001). However, the HBSC tool used in the current study has

multidimensional scales, leading to poor internal consistency, and therefore principal component analysis (factor analysis) with rotational technique (Varimax) and item analysis/coefficient Cronbach's alpha were performed to improve the reliability of the HBSC scales.

The analysis of the HBSC tool was carried out in three stages. First, the range of descriptive statistics were calculated and summarised as means ± standard deviation (SD). Then, percentages within frequency and contingency tables were added for more clarification, as well as some charts. Second, to explore the relationship between the study variables, which provided an insight into how the various variables may affect one another and helped to identify an initial regression model, the correlation analysis was conducted via Spearman's and Spearman's coefficients using the Chi square test; in addition, the t-test and ANOVA were applied to test for mean differences among the study variables. Finally, multiple stepwise regression and mediation analyses were applied to test for the association among the study variables, and find a best model as a linear function of the multiple Independent Variables (IV) used to predict the BMI value.

3.4 The RSE scale

3.4.1 The RSE scale description

The RSE scale is a 10-item tool designed to measure self-esteem in adolescents, first published in 1965 and reprinted in 1989. Five of the items on the scale are positively phrased, while the other five items are negatively phrased, assessing positive and negative perceptions and beliefs about oneself that constitute self-esteem (Martín-Albo *et al*., 2007). The items on the questionnaire are rated by the participant using a 4-point Likert-type scale, ranging from 1 (strongly agree) to 4 (strongly disagree). In the scoring process,

the negative items 2, 5, 6, 8, 9 were reverse scored so that 'Strongly Disagree' was allocated 1, 'Disagree' was allocated 2, 'Agree' was allocated 3, and 'Strongly Agree' was allocated 4. After reversing the negatively worded items, the higher scores indicate higher self-esteem (Ruddell, 2020).

The concept of self-esteem, or perceived self-worth, is an important psychological aspect that is part of the wider self-concept. The RSE was chosen for the study because it is a widely used measure of self-esteem and easy to administer. The RSE scale employed in the study was previously translated into Arabic (see appendices IX and X).

3.4.2 Analysis of the RSE tool

The validity and reliability of the tool was tested using the Cronbach's alpha statistic and inter-item correlation. The analysis of the RSE tool was carried out through regression via path analysis, to investigate the association between the RSE with the BMI and socio-demographic factors. Although based on correlational data, path analysis provides the researcher with a multivariate method to estimate structurally interpretable terms, such as the direct, indirect and total effects among a set of variables.

The regression model used in the current study was modified by Baron and Kenny (1986). They suggested that the intermediate variable M (RSE) is considered as a mediator in the regression model if:

The independent variable (socio-demographic variable) is significantly associated with the dependent variable (BMI).

1- The independent variable (socio-demographic variable) is significantly correlated with the mediator variable (RSE).

2- The mediator (RSE) is significantly associated with the dependent variable (BMI) after controlling for the effects of the independent variable.

The satisfaction of the above conditions indicates that there is an indirect (mediating) effect of the independent variable on the dependent variable (BMI) through the RSE. Moreover, the normality assumption must be tested and satisfied.

For model goodness-of-fit test, the F distribution and one-way ANOVA were applied. Parameter estimation was conducted using maximum likelihood, which is a robust estimation method even for non-symmetrical data. However, the study sample in hand (N=1,181) was too large, indicating that a robust estimation can be expected with skewness coefficients.

3.5 The Body Image and Body Shape Preception

This thesis has explored the determinants of obesity/BMI (kg/m2) among adolescents in association of their perception of their body images.

Body image is conceptualised as a multidimensional construct involving self-perception on size and body shape, surrounded by the sensations and immediate experiences, also involving a subjective component that refers to individual satisfaction with body size (Moehlecke, *et al*., 2020).

Body image includes positive and negative self-perceptions and attitudes (i.e., thoughts, feelings, and behaviours) regarding the body (Gruszka W, *et al*., 2022). This global term includes subjective, affective, cognitive, behavioural and perceptual processes (Thompson, *et a*l.,1999). Incorrect assessment of body size in patients with bulimia

nervosa and anorexia nervosa were confirmed previously (Ferrer-García, M. & Gutiérrez-Maldonado, J. 2008).

Recently (Ralph-Nearman, *et al*.,2021) shown that patients with anorexia nervosa demonstrate not only greater differences between their own current and ideal body and body dissatisfaction but also regional perceptual inaccuracy for their own current body than healthy controls. In addition, a systematic review performed by (Shagar *et al*., 2017) showed that body dissatisfaction is an important risk factor for the development of eating disturbances in adolescents. It should be noted, that the relationship between body image and body size is not well known among overweight and obese subjects. The growing epidemic of obesity indicates the need to extend the assessment of body image disturbances to subjects with overweight what may help to prevent the progression to obesity (Kelly *et al*., 2008).

Analysis of these disturbances and finding tools, allowing to assess them easily, may provide valuable guidance for its use in clinical practice. The screening of subjects for body image disturbances may select the group requiring psychotherapy. Its implementation may in some of them prevent the development of obesity, while in the obese increase the effectiveness of its treatment (Gruszka W, *et al*., 2022).

3.5.1 The BSQ description

The validity and reliability of the tool was tested using the Cronbach's alpha statistic and inter-item correlation. The BSQ contained 34 items and was designed to measure perceptions about body shape (Cooper *et al.*, 1986). The survey items requested that the participants rate the frequency of experiencing feelings or perceptions related to body shape using a 6-point scale ranging from 1 (never) to 6 (always) (da Silva *et al.*, 2019).

The survey has been translated into Arabic in previous studies, with the internal consistency for the BSQ reported at a value of 0.98 for the Kurdish version and 0.97 for the Arab version (Dzayee and Ishak, 2016). Cooper and Taylor (1987) classified the scores of this scale as:

- less than 81 is considered not worried
- 81–110 is slightly worried
- 111–140 is moderately worried
- above 140 is extremely worried

The BSQ was used in its original form and translated into Arabic by the Department of English Language at the Emirates College of Technology (see appendices V and VI).

The BSQ was the most suitable tool for the study as it allowed the researcher to get a better view and understanding of the psychological factors related to overweightness and obesity. The questions were straightforward and easy for the participants to understand. The scoring method was simple and quick, which minimised survey fatigue in the participants as much as possible.

3.5.2 BSQ analysis

The analysis of the BSQ tool was carried out through regression via path analysis, to investigate the association between the BSQ with the BMI and socio-demographic factors. Although based on correlational data, path analysis provides the researcher with a multivariate method to estimate structurally interpretable terms, such as the direct, indirect and total effects among a set of variables.

The regression model used in the current study was modified by Baron and Kenny (1986). They suggested that the intermediate variable M (body shape perception) is considered as a mediator in the regression model if:

1- The independent variable (socio-demographic variable) is significantly associated with the dependent variable (BMI).
2- The independent variable (socio-demographic variable) is significantly correlated with the mediator variable (body shape perception).
3- The mediator (body shape perception) is significantly associated with the dependent variable (BMI) after controlling for the effects of the independent variable.

The satisfaction of the above conditions indicates that there is an indirect (mediating) effect of the independent variable on the dependent variable (BMI) through (body shape perception). Moreover, the normality assumption must be tested and satisfied.

For model goodness-of-fit test, the F distribution and one-way ANOVA were applied. Parameter estimation was conducted using maximum likelihood, which is a robust estimation method even for non-symmetrical data. However, the study sample in hand (N=1,181) was too large, indicating a robust estimation can be expected with skewness coefficients.

3.6 Pilot study

A pilot study was conducted before the beginning of the main study for the following reasons:

1. To measure the time required for the administration of the questionnaire.

2. To check the content and language of the questionnaires.
3. Assessing the feasibility of the steps that need to take place as part of the main study.
4. To check the procedure and management of the questionnaires.

Prior to conducting the main research investigation, the survey started with a two weeks pilot study in order to account the time they needed to fill in the questionnaire. Selection of students was carried out on a random basis with consideration of selecting the first five names on each list for each class. Three types of questionnaires concerning (HSBC, Body shape satisfaction, Self-Esteem) were randomly distributed to forty students (20 male and 20 female) from the selected study sample (N=1,181; 48.8% males). The pilot study also included an interview with the students in order to make them aware of the questionnaire details and ensure correct information was provided. The questionnaires required 40–60 min to be completed by the students. The final draft of the questionnaire was modified based on the feedback received from the students. The four schools participating in the pilot study were excluded from the selected schools for the final study.

The above questionnaires were administered by the researcher in class room settings with the assistance from trained administrators in all the chosen schools. Access to schools was granted from the education authority in Abu Dhabi. Prior to conducting the research study both female and male schools were visited on scheduled programs. This was conducted in coordination with Abu Dhabi Food Control Authority (ADFCA) school inspection unit. In order to accomplish school visits, an approval from Abu Dhabi education council was obtained and an official letter was supplied for research purpose. The AD Education Council provided a full list of schools both private and public where

the students' details such as gender, age and nationalities were included. ADFCA was also approached to help in school visits. ADFCA also helped in providing transportation and time scheduling for each school visited. Following the agreements with the council and ADFCA; a pre-review with schools' head teachers were conducted a day before the visit in order to manage the process within their schools. Final approvals from all the schools that had been contacted were received. Consent was also attained from all parents or guardians of the children through a parental consent letter. This was carried out by the children taking the notification letter home to the parents. The letter contained all the relevant information and the research was described in order for parents to gain a full understanding of the study before providing their consent. Parents were then asked to return the reply slip provided to them by the researcher if they consented for their child being part of the study. A child information sheet was also included with the parental consent letter.

In summary, using a cross sectional study design, a random representative sample of adolescents (N=1,181; 48.8% males) aged 14-17 years was recruited from public and private schools in Abu Dhabi, during the academic year 2011-2012 by using a two-stage stratified cluster sampling approach.

This study included only Emiratis male and female students. All Emiratis students who were below 14 years and those who were above 17 years old were excluded from the study. The sample size was chosen upon "A-priori Sample Size Calculator for Multiple Regression";

Participants completed a questionnaire collecting socio-demographic, Health Behaviour in School-aged Children (HBSC), Rosenberg Self-Esteem Scale (RSE), and Body Image Satisfaction Questionnaire (BSQ) data. The first part of each questionnaire required the

height and weight measurements of the student to be written at the top of the survey so that the measurements could be used to calculate the BMI.

Body mass index-derived estimates of obesity were calculated using international cut-off: the World Health Organization (WHO). A pilot study was conducted before the beginning of the main study carried out on a random basis with consideration of selecting the first five names on each list for each class and included an interview with the students in order to make them aware of the questionnaire details and ensure correct information was provided.

The validity and reliability of the questionnaires were tested using the Cronbach's alpha statistic and inter-item correlation

The analysis of the HBSC questionnaire carried out in three stages. First, the range of descriptive statistics were calculated and summarised. Second, to explore the relationship between the study variables, which provided an insight into how the various variables may affect one another and helped to identify an initial regression model, Finally, multiple stepwise regression and mediation analyses were applied to test for the association among the study variables. and find a best model as a linear function of the multiple Independent Variables (IV) used to predict the BMI value. The analysis of the body shape perception and self-esteem tools were carried out through regression via path analysis, to investigate the association between the body shape perception, self-esteem with the BMI and socio-demographic factors

Chapter 4
Results

4.1 Introduction

This chapter introduces the results of the data analysis in five parts, and discusses the main findings. The second section introduces the characteristics of the research tools, including the reliability analysis and descriptive statistics of the participants' socio-demographic information. The third section introduces the results of the association between the socio-demographic characteristics and the main research factor: BMI. The fourth section introduces the results of the multiple regression analysis, followed by the final section that introduces the results of the mediation analysis.

4.2 Sample characteristics

The study sample included 1,181 Abu Dhabi adolescents between the ages of 14 and 17 years. This section introduces the reliability analysis and descriptive statistics of the research instruments.

Cronbach's alphas for the ten self-esteem and the 34 body shape item scales are presented in Table 4.1, where Cronbach's alpha was found to be excellent at .95, which is very high and indicates strong internal consistency among the 34 body shape items, while it is acceptable at > .7, indicating good internal consistency among the 10 self-esteem items. Furthermore, it is acceptable for the social and psychological scales, where the Cronbach's alphas respectively were .832 and 0.883.

Principal component analysis (factor analysis) and rotational technique (Varimax) were performed to improve the reliability of the socio-demographic (eating and dieting)

and (physical) scales (see Table 4.2 and Table 4.3). After excluding five items in the eating and dieting scale, and one item in the physical scale, the results show that these scales have acceptable internal consistency (Cronbach's alpha > 0.7). In addition, during the research all excluded items were excluded from the analysis.

Table 4.1: Reliability statistics of self-esteem, body shape perception and HBSC scales

Scale	Cronbach's alpha	N of items
Self-esteem	0.808	10
Body shape perception	0.958	34
Social factors	0.832	9
Eating and dieting factors	0.782	14
Physical factors	0.736	5
Psychological factors	0.883	4

Table 4.2: Principal component analysis (eating and dieting) scale

Factor	Component				
	1	2	3	4	5
Breakfast during the week	0.57	-0.18	0.06	-0.04	0.63
Breakfast during the weekend	0.58	0.00	0.30	-0.07	0.28
Eating fruit per day	0.00	-0.02	0.01	0.82	-0.03
Eating vegetables per day	0.02	0.03	0.01	0.82	0.52
Additional meal in a day during the week	-0.05	-0.01	0.79	0.01	0.11
Additional meal in a day during the weekend	-0.08	0.00	0.76	0.01	0.46
Midday meal	0.09	-0.20	0.16	0.03	0.48
Eat snacks while watching TV	-0.60	-0.09	0.22	-0.02	0.25
Eat snacks while at work or play on a computer	-0.54	-0.06	0.09	-0.01	0.43
Eat fast food	-0.42	0.06	0.39	0.04	-0.15
Get all wanted items from your parents	-0.31	-0.07	0.14	-0.04	-0.01
Follow mealtime rules	0.63	-0.01	-0.02	0.05	0.10
Control your weight by exercising	0.40	0.41	-0.03	-0.04	0.16
Control your weight by dieting	0.00	0.37	-0.02	-0.06	0.54
Control your weight by skipping meals	0.10	0.50	-0.07	-0.05	-0.03
Control your weight by diet pills	-0.04	0.23	-0.03	0.00	0.57
Now are you on a diet?	-0.24	0.60	0.04	0.03	0.64
Have you been on a diet in last 12 months?	0.06	0.75	0.08	0.05	-0.14
Have you been on a diet to lose weight during the last 12 months?	-0.04	0.70	-0.01	0.04	0.21

Rotation method: Varimax with Kaiser normalisation; five components extracted

Table 4.3: Principal component analysis (physical) scale

Factor	Component 1
Physical activities in past 7 days	.80
Traveling time to school	.46
Watch TV in weekdays	.77
Watch TV at weekend	.67
Do school homework during weekdays	.36
Do school homework during weekend	–.32

Rotation method: Varimax with Kaiser normalisation;
one component extracted

From the 1,181 participants, 576 of them were males (48.1%) and 605 were females (51.2%). The age distribution ranged from 12% at age 14 years to 28.5% at age 17 years. The characteristics of the study participants are shown in Table 4.4. The participants had a mean weight of 72.78 kg, a mean height of 162.27 cm and a mean BMI of 27.63 kg/m2.. On average, the age of the participants was 15.75 years old, while the average self-esteem score was 25.82 points (out of a possible 40 points), which can be regarded as a low level according to Echeburúa (1995), and the average body shape score was 89.69 points (out of a possible 204 points), indicating that the participants were mildly concerned with their shape (Cooper *et al*., 1987). As shown in Table 4.5, the majority of the participants (98.6%) were living in an urban area, while only 1.4% lived in a rural area. In terms of the parents' education, 81.5% of the participants' mothers were 'low educated', making this the highest percentage. More than 50% of the participants came from a medium-sized family (7–10 members) and 14.7% came from a larger-sized family (11 members and above). The results show that 56% of the households had a monthly income within the 11,000–15,000 dirham range, and 30.1% of the participants had a monthly income of more than 15000 dirham. The majority of the students lived with both parents (78.1%), while a minority lived with their father only (5.8%).

Approximately 22% of the participants said their father was obese, and 24% reported their mother to be obese.

Table 4.4: Sample's quantitative socio-demographic characteristics

Characteristic	*Mean*	±	*SD*
Weight	72.78	±	14.13
Height	162.27	±	8.80
BMI	27.63	±	4.89
Age	15.75	±	.99
BS	89.69	±	33.90
SE	25.82	±	2.72

BS: body shape, SE: self-esteem

Table 4.5: Sample's qualitative socio-demographic characteristics

Characteristic	Category	N	%
Gender	Male	576	48.8
	Female	605	51.2
Residence	Urban	1,165	98.6
	Rural	16	1.4
Grade	9th Grade	127	10.8
	10th Grade	359	30.4
	11th Grade	400	33.9
	12th Grade	295	25
Father's level of education	Low education	713	60.4
	High education	468	39.6
Mother's level of education	Low education	963	81.5
	High education	218	18.5
Number of family members	3–6	407	34.5
	7–10	600	50.8
	11 and above	174	14.7
Monthly income of the family	10,000 or less	152	12.9
	11,000–15,000	662	56.1
	16,000–20,000	93	7.9
	More than 20,000	274	23.2
Social status	Live with mother and father	922	78.1
	Live with father only	69	5.8
	Live with mother only	190	16.1
Father's body	Thin	130	11.0
	About the right size	786	66.6
	Obese	265	22.4

Mother's body	Thin	130	11.0
	About the right size	770	65.2
	Obese	281	23.8
Breakfast during the week	Less than 4 days a week	714	60.5
	4 days a week or more	467	39.5
Breakfast during the weekend	Never have breakfast during the weekend	306	25.9
	Once or twice	875	74.1
Eating vegetables per day	Not eating or less than one time per day	639	54.1
	Once or more per day	542	45.9
Additional meal in a day during the week	Never have an additional meal during the week	199	16.9
	Once or more	982	83.1
Additional meal in a day during the weekend	Never have an additional meal during the weekend	214	18.1
	Once or more	967	81.9
Midday meal	Never eat a midday meal	247	20.9
	At school	934	79.1
Eat snacks while watching TV	4 times or less per week	726	61.5
	More than 4 times a week	455	38.5
Eat snacks while at work or play on a computer	4 times or less per week	794	67.2
	More than 4 times a week	387	32.8
Follow mealtimes rules	Disagree	537	45.5
	Agree	644	54.5
Control your weight by exercising	No	483	40.9
	Yes	698	59.1
Control your weight by dieting	No	951	80.5
	Yes	230	19.5
Control your weight by diet pills	No	994	84.2
	Yes	187	15.8
Now are you on a diet?	Yes Satisfied	350	29.6
	No Unsatisfied	831	70.4
Have you been on a diet to lose weight during the last 12 months?	None or less than 2 times	820	69.4
	Three times or more	361	30.6
Physical activities in past 7 days	4 days or less	1088	92.1

	More than 4 days	93	7.9
Traveling time to school	Less than 30 mins	906	76.7
	30 mins or more	275	23.3
Watch TV in weekdays	Less or equal to 2 hours a day	582	49.3
	More than 2 hours a day	599	50.7
Watch TV at weekend	Less or equal to 2 hours a day	454	38.4
	More than 2 hours a day	727	61.6
Doing school homework during weekdays	Less or equal to 2 hours a day	948	80.3
	More than 2 hours a day	233	19.7
Your health is	Excellent	316	26.8
	Good	456	38.6
	Fair	281	23.8
	Poor	128	10.8
Feel lonely	Yes, very often	121	10.2
	Yes, often	194	16.4
	Yes, sometimes	396	33.5
	No	470	39.8
Students not spending time with you at school	It hasn't happened this term	575	48.7
	Once or twice	233	19.7
	Sometimes	240	20.3
	About once a week	63	5.3
	Several times a week	70	5.9

Table 4.6 shows that the prevalence of overweight and obesity in the entire population was estimated by 19.2% and 11.2%, respectively, while the prevalence of underweight was 9.4%. However, the prevalence of overweight and obesity in males was 21.7% and 12.7%, respectively, while in females this was 16.9% and 9.8%, respectively.

Table 4.6: BMICs distributed by gender

BMIC	Gender				Total	
	Male		Female			
	%	N	%	N	%	N
Underweight	6.1%	35	12.6%	76	9.4%	111
Normal weight	59.5%	343	60.8%	368	60.2%	711
Overweight	21.7%	125	16.9%	102	19.2%	227
Obese	12.7%	73	9.8%	59	11.2%	132
Total	100.0%	576	100.0%	605	100.0%	1,181

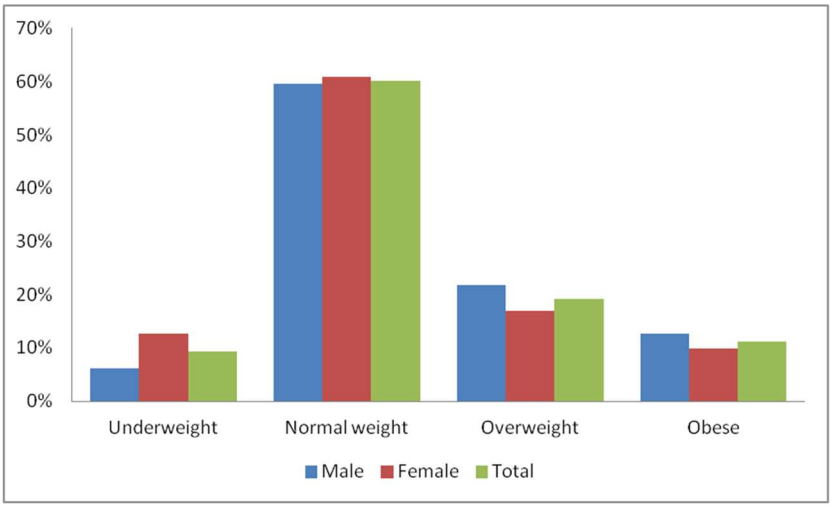


Figure 4.1: Distribution of BMIC by gender

4.3 Association between socio-demographic factors and BMI

Pearson's correlations were used to explore the relationship between the study variables, which provided an insight into how the various variables may affect one another and helped to identify an initial regression model. Table 4.7 shows the bivariate associations of the quantitative factors and BMI. As expected, weight was highly positively correlated with the BMI of the respondents (r = 0.824; $p < 0.05$), and height was negatively correlated with the BMI of the respondents (r = –0.136; $p < 0.05$). Whereas, age did not affect the BMI (r = –0.024; $p \geq 0.05$). Moreover, self-esteem was negatively correlated with the BMI of the respondents (r = –0.154; $p < 0.05$), and body shape was positively correlated with the BMI of the respondents (r = 0.490; $p < 0.05$).

Table 4.7: Associations between quantitative factors and BMI

Variable	Pearson correlation (*r*)	p-value
Weight	0.82	0.000
Height	–0.13	0.000
Age	–0.02	0.416
SE	–0.15	0.000
BS	0.49	0.000
BS vs. SE	–0.19	0.002

BS: body shape, SE: self-esteem

Spearman correlation and the Pearson chi-square test were used to explore the association between the qualitative study variables and the BMICs, which provided an insight into how these variables may affect predicting the BMI and helped to identify an initial regression model. Table 4.8 only shows the bivariate significant association between the qualitative factors and BMICs. Some of these factors are negatively associated with the BMICs and hence associate negatively with the BMI; for example, gender is negatively associated with BMIC, that is, males (0) (low rank) have a BMIC (underweight (1) … obese (4)) that is a larger rank than females (1), indicating that gender associates negatively with the BMI. Moreover, some of these factors are positively correlated with the BMIC, and hence associate positively with the BMI; for example, the father's body shape is positively correlated with the BMI, that is, the participants who saw their fathers as obese had a greater BMI score than those who saw their fathers as thin.

Table 4.8: Associations between qualitative factors and BMICs

Variable	Spearman's ρ	Pearson chi-square (χ^2)	p-value
Gender	-0.11	19.14	0.000
Father's level of education	-0.14	31.96	0.000

Mother's level of education	-0.08	12.17	0.022
Monthly income	-0.10	12.36	0.001
Father's body	0.28	114.2	0.000
Mother's body	0.23	71.24	0.000
Breakfast during the week	-0.22	77.76	0.000
Breakfast during the weekend	-0.14	26.39	0.000
Eating vegetables per day	0.09	14.53	0.008
Additional meal in a day during the week	0.19	44.50	0.000
Additional meal in a day during the weekend	0.12	26.47	0.000
Midday meal	0.15	31.75	0.000
Eat snacks while watching TV	-0.18	38.31	0.000
Eat snacks while at work or play on a computer	-0.08	11.61	0.008
Follow mealtimes rules	0.10	15.52	0.001
Control your weight by exercising	0.31	112.4	0.000
Control your weight by dieting	0.17	35.08	0.000
Control your weight by diet pills	0.17	32.19	0.000
Now are you on a diet?	-0.12	18.65	0.000
Have you been on a diet to lose weight during the last 12 months?	0.13	64.18	0.000
Physical activities in past 7 days	-0.12	18.35	0.000
Traveling time to school	0.10	62.13	0.000
Watch TV in weekdays	0.19	46.73	0.000
Watch TV at weekend	0.09	10.70	0.002
Doing school homework during weekdays	-0.04	12.36	0.113
Your health is	0.33	166.45	0.000
Picture of a ladder	-0.32	182.17	0.000
Feel lonely	-0.10	23.78	0.000
Students not spending time with you at school	0.14	34.75	0.000

Table 4.9 shows the differences in BMI within some of the socio-demographic categories, where only the significant categories entered (see the BMI model in section 4.4) were presented. Overall, the males had significantly higher BMI compared to the females ($t = 9.37$; $p < 0.05$). The participants with low educated parents (father and mother) had a significantly higher BMI compared to those with high educated parents at ($t = 5.17$; $p < 0.05$) and ($t = 3.12$; $p < 0.05$), respectively. Adolescents in Abu Dhabi with low family income had a significantly higher BMI compared to those with a high family income ($t = 3.35$; $p < 0.05$). Adolescents who perceived their parents (father and mother)

as obese had significantly the highest mean BMIs compared to those who perceived their parents to be thin or about the right size at ($F = 68.27$; $p < 0.05$) and ($F = 42.16$; $p < 0.05$), respectively. Moreover, adolescents in Abu Dhabi who ate breakfast less than 4 days a week had significantly lower BMI compared with those who ate breakfast 4 days a week or more ($t = 8.25$; $p < 0.05$). On the other hand, adolescents in Abu Dhabi who were unsatisfied with a diet had a significantly higher BMI compared with those who were satisfied ($t = –13.21$; $p < 0.05$). Furthermore, adolescents who perceived their health as excellent had significantly the lowest mean BMI compared to those who perceived their health to be good, fair, or poor ($F = 42.16$; $p < 0.05$).

On the adolescents' physical side, those who did physical activities for 4 days or less per week, and who watched television for more than 2 hours a day had a significantly high mean BMI at ($t = 4.98$; $p < 0.05$) and ($t = –7.64$; $p < 0.05$), respectively. Finally, adolescents who felt lonely very often had significantly the highest mean BMI ($t = 7.35$; $p < 0.05$).

In summary, the above differences indicate that some of socio-demographic variables significantly influence overweight and obesity through BMI, positively and some negatively. In other words; these findings give preliminary indications of the impact of these variables on BMI as well as help in building and understanding the regression model for predicting the BMI value through these variables. Moreover, these differences illustrate the direction of relationships in mediation models.

Table 4.9: Differences in the mean BMI due to socio-demographic factors

Socio-demographic	Category	BMI $mean \pm SD$	t/F-value	p-value
Gender	Male	28.95 ± 5.05	9.37[a]	0.000
	Female	26.38 ± 4.37		
Father's level of education	Low education	28.22 ± 5.03	5.17[a]	0.000
	High education	26.73 ± 4.52		
Mother's level of education	Low education	27.84 ± 4.93	3.12[a]	0.002
	High education	26.71 ± 4.57		
Monthly income	10,000 or less	28.86 ± 4.57	3.35[a]	0.001
	More than 10,000	27.45 ± 4.67		
Father's body	Thin	25.89 ± 4.26	68.27[b]	0.000
	About the right size	26.95 ± 4.66		
	Obese	30.50 ± 4.71		
Mother's body	Thin	25.71 ± 4.03	42.16[b]	0.000
	About the right size	27.18 ± 4.83		
	Obese	29.75 ± 4.88		
Breakfast during the week	Less than 4 days a week	26.22 ± 4.27	8.25^{a}	0.000
	4 days a week or more	28.55 ± 5.04		
Now are you on diet	Satisfied	24.93 ± 3.57	-13.21^{a}	0.000
	Unsatisfied	28.77 ± 4.92		
Your health is	Excellent	25.61 ± 3.83	60.25[b]	0.000
	Good	27.19 ± 4.81		
	Fair	28.82 ± 5.08		
	Poor	31.57 ± 3.97		
Physical activities in past 7 days	4 days or less	27.84 ± 5.08	4.98^{a}	0.000
	More than 4 days	25.23 ± 3.97		
Watch TV in weekdays	Less or equal to 2 hours a day	26.55 ± 4.45	-7.64^{a}	0.000
	More than 2 hours a day	28.67 ± 5.06		
Students not spending time with you at school	Yes, very often	29.27 ± 5.17	7.35[b]	0.000
	Yes, often	27.70 ± 4.94		
	Yes, sometimes	27.75 ± 4.73		
	No	26.92 ± 4.81		

a: *t*-value (independent *t* test), b: F-value (ANOVA)

4.4 The influence of socio-demographic variables on the BMI

This section aims to answer the research questions related to the socio-demographic variables and their impact on the BMI. In order to facilitate the process of tracking the

results, this section is divided into two sub-sections, respectively showing the results of the answers to the first and second research questions.

4.4.1 The influence of body shape perception and self-esteem on the BMI

The purpose of this section is to answer the first research question:

RQ1: Do body shape perception and self-esteem affect the BMI among adolescents in Abu Dhabi?

Consistent with past studies examining samples of other adolescents, it was hypothesised that the BMI of the Abu Dhabi adolescents would be related to their body shape (body image dissatisfaction) and self-esteem level. In other words, the aim was to verify whether the level of self-esteem and body Shape perception dissatisfaction as subjective variables were significantly related to the BMI as objective variables. Subsequently, the intention was to estimate which range of BMI in our research group is determined by body shape, and what role self-esteem plays in this equation.

As shown in Table 4.4, the BMI mean value was 27.63 kg/m^2 (SD=4.89), the body shape mean value was 89.69 (SD=33.9), and the self-esteem mean value was 25.82 (SD=2.72). Testing hypothesis (1), a significant positive correlation was found between body shape (body image dissatisfaction) and BMI, whereby the higher the degree of dissatisfaction, the higher the BMI. As shown in Table 4.7, the correlation coefficient of these two variables is: $r = 0.49,\ p < 0.001$. Because $r \neq 0$, the null hypothesis is rejected and the alternative hypothesis is supported. This shows that dissatisfaction with body shape perception has a positive effect on the BMI value.

Testing hypothesis (2), a significant negative correlation was found between the BMI and self-esteem, whereby the higher the BMI, the lower the self-esteem. As shown in Table 4.7. The correlation coefficient of these two variables is: $r = -0.154,\ p < 0.001$. Because $r \neq 0$, the null hypothesis is rejected and the alternative hypothesis is supported. This indicates that self-esteem negatively influenced the BMI values.

As a result, body shape and self-esteem affected the BMI among the adolescents in Abu Dhabi, supporting the first research question. In addition, these findings are consistent with many studies, including Schwartz and Brownell (2004) and Radwan H *et al.* (2019).

Following the research objectives and findings, the influence of body shape perception on the adolescents in Abu Dhabi's BMI scores is estimated by calculating the coefficient of determination: $R^2 = 0.24$. This means that 24% of the variance in BMI scores is determined by the body shape dissatisfaction. This modest value means that the BMI score is determined in considerable proportion (76%) by other factors.

In contrast, the influence of self-esteem level on the adolescents' BMI scores is estimated by calculating the coefficient of determination: $R^2 = 0.024$. This means that only 2.4% of the variance in BMI scores is determined by the self-esteem level. This very low value means that the BMI score is determined in considerable proportion (97.6%) by other factors.

Comparing the two subjective variables with the BMI results, we obtain different results. body shape perception is strongly correlated with the BMI. Computing the statistical significance of this result, we obtained a high significant *t* value ($t = 19.75,$

$p < 0.001$). The other subjective variable, self-esteem, is negatively correlated with BMI, and the result is also statistically significant ($t = -5.35,\ p < 0.001$).

Therefore, the answer to research question **(RQ1)** is: "Yes" body shape perception and self-esteem affect BMI among adolescents in Abu Dhabi. Body shape has a positive effect on BMI, and self-esteem is negatively affected

4.4.2 Prediction of BMI

This sub-section details the research question at the base of this study:

RQ2: Do the socio-demographic factors predict obesity (BMI) among adolescents in Abu Dhabi?

As anticipated in Chapter 1, the purpose of this study is to explore the relationship between socio-demographic factors, in the form of negative and positive affectivity for BMI through the use of multiple linear regression. In particular, the sub-questions that drove the second research question are presented as follows:

Q2.1 Is it possible to predict the BMI value using socio-demographic variables?

Q2.2 Which socio-demographic variables allow better prediction of the BMI?

Q2.3 Among them, which one has more influence on the prediction capability?

In order to answer the questions above, a multiple linear regression was performed, where BMI was the dependent variable and socio-demographic factors were the independent variables.

4.4.2.1 Model assumptions

When running a multiple linear regression, there are several assumptions that must be checked in terms of the data meeting them.

First, there is the normality of the dependent variable. “One of the assumptions for most parametric tests to be reliable is that the data is approximately normally distributed”. Figures 4.2 and 4.3 show the results of the Kolmogorov–Smirnov test and the Q–Q plot for normal distribution of the independent variable (BMI). It is clear from the frequency distribution that the data were represented as the normal data distribution. Moreover, this is proved by the trends of the data points that converge to the straight line in the Q–Q plot. Furthermore, the p-value of the Kolmogorov–Smirnov test in Table 4.10 is 0.000. The p-value is thus less than 0.05, indicating that the distribution is an accepted normality (Jann, B, 2008). In addition, the data passes the test of normal distribution because the coefficients of skewness and kurtosis (0.471 and –0.187, respectively) are approximate to zero (Brown, 2011). Hence, the BMI variable can be described through of the mean and standard deviation, and also subjected to parametric statistical test.

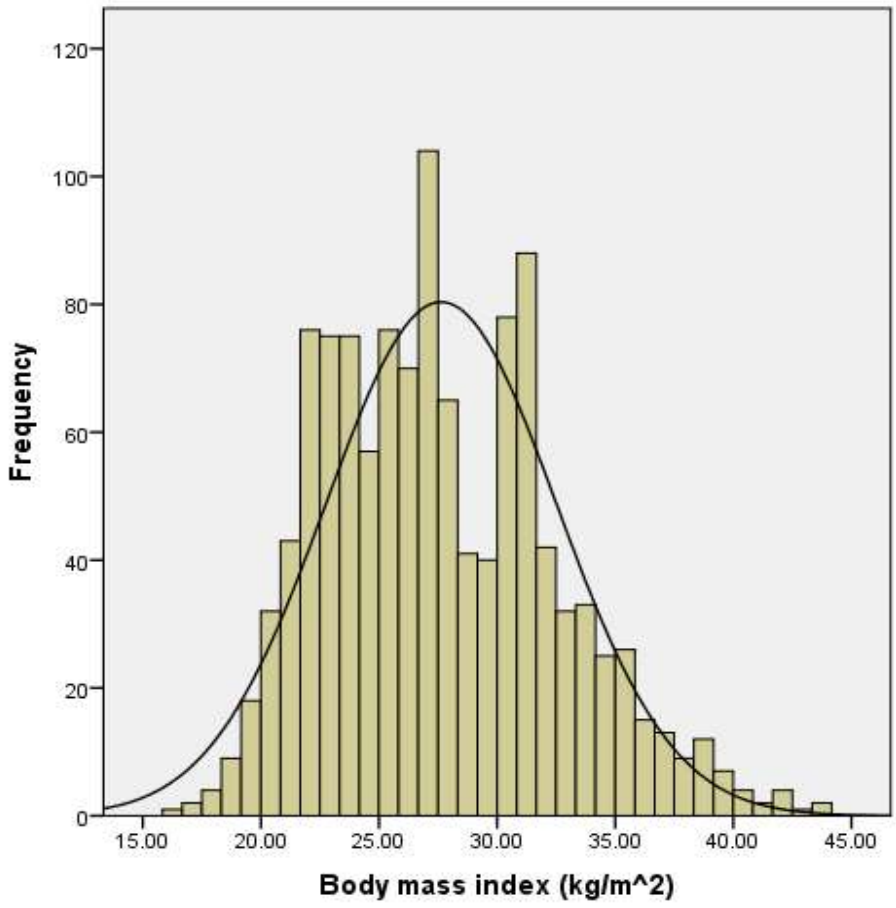


Figure 4.2:Frequency distribution of the BMI independent variable

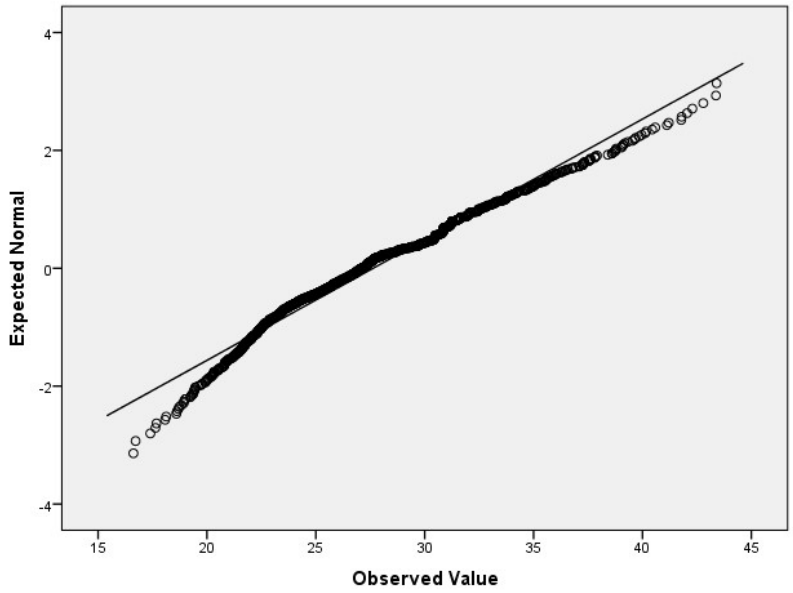


Figure 4.3: Normal Q–Q plot of the BMI independent variable

Table 4.10: Kolmogorov–Smirnov test for the normal distribution of BMI

		Statistic	p-value
Mean		27.63	
95% confidence interval for mean	Lower bound	27.35	
	Upper bound	27.91	
5% trimmed mean		27.46	
Median		27.12	
Std. deviation		4.89	
Minimum		16.62	
Maximum		43.40	
Range		26.78	
Interquartile range		7.19	
Skewness		.47	.011
Kurtosis		-.18	.026
Kolmogorov–Smirnov		.06	.000

Second, there must be a linear relationship between the outcome variable (dependent variable) and the independent variable. The results in Table 4.7 report that there is a positive linear relationship between the BMI and body shape, and also that there is a negative linear relationship between the BMI and self-esteem. In addition, by considering the scatter plots in Figures 4.4 and 4.5, it can be seen that the relationship between the independent variable and the dependent variable could be modelled by a straight line, suggesting that the relationship between these variables is linear. On the other hand, the Spearman's correlation in Table 4.8 measures the strength and direction of the monotonic association between these variables and the BMI. 'Monotonicity is less restrictive' than that of a linear relationship. However, a measure of association would normally be picked, such as Spearman's correlation, that fits the pattern of the observed data, that is, if a scatter plot shows that the relationship between the two variables looks monotonic, a Spearman's correlation would be run because this will then measure the strength and direction of this monotonic relationship. On the other hand if, for example, the relationship appears linear (assessed via scatterplot), a Pearson's correlation would be run because this will measure the strength and direction of any linear relationship (Laerd

Statistics, statistics.1aerd.com), (Barbara,G *et al* . (2001). For the dichotomous variables, the multiple regression model was entered as binary variables (0, 1); however, dummy variables were established for multichotomous variables. Hence, linear relationships were tested. The results were consistent with that found in Table 4.8.

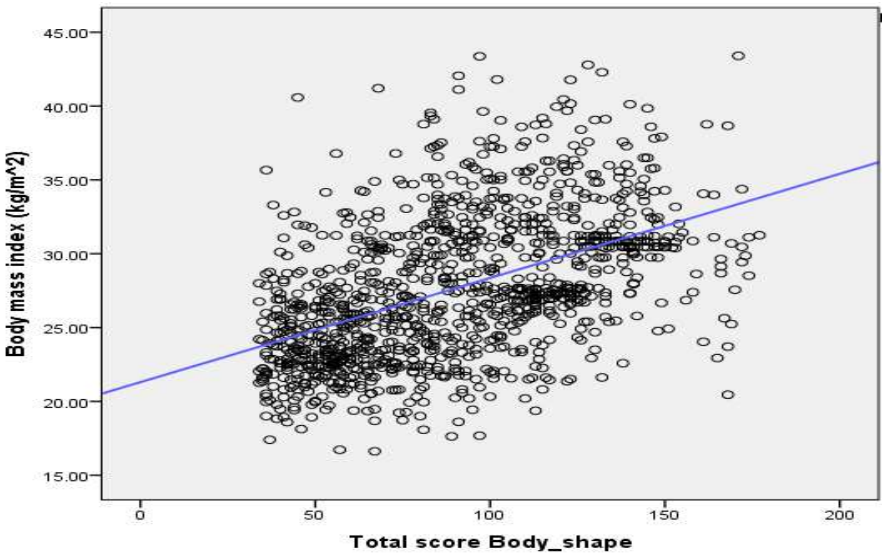


Figure 4.4: Scatter plot of BMI and body shape perception

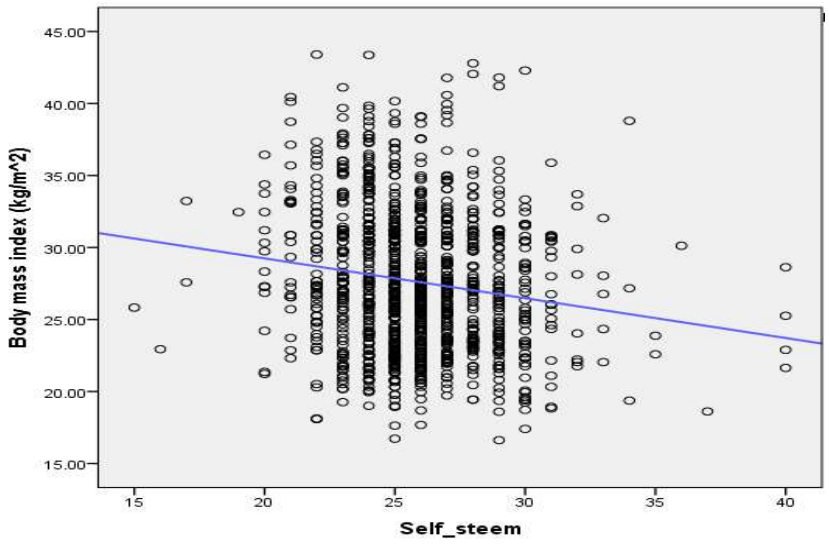


Figure 4.5: Scatter plot of BMI and self-esteem

Third. No multicollinearity. Multiple regression assumes that the independent variables are not highly correlated with each other. This assumption is usually tested using variance inflation factor values. However, a method that almost always resolves multicollinearity is stepwise regression. Those predictors that would be ideal to include are specified.

In addition, for missing data and their impact on the regression model, it should be noted here that some variables that contain missing data are not included in the scope of the analysis, but no variables included in the study contain missing data. Moreover, the left panel of Figure 4.6 shows the trend of BMI and standardised residuals, which is about a straight line, while the right panel in Figure 4.6 shows that the vertical distribution of the standardised residuals is roughly the same as when observed from left to right, and both are about zero, showing that the linearity and homoscedasticity assumptions are met.

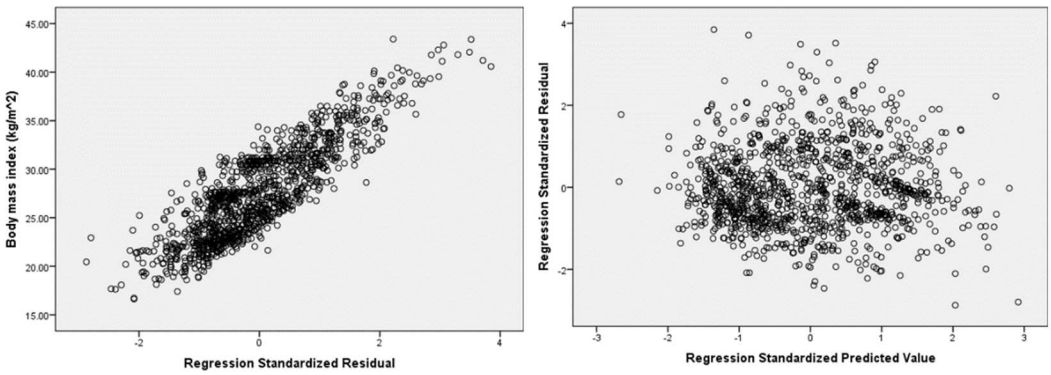


Figure 4.6: left: scatter plot of the BMI and residuals; right: scatter plot of the predicted and residuals

4.4.2.2 Multiple regression model

The aim of this study is to predict the BMI values through the socio-demographic variables. However, many difficulties tend to arise when there are more than five

independent variables in a multiple regression equation. One of the most frequent is the problem that two or more of the independent variables are highly correlated to one another, which is called multicollinearity, as well as variable selection. To overcome such difficulties, stepwise regression was used.

Stepwise regression is an appropriate analysis for the current study, since there are many variables and the study is interested in identifying a useful subset of the predictors. In addition, it deals with the multicollinearity where predictors are added to or removed from the model sequentially (Paul, 2006). Stepwise regression is used when there is evidence of multicollinearity by sequentially adding or removing some of the regressors into/from the model according to some criteria, such as the F-test of the significance of the independent variables (Luetjohann, 1968). Based on this test, only variables that are significant are included in the model, and any variable that becomes insignificant at subsequent steps is removed from the model. Furthermore, it is a combination of the forward and backward selection techniques, requiring two significance levels: one for adding variables and one for removing variables. The cut-off probability for adding variables should be less than the cut-off probability for removing variables, so that the procedure does not get into an infinite loop (Wang and Zhuo, 2016). In addition, stepwise regression is used to select the best grouping of predictor Independent Variables (IV) that account for the most variance in the outcome (R-squared).

As shown in Table 4.11, Model 1 contains only the independent variable body shape perception with $\Delta R^2 = 0.24$, indicating that body shape is the strongest factor of the BMI regression model, while it also explains 24% of the variances in BMI of the

respondents (F = 371.527; (p = 0.000) << 0.01). These findings are consistent with the univariate analysis in section 4.4.2.1, indicating that the BMI score is determined in considerable proportion (76%) by other factors. In the second model, the independent variable gender was entered with $\Delta R^2 = 0.108$, indicating that gender is the second strongest factor of the BMI regression model; this means that the BMI score is determined in considerable proportion by 65.2% $\{100\% - (24\% + 10.8\%)\}$ other factors, rather than self-esteem and gender. Keep tracking until Model 13, which includes all the significant independent variables in the BMI regression model with the strongest factor of body shape perception, and mother's educational level the weakest factor in the model. However, all other factors were excluded from the model since they can be explained by other factors entered into the Multicollinearity model. Therefore, Model 13 will be the main multiple linear regression model for predicting the BMI values, denoted by BMI model.

To tests for residual normality, Figure 4.7 illustrates an approximately normal distribution of the residuals produced by the BMI model. A normal density function has been superimposed on the histogram. In addition, the normal probability plot of the residuals in Figure 4.8 verifies the assumption that the residuals are normally distributed. The normal probability plot of the residuals approximately follows a straight line. Furthermore, the standardised residuals are plotted against the standardised predicted values in Figure 4.9, with no patterns clearly presented, indicating that the BMI model fits well. Moreover, the results show that 78.1% of the variances in BMI of the respondents is accounted for by the included 13 variables (Table 4.11), whereby collectively (F = 60.538; p < 0.001) the overall significance of the multiple linear regression model gives a better fit to the data.

Table 4.11: Multiple linear stepwise regression models of BMI

	Model summary						ANOVA	
Model	R	R^2	**Std. error**	(ΔR^2)	**F change**	**Sig. F change**	**F**	**Sig.**
1	0.49	0.24	4.26	0.24	371.53	0.000	371.53	0.000
2	0.59	0.35	4.14	0.11	70.92	0.000	232.24	0.000
3	0.67	0.45	4.04	0.10	58.42	0.000	181.85	0.000
4	0.73	0.54	3.97	0.09	47.66	0.000	153.71	0.000
5	0.79	0.62	3.92	0.08	36.90	0.000	131.06	0.000
6	0.83	0.68	3.90	0.07	31.14	0.000	113.23	0.000
7	0.85	0.72	3.88	0.03	26.91	0.001	99.40	0.000
8	0.86	0.74	3.87	0.02	15.82	0.001	89.10	0.000
9	0.87	0.75	3.85	0.01	10.77	0.004	81.60	0.000
10	0.87	0.76	3.84	0.01	11.05	0.006	75.73	0.000
11	0.88	0.77	3.84	0.01	8.23	0.008	69.22	0.000
12	0.88	0.78	3.83	0.01	7.68	0.012	64.76	0.000
13	0.88	0.78	3.83	0.00	3.86	0.043	60.54	0.000

Dependent variable: BMI; D: dummy variable

1. Predictors: (Constant), BS_Centered
2. Predictors: (Constant), BS_Centered, Gender
3. Predictors: (Constant), BS_Centered, Gender, Now are you on diet
4. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape
5. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week
6. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health
7. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays
8. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered
9. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered, Father's Educational Level
10. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered, Father's Educational Level, Physical activities in past 7 days
11. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered, Father's Educational Level, Physical activities in past 7 days, Monthly Income
12. Predictors: (Constant), BS_Centered, Gender, Now are you on diet, D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered, Father's Educational Level, Physical activities in past 7 days, Monthly Income, D_Feel Lonely_often

13. Predictors: (Constant), BS_Centered, Gender, Now are you on diet , D_Father_Shape, Breakfast during the week, D_Health, Watch TV in weekdays, SE_Centered, Father's Educational Level, Physical activities in past 7 days, Monthly Income, D_Feel Lonely_often, Mother's Educational Level

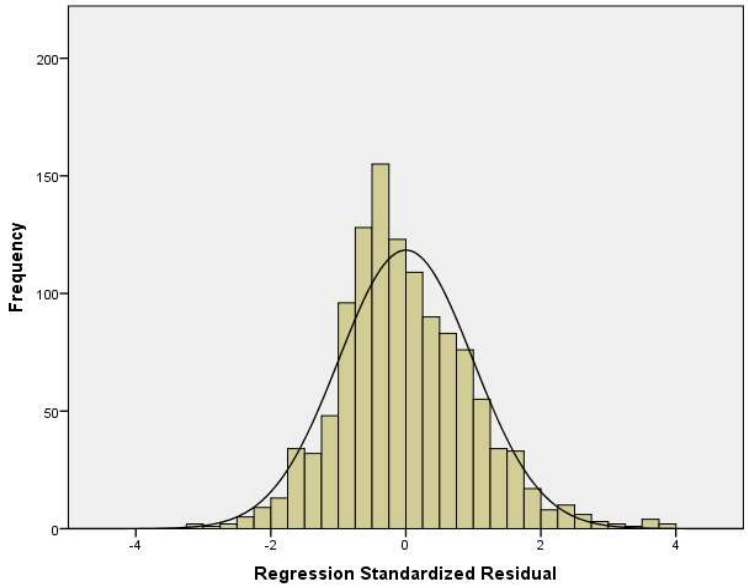


Figure 4.7: Histogram, dependent variable (BMI)

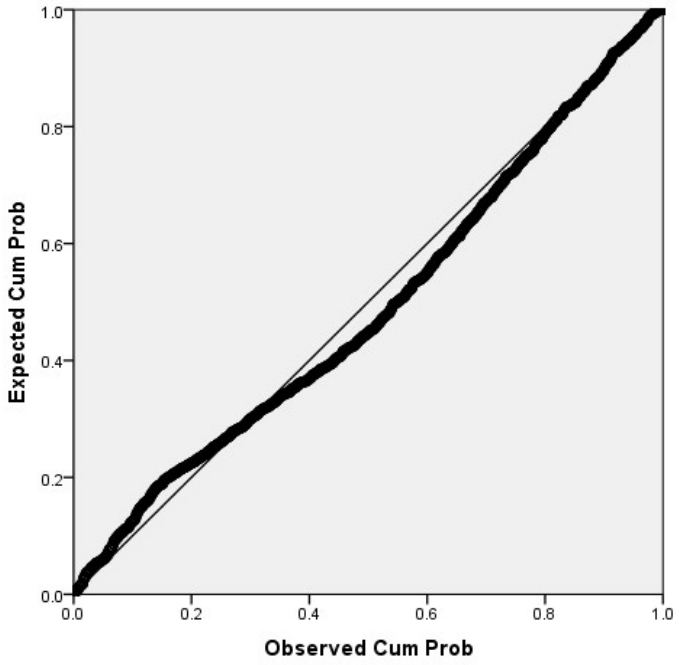


Figure 4.8: Normal probability plot of standardised residuals

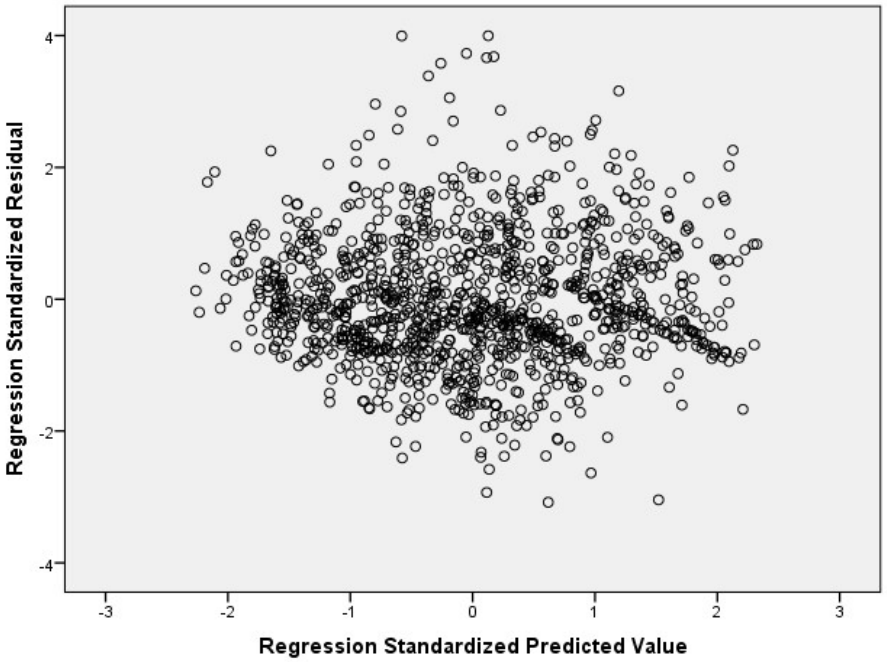
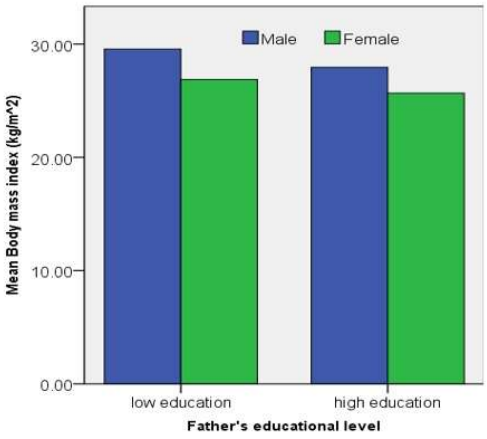
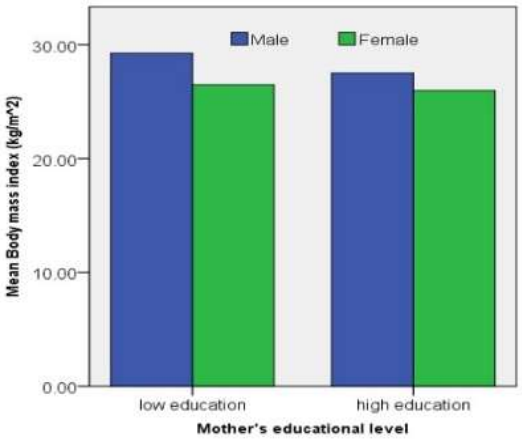
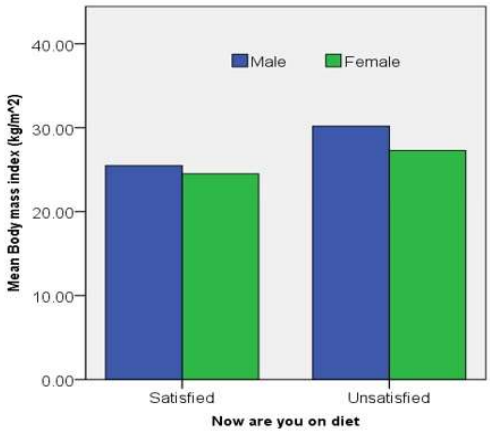


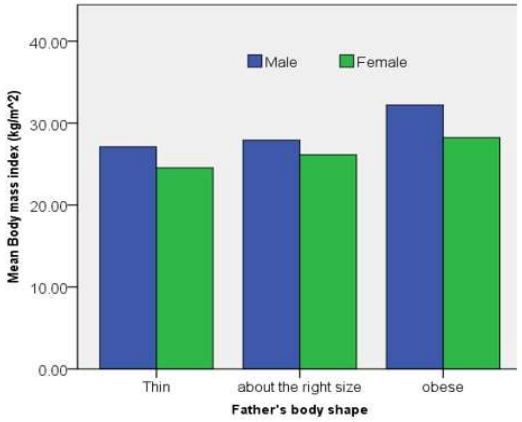
Figure 4.9: Residual scatter plot

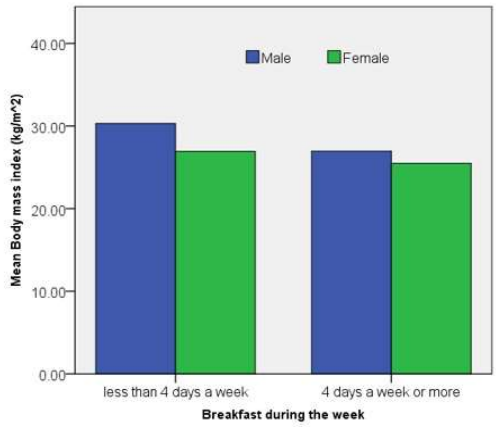
The prevalence of obesity (BMI average) among adolescents in Abu Dhabi, due to sex and all significant categorical variables in the model are presented in Figure 4.10. By visualising the data, valuable insights are gained that could not initially be obtained from just looking at the raw data values. The correlations and differences obtained in Tables 4.11 and 4.12 are still acceptable, even with the difference in the BMI values between males and females.

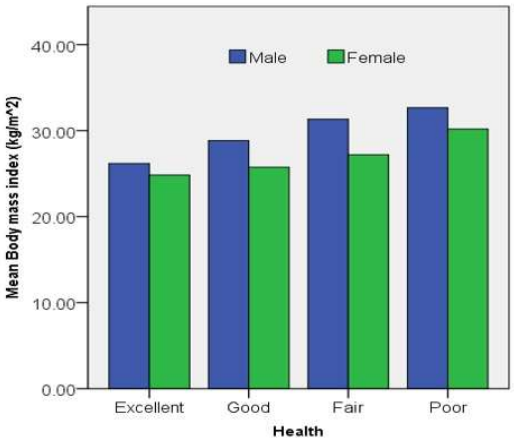

Male
Female
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
low education
high education
Father's educational level


Male
Female
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
low education
high education
Mother's educational level


Male
Female
40.00
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
Satisfied
Unsatisfied
Now are you on diet


Male
Female
40.00
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
Thin
about the right size
obese
Father's body shape


Male
Female
40.00
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
less than 4 days a week
4 days a week or more
Breakfast during the week


Male
Female
40.00
30.00
20.00
10.00
0.00
Mean Body mass index (kg/m^2)
Excellent
Good
Fair
Poor
Health

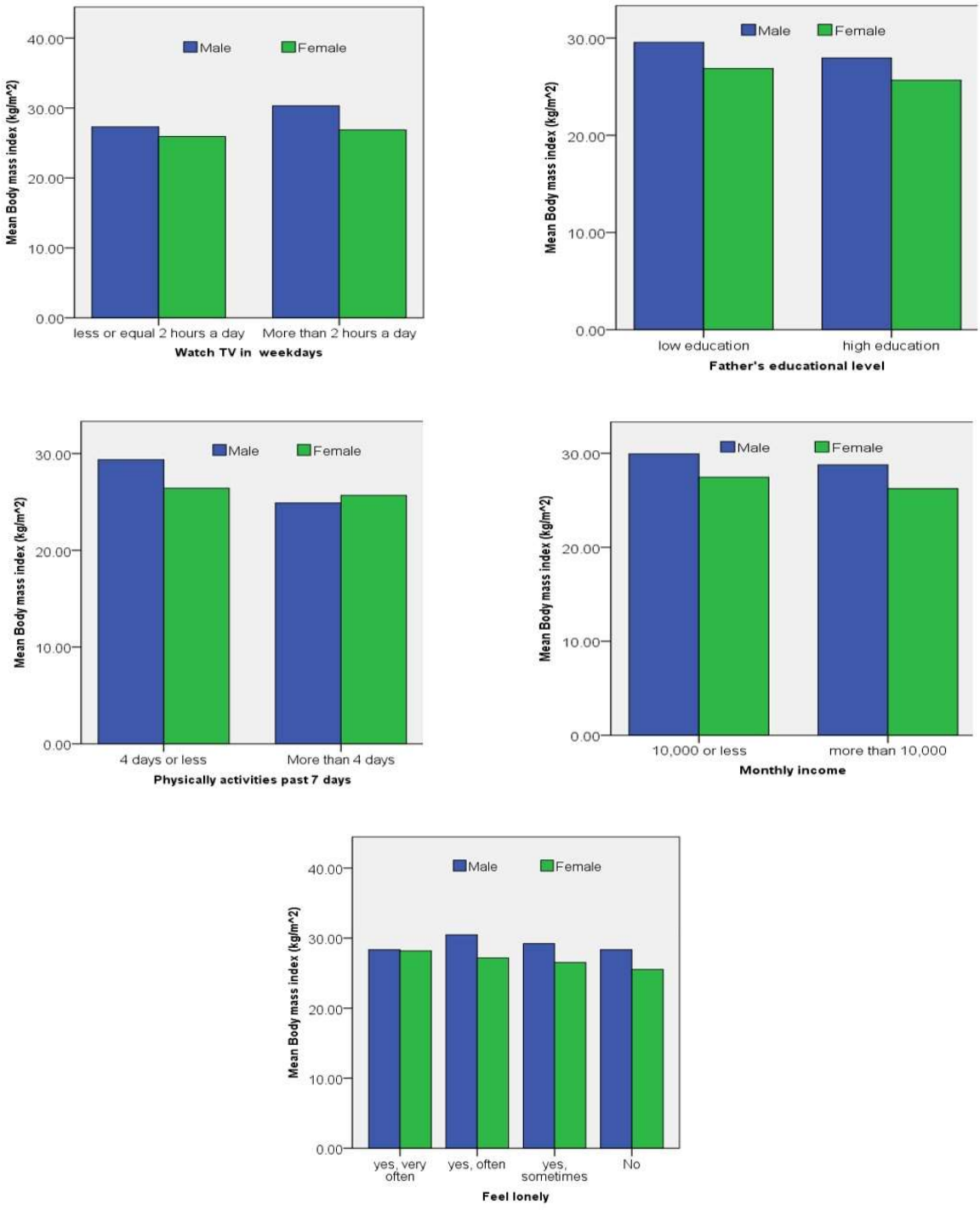


Figure 4.10: Distribution of categorical variables due to gender according to BMI average

Looking at the unique contributions of the variables in Table 4.12, the results show that the body shape value ($\beta = 0.301, t = 10.935,\ p = 0.00$) is positively associated with the BMI score, and the self-esteem value ($\beta = -0.067, t = -2.889,\ p = 0.003$) is negatively associated with the BMI score. Moreover, the results indicate that the male respondents were more likely to have a high BMI score ($\beta = -0.20, t = -8.44,\ p = 0.00$), while those respondents who were unsatisfied in dieting were more likely to have a high BMI score ($\beta = 0.171, t = 6.849,\ p = 0.00$).

Furthermore, the results also revealed that respondents who thought their father was obese were more likely to have a high BMI score ($\beta = 0.118, t = 4.719,\ p = 0.00$). On the contrary, the respondents who had breakfast less than 4 days a week ($\beta = -0.091, t = -3.78,\ p = 0.00$), and those who saw their health as excellent ($\beta = -0.098, t = -3.723,\ p = 0.00$) were less likely to have a high BMI score. On the other hand, the respondents who watched television during their free time in weekdays for more than 2 hours a day ($\beta = 0.081, t = 3.387,\ p = 0.001$), and those who often felt lonely ($\beta = 0.058, t = 2.108,\ p = 0.032$) were more likely to have a high BMI score. On the contrary, respondents whose father's educational level was low ($\beta = -0.068, t = -2.852,\ p = 0.004$), mother's educational level was low ($\beta = -0.071, t = -2.003,\ p = 0.041$), in the past seven days had physical activity for a total of at least 60 minutes per day for 4 days or less ($\beta = -0.070, t = -2.993,\ p = 0.003$), or who had a monthly household income of 10,000 dirhams or less ($\beta = -0.065, t = -2.823,\ p = 0.005$) were more likely to have a high BMI score. In the result, it is possible to predict the value of the BMI (the presence of obesity and overweight from the absence of it) through the negative or positive effect of all the previous variables, which are statistically significant

As expected, all the above-mentioned results are consistent with the results presented in sub-section 4.4.2.1, indicating the accuracy and robustness of the multiple regression model (BMI model).

Table 4.12: Parameter estimate coefficients of the BMI model

Model	B	Std. error	Standardised β	t	Sig.
(Constant)	28.19	0.50		56.01	.000
BS_Centered	0.04	0.00	0.30	10.94	.000
Gender	-1.95	0.23	-0.21	-8.44	.000
Now are you on diet	1.83	0.27	0.17	6.85	.000
D[a]_Father_Shape_obese	1.38	0.29	0.14	4.72	.000
Breakfast during the week	-0.91	0.24	-0.09	-3.78	.000
D[a] _Health_Excellent	-1.00	0.27	-0.10	-3.72	.000
Watch TV in weekdays	0.79	0.23	0.08	3.39	.001
SE_Centered	-0.12	0.04	-0.07	-2.89	.003
Father's Educational Level	-0.13	0.12	-0.07	-2.85	.004
Physical activities in past 7 days	-1.27	0.42	-0.07	-2.99	.003
Monthly Income	-0.95	0.34	-0.07	-2.82	.005
D[a] _ Feel Lonely _often	0.53	0.27	0.06	2.11	.032
Mother's Educational Level	-0.11	0.32	-0.07	-2.00	.041

Dependent variable: BMI; D[a]: dummy variable

4.4.2.3 Research question RQ2.1

From the results presented above in sub-section 4.4.2.2, it is clear that the answer to sub-research question RQ2.1 ("Is it possible to predict the BMI value using socio-demographic variables?") is affirmative. In fact, using affect-related variables it is possible to predict the BMI with a high level of accuracy ($F = 60.538$; $p < 0.001$).

In responding to sub-question RQ2.2 ("Which socio-demographic variables can better predict BMI?"), the results reported in Table 4.11 indicate that the BMI can be better predicted by a set of positive and negative impact-related variables, such as body shape, gender, diet ... and the mother's education level. The advantage of stepwise regression analysis is that it gives the results sorted according to the coefficient of determination (R^2). The higher the R^2, the better the predictor. Therefore, body shape is

the highest significant variable ($R^2 = 0.24,\ p < 0.0001$), and gender is the second highest significant variable ($R^2 = 0.108,\ p < 0.0001$). The mother's education level variable has the lowest significance ($R^2 = 0.24,\ p < 0.0001$).

In order to fully answer the second research question ("Do the socio-demographic factors predict obesity (BMI) among adolescents in Abu Dhabi?"), the response is made by clarifying the relevant analysis results of research sub-question RQ2.3 ("Among them, which one has more influence on the prediction capability?"). Regardless of all the previous results, whether in the current study or in the previous studies, it is shown that body shape has the greatest impact on BMI, which can be clearly seen by looking at the standard β value in Table 4.12, which is the largest. However, what is interesting in this study is that most of the other variables that have a clear effect on BMI have not been examined before—at least in the Arab Gulf countries. The following variables are arranged in descending order according to their influence on BMI: diet ($\text{Standard}\,\beta = 0.171$), father's shape ($\text{Standard}\,\beta = 0.136$), health ($\text{Standard}\,\beta = -0.098$), breakfast during the week ($\text{Standard}\,\beta = -0.091$), Watch TV in weekdays ($\text{Standard}\,\beta = 0.081$), mother's educational level ($\text{Standard}\,\beta = -0.071$), physical activities ($\text{Standard}\,\beta = 0.07$), father's educational level ($\text{Standard}\,\beta = -0.068$), self-esteem ($\text{Standard}\,\beta = -0.067$), monthly income ($\text{Standard}\,\beta = -0.065$), and feel lonely ($\text{Standard}\,\beta = 0.058$).

As it is clear from the previous results that the self-esteem variable comes in at the late stage in influencing the BMI, this shows that the concept of self-esteem needs to be strengthened and reconsidered in the entire population.

4.5 Mediation analysis

Mediation analysis is a method to increase the information obtained from a research study when the measures of the mediating process are available (MacKinnon *et al.*, 2007). In this section, self-esteem and body shape are respectively studied to explore the mediating effect of the relationship between socio-demographic characteristics and total BMI.

The third research question ("Does self-esteem mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?") and the fourth ("Does body shape perception mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?") will be answered through the upcoming sub-sections based on the variable types, as well as the dimensions of these variables.

4.5.1 Self-esteem mediation model

To answer on the third research question "Does Self-Esteem mediate sociodemographic variations in BMI among adolescents' in Abu Dhabi?". Figure 4.11 shows the self-esteem mediation model, where X (Socio Demog) is the socio-demographic variable, the intermediate variable M (self-esteem) is considered to be a mediator, and Y (BMI) is the outcome variable. Moreover, α measures the association between X and M, β measures the relationship between M and Y, controlling for X, γ is the direct effect of X on Y, the indirect (mediation) effect is then $c = \alpha \times \beta$, and thus, the total effect is $c' = \gamma + \alpha \times \beta$.

Table 4.13 shows that self-esteem mediated the relationship between BMI on all but one of the socio-demographic subscales and the total score. Only the significant socio-demographic variables were entered into the analysis. There were strong, statistically significant, unadjusted relationships between the socio-demographic (weight) and the BMI total score ($c' = 0.824;\ p < 0.0001$) and the weight ($c' = -0.136;\ p < 0.01$),

gender ($c' = -0.264;\ \ p < 0.001$), father's education level ($c' = -0.360;\ \ p < 0.001$), mother's education level ($c' = -0.317;\ \ p < 0.001$), monthly income ($c' = -0.342;\ \ p < 0.01$), father's body ($c' = 0.350;\ \ p < 0.001$), and mother's body ($c' = 0.401;\ \ p < 0.001$).

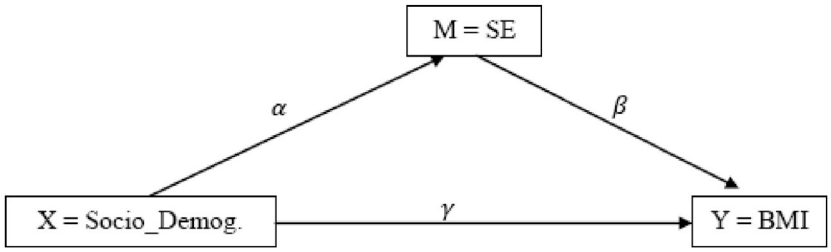


Figure 4.11: Diagram of the self-esteem mediation model

After controlling for self-esteem, the results in Table 4.13 indicate that self-esteem partially mediated the relationship between some socio-demographic variables and BMI scales (see *c* column and 95% confidence interval values in Table 4.13). Furthermore, the bias-corrected confidence intervals for the indirect effects not including zero indicate that these partial mediation effects are statistically significant. However, the 95% confidence interval for the indirect effects of height contains zero, indicating that self-esteem does not completely mediate the relationship between height and BMI.

In summary, the purpose of this sub-section was to examine the socio-demographic variables of adolescents in Abu Dhabi and to determine if self-esteem is a mediator in the BMI relationship. Except for the socio-demographic variable 'height', the results support research question RQ3: "Does self-esteem mediate socio-demographic variations in BMI among adolescents' in Abu Dhabi?".

Table 4.13: Results for the tests of self-esteem mediation of the socio-demographic of the BMI relationship

Socio-demographic	Standardised direct effects		Standardised indirect effect (mediation)		Total effect	
	γ	p-value	c	95% CI	c'	p-value
Weight	0.731	0.000	0.193	(.13, .26)	0.924	0.000
Height	–0.124	0.000	–0.012	(–.02, .01)	–0.136	0.002
Gender	–0.150	0.000	–0.114	(–.21, –.07)	–0.264	0.000
Father's education	–0.119	0.000	–0.241	(–.29, –.18)	–0.360	0.000
Mother's education	–0.125	0.000	–0.192	(–.28, –.13)	–0.317	0.000
Monthly income	–0.179	0.000	–0.163	(–.24, –.19)	–0.342	0.001
Father's body	0.142	0.000	0.209	(.17, .25)	0.351	0.000
Mother's body	0.137	0.000	0.264	(.21, .31)	0.401	0.000

Bias-corrected estimate of indirect effects with bias-corrected, accelerated 95% confidence interval (CI) based on 5,000 bootstrap resamples.

Therefore, the answer on the third research question is: Except the socio-demographic variable "Height", results support the third research question self-esteem (SE) perception mediate associations between socio-demographic characteristics and BMI among adolescents in Abu Dhabi".

4.5.2 Body shape perception mediation model

To answer on the fourth research question "Does body shape perception mediate socio-demographic variations in BMI among adolescents' in Abu Dhabi?". Figure 4.12 shows the body shape mediation model, where X (Socio_Demog) is the socio-demographic variable, the intermediate variable M (body shape) is considered to be a mediator, and Y (BMI) is the outcome variable.

Table 4.14 demonstrates that body shape mediated the relationship between BMI on almost all of the socio-demographic subscales and the total score. Only the significant socio-demographic variables were entered into the analysis. There were strong, statistically significant, unadjusted relationships between the socio-demographic (weight) and BMI total score ($c' = 0.941;\ p < 0.001$) and the height ($c' = -0.136;\ p <$

0.01), gender ($c' = -0.345; \quad p < 0.001$), father's education level ($c' = -0.286; \quad p < 0.001$), mother's education level ($c' = -0.128; \quad p < 0.01$), monthly income ($c' = -0.233; \quad p < 0.01$), father's body ($c' = 0.335; \quad p < 0.001$), and mother's body ($c' = 0.255; \quad p < 0.01$).

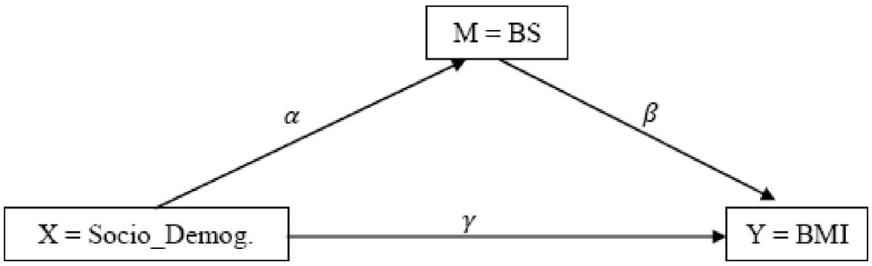


Figure 4.12: Diagram of body shape mediation model

After controlling for body shape, the results in Table 4.14 indicate that body shape partially mediated the relationship between some socio-demographic variables and the BMI scales (see *c* column and 95% confidence interval values in Table 4.14). Furthermore, the bias-corrected confidence intervals for the indirect effects not including zero indicate that these partial mediation effects were statistically significant. However, the 95% confidence intervals for the indirect effects of height and mother's education contain zero, indicating that BS completely did not mediate the relationship between height and mother's education and BMI. Whereas, after controlling for body shape, the direction of the relationship changed and was no longer statistically significant, indicating that body shape completely mediated the relationship between monthly income and BMI.

In summary, the purpose of this sub-section was to examine the socio-demographic variables in adolescents in Abu Dhabi and to determine if body shape was a mediator in the BMI relationship. The results support research question RQ4: "Does

body shape perception mediate socio-demographic variations in BMI among adolescents' in Abu Dhabi?".

Table 4.14: Results for the tests of body shape mediation of the socio-demographic of the BMI relationship

Socio-demographic	Standardised direct effects		Standardised indirect effect (mediation)		Total effect	
	γ	p-value	c	95% CI	c'	p-value
Weight	0.76	0.000	0.181	(.14, .23)	0.941	0.000
Height	–0.137	0.000	0.001	(–.01, .01)	–0.136	0.001
Gender	–0.180	0.000	–0.165	(–.27, –.09)	–0.345	0.000
Father's education	–0.102	0.003	–0.184	(–.21, –.17)	–0.286	0.002
Mother's education	–0.132	0.000	–0.04	(–.02, .02)	–0.128	0.000
Monthly income	–0.086	0.342	0.247	(.17, .36)	0.161	0.004
Father's body	0.190	0.000	0.145	(.12, .21)	0.335	0.000
Mother's body	0.132	0.004	0.123	(.06, .22)	0.255	0.003

Bias-corrected estimate of indirect effects with bias-corrected, accelerated 95% confidence interval (CI) based on 5,000 bootstrap resamples.

Therefore, the answer on the fourth research question is: Results support the fourth research question, body shape (BS) perception mediate associations between socio-demographic characteristics and BMI among adolescents in Abu Dhabi.

4.5.3 Socio-demographic eating and dieting variables mediation model

As mentioned in the methodology chapter, the questions in this part used different scales that led to multi-dimensional responses, and thus these questions were rescaled into a binary question (0 = low, 1 = high). To perform the analysis, BMICs were used.

Table 4.8 above shows the association between BMIC and the socio-demographic eating and dieting variables. Only significant variables were presented. It is clear that some of these variables are negatively associated with the BMIC; that is, the higher the

value, the lower the obesity, for example, 'Breakfast during the week: How often do you usually have breakfast?' less frequently led to high BMICs, and some were positive, such as 'Eat snacks while watching TV: How often do you eat a snack while you watch TV?' , where the high frequency of snack consumption led to high BMICs.

To test how body shape and self-esteem mediate associations between the socio-demographic eating and dieting and BMIC among adolescents in Abu Dhabi, the eating and dieting variables in Table 4.8 were clustered via a latent variable (eating and dieting). The results in Table 4.15 indicate that the mediation of self-esteem and body shape increased the impact of eating and dieting on BMIC, thus supporting the response to the question: "Does self-esteem mediate socio-demographic variations in BMI among adolescents' in Abu Dhabi?

Table 4.15: Results for the tests of self-esteem and body shape mediations (eating and dieting) of the BMIC relationship

Socio-demographic	Standardised direct effects		Standardised indirect effect (mediation)		Total effect	
	γ	p-value	c	95% CI	c'	p-value
Self-esteem[1]	0.521	0.000	0.347	(.301, .422)	0.868	0.000
Body shape[2]	0.132	0.004	0.123	(.06, .22)	0.255	0.003

1: X = eating and dieting; Y = BMIC; M = self-esteem; 2: X = eating and dieting; Y = BMIC; M = body shape

4.5.4 Socio-demographic physical variables mediation model

Table 4.8 above also shows the association between BMIC and the socio-demographic physical variables (The physical activities). Only significant variables were presented. It is clear that some of these variables are negatively associated with the BMIC; that is, the higher the value, the lower the obesity, for example, 'Physical activities in the past 7 days: Over the past 7 days, on how many days were you physically active for a total of at least

60 minutes per day?' less often gives a high BMIC, and some of them are positive, like 'Watch TV in weekdays: About how many hours a day do you usually watch television (including videos) in your free time? Weekdays?' that more frequently gives a high BMIC.

In order to test for how body shape perception and self-esteem mediate the associations between the socio-demographic physical and BMIC among adolescents in Abu Dhabi, the physical variables in Table 4.8 were clustered via a latent variable (physical). The results in Table 4.16 indicate that self-esteem does not mediate physical on BMIC; however, BMIC is negatively influenced by physical. Where, the inverse direction of the relationship in the indirect effect of physical and BMIC is statistically significant, indicating that BS partially mediated the relationship between physical and BMIC.

In conclusion, only body shape mediated the associations between physical and BMIC among the adolescents in Abu Dhabi.

Table 4.16: Results for the tests of self-esteem and body shape perception mediations (physical) of the BMIC relationship

Socio-demographic	Standardised direct effects		Standardised indirect effect (mediation)		Total effect	
	γ	p-value	c	95% CI	c'	p-value
Self-esteem[1]	–0.323	0.001	0.012	(–0.021, .023)	0.311	0.004
Body shape[2]	–0.757	0.000	0.353	(.27, .45)	0.404	0.000

1: X = physical, Y = BMIC, M = self-esteem; 2: X = physical, Y = BMIC, M = body shape

4.5.5 Socio-demographic psychological variables mediation model

Table 4.17 shows the association between the BMIC and socio-demographic psychological variables. It is clear that some of these variables are negatively associated with the BMIC; that is, the higher the value, the lower the obesity, for example, 'Feel

lonely: Do you feel lonely?' (4. No) gives less in the BMIC, while some of them are positive such as 'Students not spending time with you at school: How often does it happen that other students don't want to spend time with you at school and you end up being alone?' (5. Several times a week), where more gives high BMIC's.

In order to test for how body shape perception and self-esteem mediate the associations between the socio-demographic psychological and BMIC among the adolescents in Abu Dhabi, the psychological variables in Table 4.8 were clustered via a latent variable (psychological). The results in Table 4.17 indicate that the mediation of self-esteem and body increased the impact of psychological on BMIC, supporting the question, 'Do self-esteem and body shape mediate associations between the socio-demographic variables and BMICs among adolescents in Abu Dhabi?'.

Table 4.17: Results for the tests of self-esteem and body shape perception mediations (psychological) of the BMIC relationship

Socio-demographic	Standardised direct effects		Standardised indirect effect (mediation)		Total effect	
	γ	p-value	c	95% CI	c'	p-value
Self-esteem[1]	–0.423	0.000	–0.312	(–.26, –.40)	–0.735	0.000
Body shape[2]	–0.557	0.000	–0.348	(–.28, –.43)	–0.905	0.000

1: X = psychological, Y = BMIC, M = self-esteem; 2: X = psychological, Y = BMIC, M = body shape

4.6 Summary

Table 4.18, summarize all RQs and their correspondent answers.

Table 4.18. Summary of RQs and their correspondent answers.

No.	Research Question	Result
RQ1	Do body shape perception and self-esteem affect the BMI	"Yes" body shape perception and self-esteem affect BMI among adolescents in

	among adolescents in Abu Dhabi?	Abu Dhabi. Body shape perception has a positive effect on BMI, and self-esteem is negatively affected.
RQ2	Do the socio-demographic factors predict obesity (BMI) among adolescents in Abu Dhabi?	"Yes" It is possible to predict the BMI with a high level of accuracy from the socio-demographic factors.
RQ3	Does self-esteem mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?	Except for the socio-demographic variable 'height', self-esteem mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?
RQ4	Does body shape mediate socio-demographic variations in BMI among adolescents in Abu Dhabi?"	Yes, body shape perception mediate associations between socio-demographic characteristics and BMI among adolescents in Abu Dhabi.

Respondents of school adolescents aged 14–17 years residing in Abu Dhabi, UAE, were represented in the survey. From the Findings of the study, all research hypotheses were were approved through the statistical approaches used in the chapter, which include multivariate regression analysis and mediation analysis.

Chapter 5
Discussion and Conclusion

5.1 Discussion

The aim of the current research was to explore the socio-demographic factors, self-esteem, body image and their associations with overweight and obesity in school adolescents aged 14–17 years residing in Abu Dhabi, UAE.

Reports indicate that the prevalence of overweight and obesity among adolescents is rapidly increasing in the UAE. Obesity is an independent key risk factor for the future development of many diseases, especially heart diseases, which lead to death. As a part of the UAE, this study has shown a high prevalence rate of overweight and obesity among adolescents in Abu Dhabi (as measured by BMI).

The main findings of this study revealed that body shape perception is a very important factor influencing overweight and obesity (BMI) among 14–17-year-olds living in Abu Dhabi. This result is not surprising, as it is in line with all previous studies, whether in Western or Arab countries. However, the wonderful element in the findings from this study is that self-esteem was of little importance in predicting BMI, which is inconsistent with many previous studies, especially in Western countries. Nevertheless, many social, physical and psychological factors, as well as diet and nutrition factors, had a significant impact on predicting the BMI value.

The prevalence of overweight and obesity (30.4%) was about three times higher than the prevalence of underweight (9.4%). When compared to the recent study of Baniissa *et al.* (2020) among school-aged adolescents in the UAE, the adolescents aged

14–17 years living in Abu Dhabi generally had a lower overweight and obesity prevalence (34.7%). This is not inconsistent with our results, because the data used in the current study were obtained in 2012, and according to Statistica's (2020) 'UAE Adult Obesity Prevalence 2007-2016', the rate of obesity growth in the UAE reached 3.3% (see Figure 5.1 below). Therefore, the result is consistent. In addition, our current results have previously been supported by many authors, including Al Junaibi *et al.* (2013), AlBlooshi *et al.* (2016) and Bin Zaal, Musaiger and D'Souza (2009).

The prevalence rates of overweight and obesity observed in our study were consistent with WHO data on the Gulf countries which have the highest rate of obesity. For instance, the prevalence of obesity among adolescents aged 10-19 years was highest among Kuwait (22.8%) followed by Qatar (17.6%), Saudi Arabia (16.7%), Bahrain (15.5%), UAE (14.8%) and Oman (12.8%), (BMI> +2 standard deviations above the median - crude estimate) (WHO (2016).

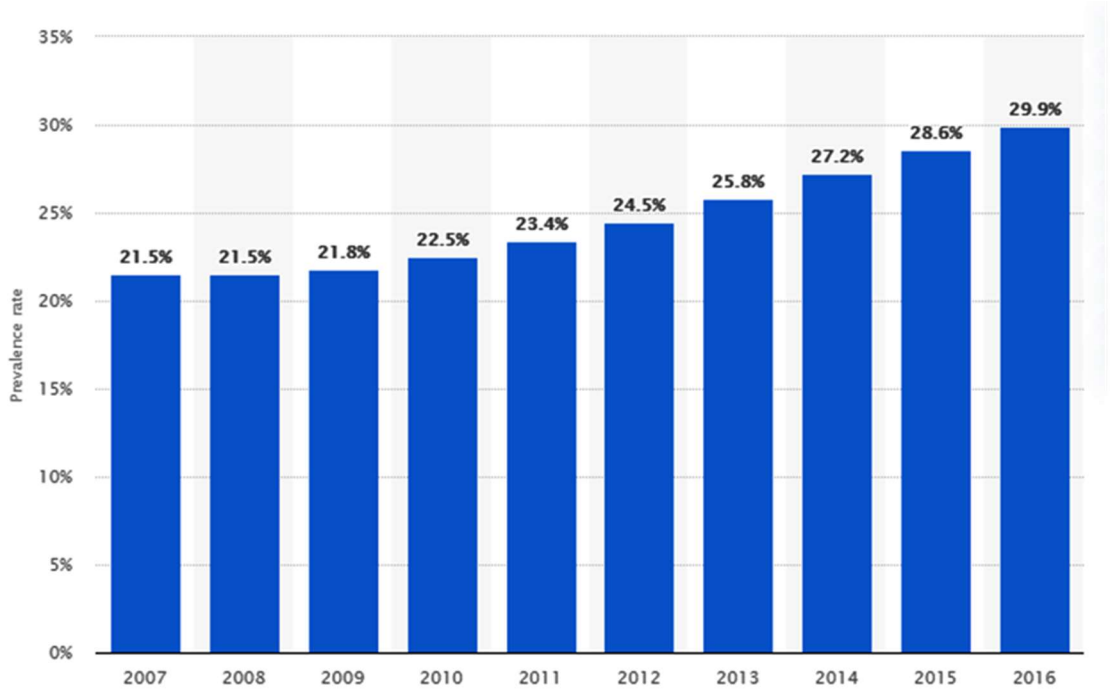


Figure 5.1: Prevalence of obesity in the adult population of the UAE 2007–2016 (Source: Statistica, 2020)

Since there is no golden and unique cut-off point for obesity and overweight, in this research the combined method of the USA scale was used. As described in the methodology chapter, this method takes into account gender and age, as well as the percentile method used by a number of researchers in Gulf countries.

Our findings revealed that most of the fathers and mothers of the participating adolescents had lower education levels at 60.4% and 80.5%, respectively. Approximately 12.9% of the households had a low monthly income, and about a quarter of them believed that their parents were 'obese'. Moreover, our findings revealed that the majority (60.5%) of the participating adolescents had breakfast meals less than 4 days per week, with 54.1% not eating vegetables or less than one time per day, while more than 80% had an additional meal, and more than 60% ate snacks while watching TV, working or playing on a computer. In contrast to the domains of food and eating, in terms of dieting more than

80% of the participating adolescents did not control their weight by dieting or diet pills, where 59.1% indicated that they controlled their weight by exercising; however, more than 90% of the participants did physical activities 4 days or less per week, with 50.7% watching television for more than two hours a day on weekdays, and 61.6% on the weekend. As for the low levels of physical activity, the finding was consistent with a global estimate from the WHO (2010) that 81% of those aged 11–17 years did not meet the daily physical activity recommendations. It is noteworthy that physical inactivity and low fruit and vegetable consumption in adolescence may persist throughout adulthood, which will increase the risk for chronic lifelong diseases later in life (Makansi *et al.*, 2018). Regarding the health side, the findings revealed that 34.6% of the participating adolescents were dissatisfied with their health ('fair' or 'poor'). In addition, more than 60% of the participating adolescents felt lonely, varying from sometimes to very often. Furthermore, more than 51% of them reported that other students did not spend time with them at school at least once a week.

5.1.1 Body shape and obesity

The study was designed to investigate the associations between measures of body shape perception and self-esteem as input, and the BMI as outcome. In addition, the study explored whether body shape and self-esteem could moderate these associations.

Analysis of the data yielded a strong positive relationship between the scores of body shape perception and BMI, indicating that an increase in body shape (more dissatisfaction and discomfort of body shape) creates high scores in BMI. Moreover, the body shape score was the most significantly superior predictor factor in the BMI regression model, and could identify participants --at risk of obesity even in

apparently healthy adolescents. Hence, these findings support the body shape part of the research question 1: “Do body shape and self-esteem affect the BMI among adolescents in Abu Dhabi?”. In addition, the findings revealed that body shape to be as prevalent in the adolescents’ population in the UAE as it is globally among other international adolescent populations (Barker and Galambos, 2003; Ojala *et al.*, 2007; Ferreiro, Seoane and Senra, 2014). Within the Arabic context, these findings from the current study are similar to what has been observed in other similar studies regarding the continuous increase in BMI among adolescent Arab populations (Mousa *et al.*, 2010; Alharballeh and Dodeen, 2021). Moreover, these results are consistent with previous studies, which show that overweight and obese individuals tend to report negative body shape concerns and poorer psychological outcomes, thus leading to efforts to lose weight or unhealthy behaviours (Kaminsky and Dewey, 2014; Kantanista *et al.*, 2017).+-

One of most important findings in the current study is that body shape mediated almost all the socio-demographic variations in BMI among the adolescents in Abu Dhabi. The participating adolescents reported an ideal body shape that was smaller than their currently perceived body shape. This body shape dissatisfaction increased as BMI increased. However, the participating adolescents still reported relatively little impairment of weight-related socio-demographic factors.

Tests for mediation revealed that the relationship between BMI and some socio-demographic subscales (social, eating and dieting, physical, health and psychological) and total scores was mediated by body shape perception. Our findings are consistent with the current literature, which shows that although there is a desire to be an ideal body shape in adolescents, the socio-demographic factors is not greatly impaired by excess weight, and the moderating effect of body shape perception supports the contention that body

shape perception may be an important resource in reducing the magnitude of the negative relationship between BMI and the socio-demographic factors (Ahadzadeh, Pahlevan Sharif and Ong, 2018; Radwan *et al.*, 2019).

The current findings demonstrate that for adolescents living in Abu Dhabi, the BMI is influenced by gender. Males were more likely to have higher BMI than females, while males were more likely to have body shape dissatisfaction than females. Moreover, the findings revealed that body shape partially mediated the relationship between gender and BMI, indicating that adolescents who were less satisfied with their bodies were more likely to experience large BMI values related to gender. The findings also revealed that body shape mediated the relationship between the father's and mother's educational levels and BMI, supporting the negative relationship between the father's and mother's educational levels intensifying the positive relationship between BMI and body shape. These findings are consistent with what has been observed, especially in Western countries (Ogden *et al.*, 2010; Matthiessen *et al.*, 2014; Stella *et al.*, 2016). It is speculated that these findings may be potentially explained by a lower level of awareness and knowledge among low educated parents in countries with higher economic status such as the UAE, for example. With regard to the negative effects of overweight and obesity, strategies to prevent overweight may be better developed in these countries. The findings also seem to indicate that the negative impact of low parental education on overweight adolescents in Abu Dhabi with higher economic status is stronger with fathers than with mothers. Furthermore, low parental education was associated with a higher likelihood of their adolescent children becoming overweight. This may be a result of social norms, where in some countries and especially the Arab world, an overweight adolescent may be seen as a 'healthy young man or woman' enjoying adequate food and food security,

particularly for families with a disposable income. In such families, adolescents may also be able to access more motorised transportation, and engage in less active excursions. This, along with minimal knowledge about the health risks associated with being an overweight.

This study's findings indicate that household income had a significant indirect effect on BMI through body shape, suggesting that the impact of income on BMI was partly caused by body shape perception. Consistent with other studies, high body shape and low income are associated with high BMI (Ahadzadeh, Pahlevan Sharif and Ong, 2018). If adolescents in Abu Dhabi are more dissatisfied with their body shape perception, then low-income adolescents are more likely to have a high BMI. These findings highlight the compounding of the effects of poverty, given that it increases the likelihood of obesity. In addition, the findings emerging from this study underscore the importance of understanding and targeting modifiable risk factors in early life for obesity, not only for improving health, but also for the potential impact on cognitive and behavioural outcomes, especially for adolescents from poor socio-economic backgrounds.

The findings also revealed that body shape mediated the relationship between the father's and mother's body shape perception and BMI, supporting the positive relationship between the father's and mother's body shape intensifying the positive relationship between BMI and body shape. These findings are consistent with what has been observed by many authors (Al Sabbah *et al.*, 2009; Kościcka, Czepczor-Bernat and Brytek-Matera, 2016; Pinto *et al.*, 2021). Furthermore, this study showed that body shape mediated the relationship between body dissatisfaction in parents and an ideal silhouette in adolescents. Moreover parents, and especially fathers, influence their children's body dissatisfaction in several ways, of which, parental attitudes towards the body are strongly

correlated with children's body dissatisfaction. It is important to point out that body attitudes in middle adolescence are different to those of adults, which is a high-risk period for developing body shape perception disturbances.

In summary, these findings support the hypothesis that self-esteem served as a partial mediator of the relationship between BMI and socio-demographic factors.

5.1.2 Self-esteem and obesity

One of the main objectives of the current study was to explore the relationship between BMI and self-esteem among adolescents aged 14–17 years residing in Abu Dhabi, UAE. In addition, the study explored whether self-esteem could moderate the associations between socio-demographic factors and BMI.

The findings revealed that self-esteem was inversely associated with BMI in adolescents aged 14–17 years residing in Abu Dhabi, which is consistent with previous research findings (AlAhmari *et al.*, 2019; Keshk *et al.*, 2019) where low self-esteem was associated with the risk of overweight and obesity. However, inconsistent with the previous studies—at least in Western countries—the self-esteem factor came in the late stage in influencing the BMI. This shows that the concept of self-esteem needs to be strengthened and reconsidered in the entire population.

The plausible explanation that low self-esteem is linked to overweight and obesity among the respondents was because adolescents who have low complaints about many negative physical and psychosocial experiences (such as low self-esteem) are more likely to be overweight and obese. This will produce a negative body image, not accepting or acknowledging the personality and functions of their body, which leads them to not accept

and appreciate their body, because they pay more attention to what their body can do than their physical appearance (Khalaf, Hashmi and Omari, 2021). Positive thoughts about the body in terms of personal development may make them more satisfied with their lives and possess a high degree of self-esteem. Therefore, educational institutions, including schools and universities, should pay attention to and begin to develop strategies to improve students' positive body image, thereby enhancing their self-esteem, such as providing educational courses and carrying out inspiring activities.

By exploring the mediating effect of self-esteem on the relationship between BMI and socio-demographic factors, it is not surprising that the same socio-demographic factors mediated by body shape in the relationship with BMI were the same as those mediated by self-esteem. This is due to several reasons, the most important of which is the strength of the relationship, whether it is negative or positive, between self-esteem and body shape perception and BMI.

Again, the findings from this study reflecting obesity among Emirati adolescents living in Abu Dhabi during years 2011-2012, self-esteem is influenced by gender, with females more likely to have higher self-esteem than males. During adolescence, girls appear to be more vulnerable to the negative psychological health effects of stress, whereby they present significantly higher levels of adaptation, depressive symptomatology and eating disorders. Boys tend to display a higher prevalence of externalising behavioural problems, aggression, antisocial behaviour and delinquency (Agam, Tamir and Golan, 2015). In addition, self-esteem mediates the relationship between BMI and gender, indicating that the key finding of this study does support the hypothesis that the relationship between gender and BMI is partially mediated by participants' self-esteem.

An important key finding of this study supports the hypothesis that the relationship between the parents' educational level and BMI is partially mediated by the participants' self-esteem. In previous work with obese populations, the parents' educational level has not typically been considered when investigating the relationship between BMI and psychological functioning; however, the findings from this study confirm that in this sample, the parents' educational level accounted for a portion of the correlations of BMI with self-esteem. Low self-esteem increased the indirect relationship between the parents' educational level and BMI ($Low\ parent's\ educational\ level\ \ Low\ SE \rightarrow\ \ High\ BMI$).

The association of self-esteem with BMI and economic factor household income is consistent with previous studies (Kolodziejczyk, 2015; Pereira *et al.*, 2019). Prior research has identified relationships between economic factors and BMI and self-esteem separately, but has not explored the moderation of this relationship by economic factors, at least with adolescents in Gulf countries. Thus, the finding that the relationship between household income and BMI was partially moderated by self-esteem provides new insight and suggests that self-esteem influences the relationship between economic factor and BMI. However, because self-esteem's enduring fascination reflects, in part, its associations with important life outcomes, such as psychological adjustment, academic success, physical health and relationship satisfaction, the extent to which self-esteem actually causes these outcomes, there may be additional aspects of the self-esteem that, if included, may have moderated the relationship between BMI and economic factors.

Another interested key finding of this research supports the hypothesis that the relationship between the parents' body shape perception and BMI is partially mediated

by the participants' self-esteem. Due to the sensitivity of disclosing personal information about parents, especially mothers, in Arab society, this study is one of the few studies dealing with such parental data. These data on parental overweight and obesity were taken for granted by the participants, and the researcher was unable to determine the credibility of such data, which is one of the most important obstacles and limitations to the current research. However, it turns out that the findings revealed that self-esteem partially mediated the relationship between the parents' body shape and BMI, indicating that parental overweight and obesity influenced the adolescents' BMI through self-esteem.

Hence, these findings support the hypothesis that self-esteem serves as a partial mediator of the relationship between BMI and socio-demographic factors.

5.1.3 BMI regression model

An important part of the current study was conducted to determine whether socio-demographic factors are related to the individuals' BMI, as well as the extent to which their own body shape perception and self-esteem influence the likelihood of affecting BMI. It was hypothesised that the independent variables (predictors) listed in Table 5.1 would predict the individual BMI score and that confirming the identity of these predictors would positively or negatively associate with the output (dependent) variable BMI. To test this hypothesis, multiple linear regression analysis was performed.

Table 5.1: Predictors in multiple linear regression model

Variable	Description	Input values
X_1	Body shape perception	Body shape total
X_2	Gender	Male = 0, Male = 1
X_3	Now are you on diet	Satisfied = 0, Unsatisfied = 1
X_4	Father's shape	Other = 0, Obese = 1 (dummy variable)
X_5	No. of days you have breakfast during the week	Less than 4 days a week = 0, 4 days a week or more = 1
X_6	Health situation	Other = 0, Good or Excellent = 1 (dummy variable)
X_7	Watch TV in weekdays	Less or equal to 2 hours a day = 0, More than 2 hours a day = 1
X_8	Self-esteem	Self-esteem total
X_9	Father's educational level	Low education = 0, High education = 1
X_{10}	Physical activities in past 7 days	Less than 4 days a week = 0, 4 days a week or more = 1
X_{11}	Monthly income	10,000 or less = 0, More than 10,000 = 1
X_{12}	Feel Lonely _often	Other = 0, Often = 1 (dummy variable)
X_{13}	Mother's educational level	Low education = 0, High education = 1

A key finding of this research is the establishment of a model that contains most types of the independent variables, including social, eating–dieting, psychological, physical and economic. All these variables are statistically significant. The model can predict the BMI value to a high degree of accuracy ($F = 60.54$, $p < 0.001$). According to the researcher's modest experience, this is the only model, at least in the Gulf countries, that has the ability to predict the BMI score of adolescents according to various criteria.

The study's findings revealed that body shape was positively associated with BMI for adolescents aged 14–17 years. The adolescents with high BMI were those who were dissatisfied with their body shape, and underestimated their body weight status. Furthermore, this factor explained about 24% of the variances in the BMI model, indicating that body shape was the most significantly associated factor with BMI. These findings are consistent with many previous and recent studies (Deshmukh and Kulkarni, 2017; Reina *et al.*, 2019; Khalaf, Hashmi and Omari, 2021).

In the current study, in contrast to body shape, self-esteem was negatively correlated with BMI. Only explaining about 1.9% of the variances in the BMI model, self-esteem seems to be one of the factors that had the least impact on BMI, but it was still significantly associated to BMI. Low self-esteem was associated with the risk of overweight and obesity. A reasonable explanation for the association of low self-esteem with overweight and obesity is that adolescents with low self-esteem show their loneliness through destructive eating habits at school, negative feelings about eating at home, and the embarrassment from movement and some sports.

The negative correlation between self-esteem and BMI is almost consistent with the results of previous and recent studies. However, compared with the models used in the previous studies, self-esteem in our regression model has a smaller impact on BMI, which is due to the quality and nature of the factors used in the regression model, and the strong association between these factors and BMI. Moreover, the method used to build our regression model (Stepwise) is based on certain criteria (the association between the independent variables and dependent variable, and the multicollinearity between the independent variables), gives the priority of some factors such as gender, parents' education level, some physical activities, eating and diet, and a person's health exceeding the self-esteem factor.

One of the important findings in the current research was the gender factor, which was the second highest factor negatively associated with body BMI, that explained about 10.8% of the variances in the BMI model. The reasons for that were the strong association between gender and BMI, as well as the greater homogeneity within females' and males' BMI scores. In addition, differences in BMI scores due to gender (usually males are larger than females) do not indicate a risk of obesity upon BMI scores, because the well-defined

cut-off points for BMI categories are different in both genders. The nature of the association (positive or negative) also involves how you encode the data. In this study, the gender variable was coded as a low rank value (0) for male, and a high rank value (1) for female; thus, the negative association between gender and BMI indicating that as the rank of gender decreased (goes to 0 (male)) the value of the BMI increased. In contrast, if 1 were coded for male and 0 for female, then the association would be reversed.

Another substantial finding in this research was the factors in deciding the effect whereby dieting, father's shape (obese), the number of times watching television in weekdays, and felt lonely (often), all were positively associated with BMI. Respectively, they explained 10.1%, 8.75, 3.3%, and 0.7% of the variances in the BMI model, indicating that adolescents who were unsatisfied with dieting, obese father's body shape, watching television more than 2 hours a day, and often feeling lonely were more likely to have a risk of overweight and obesity. It is noted that in the regression model, the father's body shape entered the model and was strongly affected the BMI score, but the mother's body shape did not enter the model, knowing that the mother's body shape had association with the BMI scores. This is due to the sensitivity of the answers by the respondents about private information regarding the parents, especially the mother, whereby in some Arab countries the mere mentioning of the name of the mother is considered a disgrace.

The regression model in this study is completed by the negative association of the following factors: number of days having breakfast during the week, health (excellent), father's educational level, physical activities in the past 7 days, monthly income, and mother's educational level, with the BMI scores. Respectively, they explained 8.4%, 6.5%, 1.4%, 1.1%, 1%, and 0.4% of the variances in the BMI model. These findings revealed that adolescents who had breakfast more than 4 days a week, excellent health,

high father's educational level, physical activities more than 4 days a week, high monthly income, and high mother's educational level were less likely to have a risk of overweight and obesity.

In summary, on the basis of these findings, a formula (regression model) is proposed that can help estimate the weight status of adolescents aged 14–17 years residing in Abu Dhabi and predict whether they will be overweight or obese through the BMI value. Such a prediction might help adolescents identify and avoid high-risk factors for overweight or obesity. The study subjects were adolescents aged 14–17 years, which is a moderate-to-low representative population. It is necessary to conduct further prospective studies to determine the impact of the most significant risk factors among young people of other age groups and different areas, especially by deepening the idea of mediation studies, which seems to be latent. In addition, this model strongly supported the most important study questions related to the relationship between BMI and the socio-demographic factors, as well as the most important predictors in this study (Mackinnon *et al., 2007; Lee et al., 2021).*

One of the questions that concerns the extent of the relationship between body shape and self-esteem has been taken care of, and it turns out that body shape was negatively associated with self-esteem. This finding is consistent with all previous research findings, until the relationship between them became axioms, so it was not deemed to be needed or necessary to expand on this relationship.

5.2 Treatment and prevention measures of obesity

Treatment of obesity is considered a challenge to medical practitioners and other healthcare workers (Wilding, 2007). Obesity is usually seen as the patient's own 'fault',

and practitioners are rarely trained in obesity and its management. This means that treatment often begins in the absence of an appropriate support programme and hence is frequently unsuccessful (Prentice 2006; Brockmann *et al.*, 2016; Sarwer and Polonsky, 2016). This type of failure serves to strengthen both the opinion of the patients and practitioners that treatment is not worthwhile. Effective programmes provide constant support, with realistic weight-loss goals and indeed the effects of treatment being monitored. This also includes long-term follow-up, which is essential if weight regain is to be avoided.

Recent treatment approaches based on diet and increased physical activity are relatively ineffective, despite obesity being increasingly recognised in children. Surprisingly, there has been developing evidence on the use of drugs and surgery for the treatment of obese adolescents in some specialist centres. Grogan and Wainright (1996) claim that in Western society, overweight women are seen as having no self-control and a failure, while the slim ones are perceived as determined and successful; thus, the reason younger women go through the hardships of dieting to be slim is identified with accomplishment, control and success.

There is a need for more effective treatments to be developed. Treatment is expected to grow as more is known about the history of childhood obesity. There is also the need for trained health professionals with good interpersonal skills to use Cognitive Behavioural Therapy appropriately (Sarwer and Polonsky, 2016). This is a behavioural approach that is aimed at assisting the patients to implement and sustain changes to their eating and activity behaviour. The combination of a behavioural approach with more traditional dietary and activity advice has been proved to result in improved short-term weight loss and is currently the most effective lifestyle approach to manage weight

control. Parents who had taken part in the behavioural change techniques commended the process (Stewart *et al.*, 2008). This technique was believed to be a child-friendly measure. Parents' developing a good relationship with the dietician was also important in their view of a progressive treatment.

Lifestyle changes have been suggested for engaging families who are employing the behavioural change method. Improvement of the offered treatment can be made by these qualitative methods of behavioural change, aimed at improving the understanding of the patient's perceptions in contrast to the general treatment for childhood obesity, which is characterised by non-attendance and the widespread failure to achieve weight maintenance. The significance of family adherence to the treatment of obesity was reported by Steele, Steele and Hunter (2009) to show an enhancement in predicting the child's outcomes. However, the reported measures of adherence by the parents themselves were better at predicting the child's outcome than objective measures.

As behavioural treatment programmes are aimed at changes that are completely or partly controlled by parents, it is not surprising that the involvement of parents can improve the effectiveness of this type of treatment. It is illustrated by Davison and Birch (2001) and Golan and Weizman (2001) that the correct behavioural treatments that involve nutrition and education on exercise have successfully prevented many of the physical and psychological problems that come along with unhealthy weight status. It has also been noted that considerable emphasis is placed on the parents in family-based paediatric obesity interventions as the most relevant targets for improvement (Golan *et al.*, 1998, 1999; Golan and Crow, 2004).

Similarly, MacDonnell *et al.* (2010) note that the more parents attend treatment sessions, the better the predicted adolescent weight loss is. This is important because it is usually difficult to retain most families in weight management programmes. It has been also recognised that the impacts of client factors such as client motivational status, client psychopathology and client beliefs about treatment efficacy are important (see Michael, Huelsman and Crowley, 2005).

Aside from the influence of environmental changes on improvement, the most important influence in treatment is the parental influence as many children tend to model parents' behaviours on diet and physical activity (Barlow and Dietz, 1998; Golan and Crow, 2004). In other words, for the child to attain the highest goals that are aimed at by the treatment, the parents must at the same time be involved by engaging in activities and behavioural change in a manner that will make the child more willing to follow suit, so the success that results will be due to both the child's and parents' involvement (Davison and Birch, 2001; Golan and Crow, 2004). McClintock and Hedge (2009) state that before treatment for child obesity commences, there is a crucial need to thoroughly evaluate the behaviour, psychology and emotions of the child. Furthermore, the child's eating habits and level of physical activity must be assessed extensively in order to determine the type of treatment that will be used, for example, increasing energy expenditure and reducing food high in calories (Barlow and Dietz, 1998).

Even though the main aim of an effective treatment of obesity involves modifying eating habits and activity, this is simultaneous with psychological and behavioural change. Before involvement, the child's self-esteem should be assessed, as well as self-efficacy, depression, anxiety and any eating disorders. This is because lack of motivation and unwillingness to change are the main obstacles often encountered in the success of a

treatment. Other obstacles encountered by practitioners in the treatment of obesity include the lack of participation by parents, lack of support services, and the lack of treatment skills by health practitioners and the futility of treatment (Story *et al.*, 2002). Other approaches including the use of low-calorie diets, energy-deficit diets and diets that are low in fat have been supported by reviews based on evidence as to the methods most likely to be effective for modest weight loss (Avenell *et al.*, 2004; Wilding, 2007). Modest physical activity is not usually advocated as the only option for obesity, even though it unquestionably contributes to weight loss and provides health benefits, and it has been shown by many studies to help in the maintenance of weight loss. The level of activity has to be constant in duration, for example, brisk walking each day for 45–60 minutes (Bensimhon, Kraus and Donahue, 2006; Wilding, 2007).

The motivation to change associated with obesity has also been found to be related to weight loss in clinical trials (Logue *et al.*, 2004). Client characteristics could also affect the degree to which treatment sessions are attended and therapeutic recommendations designed to increase weight loss are followed. Consistent with this, Zeller *et al.* (2004) found that depression and minority status predicted treatment drop-out in a community programme for paediatric weight loss. However, this study sought to determine whether socio-demographic factors are related to obesity in adolescents. This may facilitate the development of primary and secondary prevention intervention strategies, which may benefit the most cost-effective individuals affected. In addition, by understanding how psychosocial factors are related to body image satisfaction and interacting in predicting obesity, instead of trying to develop a one-size-fits-all obesity treatment model, it might facilitate providing more accurate treatments, leading to improved treatment quality.

Cunningham, Ellis and Naar-King (2010) state that effective treatment of the multiple risk factors that promote youth obesity requires approaches that are flexible and comprehensive enough to address each of these factors. One treatment approach is Multi-Systemic Therapy (MST), which is an intensive family and community-based treatment for serious juvenile offenders with possible substance abuse issues and their families. The primary goals of MST are to decrease adolescent criminal behavior and out-of-home placements. Critical features of MST include: (a) integration of empirically based treatment approaches to address a comprehensive range of risk factors across family, peer, school, and community contexts; (b) promotion of behavior change in the adolescent's natural environment, with the overriding goal of empowering caregivers; and (c) rigorous quality assurance mechanisms that focus on achieving outcomes through maintaining treatment fidelity and developing strategies to overcome barriers to behavior change. an intensive home-based treatment approach that has been proven to be effective with other childhood chronic illnesses and a community-based treatment that has historically been targeted as treatment for youth presenting with serious anti-social behaviour (e.g. violence and drug abuse) and their families; it has also been adapted to treat adolescent with obesity, as well as non-adherence among youth with chronic medical conditions such as type 1 diabetes (Ellis *et al.*, 2005, 2006a, 2006b). Multi-Systemic Therapy has been found to improve the health outcomes of urban adolescents with poorly controlled type 1 diabetes (Ellis *et al.*, 2005, 2006b).

Smolak and Thompson (2009) state that the behavioural methods adapted for the treatment of obesity have had a positive long-term effect. The behavioural interventions that are used include setting a goal, the use of rewards and self-monitoring, along with other methods of intervention, all of which have been proven to be effective. The only

study of an individualised behavioural intervention for childhood obesity in the UK that has been published was carried out in Scotland. It showed moderate benefits of counselling centred on family and behavioural strategies on physical activity and sedentary behaviour.

The guidelines from the National Institute for Health and Care Excellence (2006) state that various factors have to be incorporated into a programme for it to be recognised as a behavioural intervention. These include stimulus control, self-monitoring, goal setting, rewards for reaching goals and problem-solving. These guidelines should focus on many self-concepts upon the culture of each society, for example, the concept of self-esteem is different in Arab societies than in the Western societies in which this concept was developed, which was one of the most important obstacles in the current study. It was also recommended that praise and encouragement of parents should be included as role models for certain desirable behaviours (NHS, 2010). The research results from this study clearly show that parental culture and behaviour strongly influence the prevalence 217of obesity in adolescents

Similarly, the incorporation of behaviour changes components that should be family-based was another recommendation made by the NHS (2010) for treatment programmes in managing childhood obesity. The latter involves at least one parent and it should be aimed at changing the lifestyle of the family as a whole (Golan, Kaufman and Shahar, 2006; Golley *et al.*, 2007). It is worth noting that adopted treatment programmes should also aim at reducing the total dietary intake and time spent in sedentary behaviours, and increasing the levels of physical activity (NHS, 2010).

To sum up, the continuous changes in lifestyle worldwide have had a direct impact on health. This has led to serious health disorders, which in turn has led researchers and health practitioners to promote healthy lifestyles, using multiple behavioural change interventions. Most of the existing interventions are informed by health behaviour models and theories adapted from various disciplines (Taylor *et al.*, 2006). Individual countries and the WHO have also introduced over time, measures intended to curtail the rise of obesity. In the UK, the National Institute for Health and Care Excellence was asked by the Department of Health to develop guidance on "the most appropriate means of generic and specific intervention to support attitude and behaviour change at population and community levels" (Taylor *et al.*, 2006).

5.3 Limitations of the study

By its very nature, all research is open to interpretations and is subject to limitations, and this study is no exception. Although this research has achieved its aim and objectives, it acknowledges the following shortcomings.

Firstly, this study uses a quantitative method, whereby the data were collected using a mono-method that is potentially open to error. Therefore, further studies need to be conducted to widen the scope of this research in relation to the number of targeted populations and locations within the UAE. Such development would allow researchers to achieve a broader range of results and draw a more complete picture about childhood obesity. This study focused on the causal determinants of the rising obesity in school adolescents involving the 14–17 years age group residing in Abu Dhabi, UAE, making the generalisability of the findings of the present study limited to UAE youth within the same age group within the UAE or GCC countries. As such, the findings, although interesting

and having practical implications, may not be generalisable to other age groups within different countries due to differences in lifestyle and culture.

The scarcity of relevant and up-to-date information sources related to *adolescent's* obesity in the Middle East, and in particular the UAE, is another limitation of the study due to the lack of similar empirical studies and literature to compare and contrast with the findings of this study. Most of the literature concerning the topic under investigation originated in Western countries. Obesity remains under-researched in the UAE. The literature review is important as it allows the researcher to identify the scope of previous works, since the literature review findings are used as the foundation for the researcher to be built upon to achieve the study research objectives. Therefore, I recognise that assessment of nutritional status of the study's participants would have been an additional strength to the study outcomes, and I therefore highly recommend this as future research.

Another limitation of this study is the possible loss of meaning in the translation process. The data collection instrument (quantitative survey) used by this study was translated from English into Arabic. Although the loss of meaning was minimised by checking its accuracy through translation experts, some loss of meaning is inevitable as Arabic and English are each deeply rooted in their own specific cultures and operate from different mind-sets. In addition, the distance that separates the linguistic and cultural systems causes a serious challenge to translators.

Finally, there are other factors that have impacted on the progress of this study such as the time constraints. The timeframe was a constraining factor as the researcher had to face extreme challenges due to university issues and navigating between personal

and professional responsibilities, family duties and research commitments, which led to further pressure and slowed the progression of this research. With greater time available it would have been possible to collect and analyse larger sets of data. In addition, a change of the main supervisors (Director of Study) occurred twice, and as such, the transition to new a supervisory team and new style of supervision initially also had a disrupting and unsettling impact.

5.4 Contribution

The researcher's contribution was categorized into Contribution to knowledge and policy.

1. Contribution to knowledge
    a. This research provides a platform for further research on the different variables of obesity
    b. This study has expanded the obesity literature regarding the Gulf region
    c. Much of the literature on obesity has been conducted within developed countries' settings.
    d. This area of research remains under-researched in the UAE particularly childhood obesity
2. Contribution to policy
    a. This study findings will benefit stakeholders in the UAE government, initially in understanding and identifying the current scale of obesity and then in addressing and initiating an anti-obesity strategy based on the evidence provided.
    b. It will help formulate a future anti-obesity agenda by effectively exploiting current data from survey.

c. It will make recommendations based on the findings from this study on how to develop anti-obesity strategy with consideration of contribution to policy.
d. The results of the study will contribute to raising awareness about fighting obesity

5.4.1 Originality of the study

1. The majority of obesity studies have been conducted in Western countries, obesity is under-researched in the Middle East
2. Very limited studies to my knowledge have been conducted in the UAE. In view of the limited research on obesity in the UAE
3. Slow awareness about the health risks of obesity.

Also, the originalality of the current research were:

1. This research deals with a very topical research area obesity by positioning in it the UAE which has very different cultural settings and mind sets regarding overweight and obesity ‘’Big is beautiful’’
2. Large empirical data from quantitative (survey) to produce strong evidence and interesting findings.

In addition, this study built on previous studies. It has expanded the debate on Obesity by positioning this study in the UAE, as most of the research on obesity is conducted in the western countries or Asia, my study will be focusing on the Middle East.

5.5 Conclusion

This study aimed at investigating the relationship between BMI, body shape, self-esteem, and associated socio-demographic factors among school adolescents aged 14–17 years

and residing in Abu Dhabi, UAE. The findings revealed a significant positive association between BMI and body shape, and a significant negative association between BMI and self-esteem for these Abu Dhabi-based adolescents aged 14–17 years, indicating that the adolescents with high BMI were those who were dissatisfied with their body shape, and had low self-esteem. It is necessary to plan actions [e.g., psychological therapies like counselling or cognitive behavioural therapy (CBT)] which are aimed at reinforcing and increasing self-esteem, focusing on the adolescents with overweight and obesity problems. An Internet-based intervention may help adolescents increase and sustain physical activity if participation is based on self-choice and if they have sufficient support in their social environments. The intervention alone is not enough to support adolescents who are less motivated or have other challenges in life and may even provoke resistance and reinforce negative health behavior. Such a program may be used together with face-toface counseling in school health services, provided that it is further refined on a larger scale and that the counseling is performed by qualified health service professionals.

Mediation analysis revealed that body shape and self-esteem partially mediated the association between BMI and some of the socio-demographic factors, thus contributing to the body of existing knowledge and a better understanding of mediating affect from UAE culture.

Last but not least, one of the most important and strongest findings of this research is the establishment of a model that contains most types of independent variables, including social, eating–dieting, psychological, physical, and economic. All these variables are statistically significant. The model can predict the BMI value to a high degree of accuracy. According to the researcher's modest experience, this is the only

model, at least in the Gulf countries, that has the ability to predict the BMI score of adolescents according to various criteria.

Finally, this Study Worth Undertaking; because:

I. This study is worth undertaking in view of the limited research on obesity in the UAE.
II. There is a broad interest in addressing the health risks of obesity
III. The increased global awareness about the health risks of obesity
IV. Although the literature stresses the importance of addressing obesity challenges, it remains under-researched in the Middle East and in the UAE in particular.
V. This study is significant because it has academic value.
VI. It has expanded the literature on obesity prevalence, which will benefit future academic research
VII. It provided recommendations to inform the current policy and decision-makers
VIII. It will raise awareness about the future health implications about childhood obesity

This study has added to data in many aspects of the previous studies with focus on the UAE adolescents who have become overweight as the majority are adopting Westernised style of eating, that includes eating foods loaded with fat and sugar, and low in fibre. It also highlighted those obese adolescents are at a higher risk of remaining obese throughout adulthood. Meanwhile, the UAE is a state in nutrition transition which will require a constantly refreshed and agile workforce that is well prepared to face the challenges ahead. Thus, a holistic programme and a proactive, strategic approach are needed to curtail and address obesity in all segments of the population, with a specific focus on adolescents' obesity. We envisage that the public health intervention approach

must include initiatives such as changing sedentary lifestyles, while introducing effective economic measures to reduce the consumption of foods high in saturated fats and other energy-dense foods along with dedicated psychological therapies like counselling or cognitive behavioural therapy (CBT) for those are in need to prevent and treat obesity.

Overall, overweight and obesity are major public problems among adolescents in UAE with a significant heterogeneity between the genders (more in males than in females). The significance of this research yields new insights into the relationship between self esteem, body shape percception, and socio-demographic variables and their effect on overweight and obesity through BMI among adolescents in the United Arab Emirates to create positive social change lies in creating new knowledge that identifies new correlates and mediates for BMI and incorporates cultural competence. In addition, more accurate comparisons between adolescents and sociodemographic groups are needed to overcome weak or conflicting studies of obesity in diverse population groups. For example, adolescents in the UAE are and will continue to be the fastest growing and most influential social group. Furthermore, no prior study has looked at the relationship between overweight / obesity and most of socio-demographic factors used in this research among adolescent groups in UAE. In this study, we aimed to fill this research gap by assessing the relationship between overweight/obesity and various sociodemographic indicators such as mother's and father's educational levels, physical activities, self-esteem, body shape etc. among adolescent groups in UAE. Moreover, through these relationships, whether positive or negative, we were able to build a prediction model for BMI values with varying strength of influence of these variables.

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Appendices

Appendix I. Ethical approval: London Metropolitan University of Research Ethics Committee

Faculty of Social Sciences and Humanities

Collaborating Organisation Approval

أستمارة تعاون الموؤسسه واقرار موافقة الأداره مع اجراءات جمع البيانات

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Student name:

Student ID Number:

Collaborating organisation (name and address):----------

Tel No if available:

I, the undersigned, have given permission to the above named student to conduct fieldwork for their research. I have been fully briefed as to the nature of the project and the requirements for obtaining a suitable sample and administration of the questionnaires and agree this can be undertaken in this organization during the period specified and approved. All ethical implications that might affect the organisation's reputation and the well-being of its employees and significant third parties have been discussed and where necessary appropriate action taken. The student has been and/or will be briefed on health and safety procedures in the organisation.

Signed:

Position in organisation:

Date:

Appendix II. Ethical approval: Abu Dhabi Education Council

مجلس أبوظبي للتعليم
Abu Dhabi Education Council
Education First التعليم أولاً

Studies and Research Section

Date: 17/4/2011
الرقم ١٤٣١/ 1275

Subject: Research Ethical Clearance

Dear Principals,,,
Greetings

Research Title: **"An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE".**

By the Researcher: Musab Thabet, the student in "LONDON METROPOLITAN UNIVERSITY"

I am writing to confirm that the ethical research committee here at Abu Dhabi Education Council has no objection to provide an access for the researcher of the above investigation to have access to schools in Abu Dhabi area; and hence collect the main data required for this research project.

Also I have no reason to believe the access and this research work will violate ethical standards and professional code of practice.

Due to the reasons indicated and the usefulness of this research work clearance is granted.

Mohammad Salem Al-Dhahri
Executive Manager of Schools Operations Sector

مجلس أبو ظبي للتعليم
عمليات المدارس
School Operations
Abu Dhabi Education Council

نسخة لـ:
- مكتب المدير
- قسم الإدارة التربوية
- قسم البرامج والمناهج

- المنجوق بريد:٣٦٠٠٥، أبوظبي - أ.ع.م، هاتف: ٠٠٠٠ ٦١٥ ٢ ٩٧١+، فاكس: ٠٥٠٠ ٦١٥ ٢ ٩٧١+، البريد الإلكتروني: info@adec.ac.ae
P.O.Box: 36005, Abu Dhabi - UAE, Tel: +971 2 615 0000, Fax: +971 2 615 0500, Email: info@adec.ac.ae

Appendix III. Ethical approval: UAE Ministry of Education

United Arab Emirates
Ministry of Education
Abu Dhabi Educational Zone

دولـة الإمارات العـربيـة المتحدة
وزارة التربيـــة والتعـلـيـــم
ادارة منطقة أبوظبي التعليمية

Programs & Curricula Department
Research's & Studies Section

The Directors of UAE Government Schools

Subject: Ethical Approval, Proposed Research Work on obesity among children in the UAE

Dear Mr. \ Mrs.; Principals of Governmental School in Abu Dhabi

Iam writing to thank you for your continuous support in all areas intended to enhance the education process in general and research work in particular.

In the framework of existing cooperation, between the Abu Dhabi Education Zone and government establishments all over UAE.

We would like to request your assistance in facilitating the research work of **Mr. Musab s. Thabet,** who works for **Abu Dhabi Food Control Authority,** in conducting the tools of his research study, titled

"Over weight and obesity among preschool and school age children from UAE and Gulf Region"

Which would tack obesity among children in the UAE.
Implementation of the planned research study will start at the beginning of the next academic year (2009 / 2010).

Yon are kindly requestea to provide all possible assistance to faeitrtate and promote the work of the said researcher.

With our best regard

You're sincerely,

منطقة أبوظبي التعليمية
قسم البرامج والمناهج
شعبة الدراسات والبحوث

Mohammad Salem Moh. AlDahri
Director of Abu Dhabi Educational Zone Dept

منطقة أبوظبي التعليمية
حائزة على جائزة حمدان بن راشد آل مكتوم للأداء التعليمي المتميز - فئة المنطقة التعليمية - الدورة السابعة
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United Arab Emirates
Ministry of Education
Abu Dhabi Educational Zone

دولـة الإمارات العـربيـة المتحـدة
وزارة التربيـــة والتعـليـــم
ادارة منطقة أبوظبي التعليمية

Programs & Curricula Department
Researchs & Studies Section

Postgraduate Research Ethics Committee
Graduate School
London Metropolitan University
Holloway Road, London N7

Ref: Ethics Clearance: Proposed Research Project on Obesity Among children in the UAE by Musab Thabet

Dear Sir/ Madam

I am pleased to confirm that the above research proposal to be completed here in the UAE has met the ethical standards. The proposed research work is unlikely to raise any ethical issues or concerns. We should therefore support and encourage such work, as the whole notion of obesity among children becomes so important to all of us researchers and professional alike. Many thanks
Best wishes.

Signed

منطقة ابوظبي التعليمية
قسم البرامج والمناهج
شعبة الدراسات والبحوث

Appendix IV. The participant information sheet

Faculty of Social Sciences and Humanities

Information Sheet for Head Teacher

استمارة البحث واقرار موافقة مدير المدرسه

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Dear Head Teacher:

My name is Musab Thabet and I am currently studying for the a PhD award at London Metropolitan University. I am conducting my research thesis entitled **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE** ; and am therefore looking for participants to form the sample of my research dissertation. This study has been approved by the Research Ethics Review Panel at London Metropolitan University and Abu Dhabi Education Authority , also it fulfils the ethics requirements the British standards .

The study is designed to investigate the young children and adolescents´ perception of overweight and obesity . Absolutely no inappropriate information will be administered to the students as the study has been ethically approved by the University.

In order to achieve the aims of this study, participants of 14 and 16 years will be asked to complete three set of questionnaires which take approximately 60 minutes during one class period in October /November 2011. It is important that you are aware that if you wish to withhold your student from the survey at any time, you can do so, without having to state a reason. Confidentiality will be maintained throughout.

If there are any questions you would like to ask about the study, please feel free to do so contacting me at mailto:mjrv00@hotmail.com musbthabet@yahoo.com and I will be happy to answer any question you may have.

If you allow your students to take part in this study, please read and signed the consent form below.

Thank you very much for you time

Sincerely,

Musab Thabet

Contact Details:

Please let me know if you would like to contact my research supervisor at London Metropolitan University and I will forward his contact details by e-mail.

Researcher:

Telephone number: **Email**:

Faculty of Social Sciences and Humanities

Information Sheet for Parent/Guardian

معلومات عن البحث خاص باولياء الأمور

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Dear parent/guardian:

My name is Musab Thabet and I am currently studying for a PhD award at London Metropolitan University. I am conducting my research thesis on overweight and obesity in 14 and 16 years old adolescents, and am therefore looking for participants to form the sample of my research dissertation. This study has been approved by the Research Ethics Review Panel at London Metropolitan University and it fulfills the ethics requirements established by the British Psychological Society.

The study is designed to investigate the adolescents´ perception of overweight and obesity and also their scores in three set of questionnaires . In order to achieve the aims of this study participants are asked to complete three questionnaires. The completion of the survey will take approximately 60 minutes and it will take place in the high school during october /November 2011. Absolutely no inappropriate information will be administered to the students as the study has been ethically approved by the university. The questionnaires will be completely anonymous and confidentiality will be maintained throughout.

If during the completion of the survey, your child wish to withdraw from the survey he/she can do so at any time without stating any reason. Also, if you wish to withhold your child from the survey you can do so at any time, without having to sate a reason.

If there are any questions you would like to ask about the study, please feel free to do so contacting me at mailto:mjrv00@hotmail.com musabthabet@yahoo.com I will be happy to answer any question or concern you may have.

If you allow your child to take part in this study, please read and signed the consent form below.

Thank you very much for you time

Sincerely,

Musab Thabet

Contact Details:

Researcher:

Telephone number: Email:

Faculty of Social Sciences and Humanities

Parent/Guardian Consent Form

استمارة موافقة اولياء الأمور للمساهمه بالبحث

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Please circle either YES or NO:

1) I have read the information sheet about this study:

YES NO

I have received enough information about this study:

YES NO

I shall have further opportunity to ask questions and possibly discuss matters with the research should I needed to:

YES NO

I understand that my child is free to withdraw from this study:

– at any time

– without giving a reason

and no implications:

YES NO

I do agree to allow my child to take part in this study:

YES NO

Signed:

Name Printed:

Date:

Information Sheet for Participants

أستمارة معلومات خاصه بالعينه المشاركه بالدراسه

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Dear participant:

My name is Musab Thabet and I am currently studying for a PhD award at London Metropolitan University. I am conducting my research thesis on overwight , obesity and its relationship with self-esteem, culture and self efficacy in 14 and 16 years old adolescents, and am therefore looking for participants to form the sample of my research thesis.

This study has been approved by the Abu Dhabi Education Authority and the Research Ethics Review Panel at London Metropolitan University and therefore it fulfils the ethics requirements established by the British standards .

The study is designed to investigate as indicated above the adolescents´ perception of overweight and obesity and their relationship to self-esteem, culture and self efficacy ; also their scores in three set of questionnaires to measure self-esteem etc. The completion of the survey will take approximately 60 minutes.

Participation in this research is strictly voluntary. If you decide to give your consent to participate, you are free to withdraw from the survey at any time, without having to state a reason, in that case, the information will be destroyed. The information you provide in these questionnaires is completely confidential and it won´t be used for any other purpose than the present study.

You do not have to state your name or address in the questionnaire, just your gender and age in the space provided for that. Once the survey is completed, each participant will introduce their survey in an envelope provided by the researcher. It is important to emphasize that there are no right or wrong answers to this survey.

If there are any questions you would like to ask now or during the survey, please feel free to do so.

If you decide to take part in this study, please read and signed the consent form below.

Thank you very much for you time.

Sincerely,

Musab Thabet

Participant Consent

استمارة اقرار موافقة المستجيبين

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

I have been given time to read the information sheet and I am aware of the time needed to complete the questionnaires, as well as my right to withdraw at any time without having to sate a reason :

I _____ give my consent to be involved in the study

Signed: _____

Date: _____

Debriefing sheet for participants

نبذه عن موضوع البحث تعطي للمستجيبين واولياء امورهم والأدارات المدرسيه

Title of Research Study: **An exploration of cultural influences on overweight and obesity among a sample of children and adolescents in the UAE**

Dear participant,

Thank you so much for participating in this study. The aim of this study is to investigate the overweight and obesity among a sample of adolescents and compare their scores in three questionnaires assessing its relationship to self-esteem., culture and efficacy. This study will be carried out with a sample of adolescents in the UAE with the aim of comparing the participants results selected from various schools, places and, also, the differences in scores between males and females.

I would like to remind you that there are not right or wrong answers to this survey. The answers to this questionnaires are completely anonymous and the data from the study is treated in a completely confidential way. This data will be exclusively used for my university project and it won´t be use for any other purpose. If once that you have agree to participate in the study, you decide that you do not want your survey to be used for the study, you can withdraw at any time and the data will be destroyed.

The fact of talking about feelings, sensations and personality features usually makes us think about how we behave and it may make us conscious about aspects of our personality that we dislike. This may provoke in some people distressing feelings.

If after the completion of this survey you feel you may need any kind of advice regarding your well-being as a result of the participation in this study feel free to contact me by email or telephone as I could provide you with information about resources and institutions that may be helpful.

If you would like to know the results of my dissertation or if you have any question about the study, feel free to contact me at mailto:mjrv00@hotmail.com musabthabet@yahoo.com and I will be delighted to let you know the main findings of my study or help in any question or concern regarding the study.

I really appreciate your participation in this study and I would like to thank you for taking your time to complete the survey.

Sincerely,

Musab Thabet

Appendix V. The HBSQ survey

Health Behaviour in School-Aged Children (HBSC)
A Regional Cross-Cultural Study
of Adolescent Food &Health Behaviours
in the UAE

RESEARCH QUESTIONNAIRE
FOR THE HBSC

Demographic Composition

Weight..... (kg)

Height..... (cm)

Q1 Age.....

1 ☐ 14 years

2 ☐ 15 years

3 ☐ 16 years

4 ☐ 17 years

Q2 Residence

1 ☐ Rural 2 ☐ Urban

Q3 Are you a boy or a girl?

1 ☐ Boy

2 ☐ Girl

Q4 What class are you in?

1 ☐ 9th Grade

2 ☐ 10th Grade

3 ☐ 11th Grade

4 ☐ 12th Grade

Q5 What is your father's educational level?

1 ☐ Reads and writes

2 ☐ Primary

3 ☐ Middle school

4 ☐ Secondary

5 ☐ University graduate

6 ☐ Postgraduate

Q6 What is your mother's educational level?

1 ☐ Housewife

2 ☐ Primary

3 ☐ Middle school

4 ☐ Secondary

5 ☐ University graduate

6 ☐ Postgraduate

Q7 Number of family members: .....

Q8- Monthly income of the family

1 ☐ Less than 5000 AED

2 ☐ 6000-1000 AED

3 ☐ 11.000-15.000 AED

4 ☐ 16.000-20.000 AED

5 ☐ 5- 20.000 AED or more

Q9- The social status of students within the family?

1 ☐ Live with mother and father

2 ☐ Live with father only

3 ☐ Live with mother only

Q10- Do you think your father's body is:

1 ☐ Thin 2 ☐ Fit 3 ☐ Obese

Q11- Do you think your mother's body is:

1 ☐ Thin 2 ☐ Fit 3 ☐ Obese

Eating and Dieting

Q12 How often do you usually have <u>breakfast</u> (more than a glass of milk or fruit juice)? Please tick one box for <u>weekdays</u> and one box for <u>weekend</u> (off school)

Q12 A	During the week	Q12 B	During the weekend
1 ☐	*I never have breakfast during the week*	1 ☐	I never have breakfast during the weekend
2 ☐	*One day*	2 ☐	I usually have breakfast on only one day of the weekend
3 ☐	*Two days*	3 ☐	I usually have breakfast on both weekend days
4 ☐	*Three days*		
5 ☐	*Four days*		
6 ☐	*Five days*		

Q13- During the past 30 days, how many times per day did you usually eat fruit, such as apples, oranges, grapes, kiwi, mango, pears, bananas, or melons?

1 ☐ I did not eat fruit during the past 30 days

2 ☐ Less than one time per day

3 ☐ 1 time per day

4 ☐ 2 times per day

5 ☐ 3 times per day

6 ☐ 4 times per day

7 ☐ 5 or more times per day

Q14- During the past 30 days, how many times per day did you usually eat vegetables, such as tomatoes, cucumbers, lettuce, zucchini, sweet peppers, or carrots?

1 ☐ I did not eat vegetables during the past 30 days

2 ☐ Less than one time per day

3 ☐ 1 time per day

4 ☐ 2 times per day

5 ☐ 3 times per day

6 ☐ 4 times per day

7 ☐ 5 or more times per day

Q15 How often do you usually have an additional meal in a day (more than a drink or a snack)? Please tick one box for <u>weekdays</u> and one box for <u>weekend</u> (off school)

Q15 A	**<u>During the week</u>**
1 ☐	*I never have additional meal during the week*
2 ☐	*One day*
3 ☐	*Two days*
4 ☐	*Three days*
5 ☐	*Four days*
6 ☐	*Five days*

Q15 B	**<u>During the weekend</u>**
1 ☐	I never have additional meal during the weekend
2 ☐	I usually have additional meal on only one day of the weekend
3 ☐	I usually have additional meal on both weekend days

Q16 **Where do you usually eat your mid-day meal on schooldays?**

1 ☐ At school

2 ☐ I never eat a mid-day meal

Q17 - How often do you eat a snack while you…

	1) Never	*2) less than once a week*	*3) 1-2 days a week*	*4) 3-4 days a week*	*5) 5-6 days a week*	*6) Every day*
Watch TV (including videos and DVDs)?	☐	☐	☐	☐	☐	☐
Q18 **Work or play on a computer or games console?**	☐	☐	☐	☐	☐	☐

Q19 **How often do you eat in a fast food restaurant?**

1) Never
2) Rarely (less than once a month)
3) Once a month
4) 2-3 times a month
5) Once a week
6) 2-4 days a week
7) 5 or more days a week

Q20 **Do you get the following items from your parents if you ask for them?**

	1)	*2)*	*3)*	*4)*
	No, I never get that	I get that sometimes	I get that every time I ask for it	I can take it when I want it

Coke or other soft drinks that contain sugar Sweets or chocolates Biscuits or pastries Crisps.

Q21- **Here are some statements about eating meals at home. Please say how much you agree or disagree with each one.**

	1)	2)	3)	4)
	Strongly agree	Agree	Disagree	Strongly disagree

In my family there are rules at mealtimes that we are expected to follow.

Q22- **Which of the following things did you do to control your weight for at least seven days during the last 12 months?** (if you did nothing tick 'no' for all of the following)

		Yes	**No**
A	Exercise	□	□
B	diet under supervision of a professional	□	□
C	skip meals	□	□
D	use diet pills or laxatives	□	□
	Other, namely……		

Q23- **At present are you on a diet or doing something else to lose weight?** *Please tick*

[1]☐ No, my weight is fine
[2]☐ No, but I should lose some weight
[3]☐ No, because I need to put on weight
[4]☐ Yes

Q24- **Have you gone on a diet, changed your eating habits or done something else to control your weight, during the last 12 months?**

1) No
2) Yes, for a few days 1)
3) Yes, for a week 2)
4) Yes, for more than a week but less than a month
5) Yes, for a month
6) Yes, for more than a month but less than 6 months
7) Yes, for 6 months or more

Q25- **How many different times have you been on a diet to lose weight during the last 12 months?** (By diet we mean changing the way you eat so you can lose weight)

1) None
2) 1-2 times
3) 3-4 times
4) 5-6 times
5) 7 or more times

These next questions are about physical activity.

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time.

Physical activity can be done in sports, playing with friends, or walking to school.

Some examples of physical activity are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, & surfing.

For these next two questions, add up all the time you spend in physical activity each day but DON'T include your physical education or gym class(es).

First, think about the different things that you did each day in the last week.

Q26- **Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?** *Please tick one box only*

☐	☐	☐	☐	☐	☐	☐	☐
0 days	1	2	3	4	5	6	7 days

Q27- **How long does it usually take you to travel to school from your home?**
(Please tick one box only)

1) Less than 5 minutes
2) 5-15 minutes
3) 15-30 minutes
4) 30 minutes to 1 hour
5) More than 1 hour

Q28- About how many hours a day do you usually watch television (including videos) in your free time?

Please tick one box for weekdays and one box for weekend

Q28	Weekdays	Q29	Weekend
1☐	None at all	1☐	None at all
2☐	Less than 1 hour a day	2☐	Less than 1 hour a day
3☐	1-2 hour a day	3☐	1-2 hour a day
4☐	3 -4 hours a day	4☐	3 -4 hours a day
5☐	5 - 6 hours a day	5☐	5 - 6 hours a day
6☐	About 7 or more hours a day	6☐	About 7 or more hours a day

Q30- About how many hours a day do you usually spend doing school homework out of school hours?

Please tick one box for weekdays and one box for weekend

Q30	Weekdays	Q31	Weekend
1☐	None at all	1☐	None at all
2☐	Less than 1 hour a day	2☐	Less than 1 hour a day
3☐	1-2 hour a day	3☐	1-2 hour a day
4☐	3 -4 hours a day	4☐	3 -4 hours a day
5☐	5 - 6 hours a day	5☐	5 - 6 hours a day
6☐	About 7 or more hours a day	6☐	About 7 or more hours a day

Mental and Physical Health:

Q32 **Would you say your health is……?** *Please tick one box only*

1 ☐ Excellent
2 ☐ Good
3 ☐ Fair
4 ☐ Poor

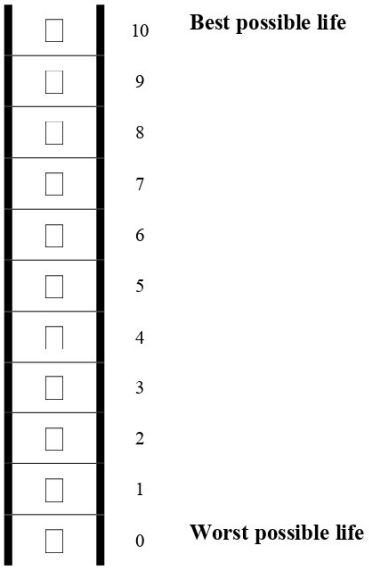
Q33

Here is a picture of a ladder.

The top of the ladder '**10**' is the best possible life for you and the bottom '**0**' is the worst possible life for you.

In general, where on the ladder do you feel you stand at the moment?

Tick the box next to the number that best describes where you stand.



Q34 **Do you feel lonely?**

[1]☐ yes, very often
[2]☐ yes, often
[3]☐ yes, sometimes
[4]☐ No

Q35 **How often does it happen that other students don't want to spend time with you at school and you end up being alone?** *Please tick one box only*

[1]☐ It hasn't happened this term
[2]☐ Once or twice
[3]☐ Sometimes
[4]☐ About once a week
[5]☐ Several times a week

Appendix VI. The HBSQ survey (Arabic translation)

مجلس الدراسات العليا
كلية الدراسات الأنسانية والأداب واللغات والتربية
رسالة الدكتوراة: الغذاء والحمية والبدانة لدى عينة من طلبة أمارة ابوظبي
مقدمة
لجامعة لندن متروبلتن- المملكة المتحدة

استبيان السلوك الصحي الغذائي لدى طلبة المدارس

عزيزي الطالب:

- لقد تم اختيارك للمشاركة في دراسة وطنية عن السلوك الصحي الغذائي .
- بالإجابة على هذه الأسئلة فإنك تساعدنا على معرفة السلوك الصحي الغذائي والنمط الحياتي .
- مشاركتك لا تتطلب وضع اسمك على الاستمارة وستبقى المعلومات سرية وتستخدم من أجل البحث العلمي فقط ولن تعرض على مدير مدرستك وأساتذتك.
- هذه الاستبانة ليست امتحانا أو اختبارا لك, الرجاء وضع الإشارة على الجواب الأقرب لرأيك وإحساسك.
- يتم الاجابة بوضع (×) داخل مربع للاختيار المطلوب او بكتابة ما يتطلبه السؤال.

وشكرا لتعاونك

الوضع السكاني

الوزن التقريبي بالكيلوغرام .....(كغم)

الطول التقريبي بالسنتيمتر ..... (سم)

Q 1 : العمر:

□ 1 14 سنة

□ 2 15 سنة

□ 3 16 سنة

□ 4 17 سنة

Q 2: السكن :

□ 1 حضر □ 2 ريف

Q 3: هل أنت ولد أو بنت؟

2

1 ☐ ولد

2 ☐ بنت

Q 4: في أي صف أنت؟

1 ☐ التاسع

2 ☐ العاشر

3 ☐ الحادي عشر

4 ☐ الثاني عشر

Q 5: التحصيل العلمي للأب

1 ☐ يقرأ ويكتب

2 ☐ ابتدائي

3 ☐ متوسط

4 ☐ ثانوي

5 ☐ جامعي

6 ☐ دراسات عليا

Q 6 : التحصيل العلمي للأم

1 ☐ ربة بيت

2 ☐ ابتدائي

3 ☐ متوسط

4 ☐ ثانوي

5 ☐ جامعي

6 ☐ دراسات عليا

Q 7 : عدد افرد الأسرة .....

Q8: الدخل الشهري للأسرة

1 ☐ أقل من 0005 درهم

2 ☐ 11.000-15.000 درهم

3 ☐ 20.000 درهم فأكثر

4 ☐ 10.000- 6000 درهم

5 ☐ 20.000-16.000 درهم

3

Q9 : الحالة الأجتماعية للطالب \ طالبة داخل الأسرة

☐1 يعيش مع الأب والأم
☐2 يعيش مع الأب فقط
☐3 يعيش مع الأم فقط

Q 10 : هل تعتقد / تعتقدين بأن جسم والدك

☐1 نحيف ☐2 مناسب (مقبول) ☐3 بدين (سمين)

Q 11 : هل تعتقد / تعتقدين بأن جسم والدتك

☐1 نحيف ☐2 مناسب (مقبول) ☐3 بدين (سمين)

التغذية وعادات تناول الطعام

Q12 : كم مرة في الأسبوع تتناول/ين عادةً وجبة <u>الإفطار</u> (أكثر من كأس حليب أو شاي أو عصير فواكه)؟
الرجاء الإجابة بما يتعلق <u>بأيام الأسبوع</u> وأخرى تتعلق <u>بالعطلة الأسبوعية</u>

Q12-A	<u>في أيام الأسبوع</u>	Q12-B :	<u>في العطلة الأسبوعية</u>
☐1	ولا مرة أتناول وجبة الإفطار في أيام الأسبوع	☐1	ولا مرة أتناول وجبة الإفطار في العطلة الأسبوعية
☐2	في يوم واحد	☐2	عادةً أتناول وجبة الإفطار في <u>أحد</u> أيام العطلة الأسبوعية (الجمعة او الاحد)
☐3	في يومين	☐3	عادةً أتناول وجبة الإفطار في <u>يومي</u> العطلة الأسبوعية (الجمعة و الاحد)
☐4	في 3 أيام		
☐5	في 4 أيام		
☐6	في 5 أيام		

Q13 :خلال ال30 يوما الماضية عادة كم مرة في اليوم الواحد اكلت الفواكه مثل التفاح , البرتقال , العنب , الكيوي , المانجو , الكمثرة الموز , البطيخ ... الخ

1 ☐ لم اكل اي نوع من الفاكه خلال ال30 يوما الماضية

2 ☐ اكلت الفواكه في ايام معدودة ولكن ليس يوميا

3 ☐ مرة واحدة يوميا

4 ☐ مرتان يوميا

5 ☐ 3 مرات يوميا

6 ☐ 4 مرات يوميا

7 ☐ 5 مرات او اكثر يوميا

Q14خلال ال30 يوما الماضية عادة كم مرة في اليوم الواحد اكلت الخضار مثل الطماطم , الخيار , الخس , الجزر ... الخ

1 ☐ لم اكل الخضروات في الشهر الماضي

2 ☐ اكلت الخضروات في ايام معدودة ولكن ليس يوميا

5

3 مرة واحدة يوميا

4 مرتان يوميا

5 3 مرات يوميا

6 4 مرات يوميا

7 5 مرات او اكثر يوميا

Q 15 : كم مرة في الأسبوع تتناول/ين عادة وجبة إضافية خلال اليوم (أكثر من مشروب خفيف أو وجبة خفيفة أو سانويتش؟
الرجاء الإجابة بما يتعلق بأيام الأسبوع وأخرى تتعلق بالعطلة الأسبوعية

A - 15 في أيام الأسبوع		B - Q15 في نهاية الأسبوع	
1 ☐	ولا مرة أتناول وجبة أضافية في أيام الأسبوع	1 ☐	ولا مرة أتناول وجبة أضافية في العطلة الأسبوعية
2 ☐	في يوم واحد	2 ☐	عادةً أتناول وجبة إضافية في **أحد** أيام العطلة الأسبوعية
3 ☐	في يومين	3 ☐	عادةً أتناول وجبة إضافية في **يومي** العطلة الأسبوعية
4 ☐	في 3 أيام		
5 ☐	في 4 أيام		
6 ☐	في 5 أيام		

Q16: عادة أين تأكل وجبة منتصف اليوم (فترة الاستراحة) في الأيام الدراسية؟

1) في المدرسة ☐

2) أنا لا اتناول وجبة منتصف اليوم (فترة الاستراحة) مطلقا ☐

Q17 : عادة كم مرة تتناول وجبات خفيفة بينما أنت:-

	(1 ولا مرة	(2 أقل من مرة في الأسبوع	(3 1-2 ايام في الأسبوع	(4 3-4 ايام في الأسبوع	(5 5-6 ايام في الأسبوع	(6 يوميا
تشاهد التلفاز (يشمل ذلك الفيدو و ال DVD)؟	☐	☐	☐	☐	☐	☐

Q18 :

تعمل أو تلعب على جهاز الحاسوب أو جهاز الألعاب الأكترونية؟	☐	☐	☐	☐	☐	☐

Q19 : عادة كم مرة تأكل في مطعم الوجبات السريعة؟ (مثل الشورما ، دجاج البروست, حمص ...)

1) ولا مرة ☐
2) نادرا (أقل من مرة في الشهر) ☐
3) مرة واحدة في الشهر ☐
4) 2- 3 مرة في الشهر ☐
5) مرة واحدة في الأسبوع ☐
6) 2- 4 ايام في الأسبوع ☐
7) 5 ايام أو أكثر في الأسبوع ☐

Q20 : هل تحصل على الأشياء التالية عندما تطلبها من امك / ابيك ؟

	1) لا أحصل عليها بتاتا	2) أحصل عليها في بعض المرات	3) أحصل عليها كلما طلبتها	4) اخذها كلما اردت لانها متوفرة
العصير أو المشروبات الخفيفة التي تحتوي على السكر	☐	☐	☐	☐
الحلويات / الشوكولاتة/ البسكويت				
المعجنات أو الفطائر				
التسالي (الشيبس او البسلي او المكسرات)				

Q21 : فيما يلي بعض العبارات المتعلقة بالوجبات الغذائية في البيت، الرجاء الاشارة الى مدى موافقتك على كل منها :-

	1) موافق بشدة	2) موافق	3) غير موافق	4) غير موافق بشدة

1. في عائلتي نظام وقواعد علينا اتباعها عند تناول الوجبات ☐ ☐ ☐ ☐

Q 22 : أيّ من الأشياء التالية قمت بتنفيذها من أجل مراقبة وزنك لمدة سبع ايام على الاقل خلال الـ 12 الأشهر الأخيرة ؟ (أشر إلى خانة واحدة في كل سطر)

	نعم	لا
1 - قُمتُ بنشاطات رياضية	☐	☐
2- قمت بإتباع حمية غذائية تحت إشراف مختص	☐	☐
3 - لم أتناول بعض الوجبات	☐	☐
4 - تناولت أقراص لتخفيف الوزن أو أدوية مُسْهلة	☐	☐
آخر، حدد _____	☐	☐

Q23 : هل تتبع/تتبعين اليوم حمية غذائية (الرجيم) أو شيء آخر من أجل تخفيف الوزن؟ (أشر إلى خانة واحدة فقط)

1 ☐ لا، وزني مقبول
2 ☐ لا، ولكنني يجب أن أخفف من وزني
3 ☐ لا، لأنني يجب أن أزيد من وزني
4 ☐ نعم

Q24 : هل قمت بحمية (دايت), أو غيرت من عادات اكلك , أوقمت باي عمل اخر للتحكم بوزنك خلال ال12

شهر الماضية؟

☐ 1	لا	☐ 4	نعم : لاكثر من اسبوع واقل من شهر
☐ 2	نعم لبعض الأيام	☐ 5	نعم : لشهر اواكثر ولكن أقل من 6 أشهر
☐ 3	نعم: لأسبوع	☐ 6	نعم : ل6 شهور أو أكثر

Q 25 : كم عدد المرات المختلفة التي أتبعت فيها حمية (الرجيم) لفقدان الوزن خلال ال12 شهرا الماضية؟

☐ 1	ولا مرة	☐ 4	6-5 مرة
☐ 2	2-1 مرة	☐ 5	7 مرات فأكثر
☐ 3	4-3 مرة		

نشاط جسماني و أنشطة في أوقات الفراغ

9

نشاط جسماني هو كل نشاط ينشط القلب ويجعلك تتنفس بسرعة في قسم من الوقت.
من الممكن ممارسة نشاط جسماني في إطار الرياضة، نشاط مدرسي، خلال اللعب مع الأصدقاء، أو خلال الذهاب مشياً إلى المدرسة.
أمثلة على نشاط جسماني هي الركض، المشي بسرعة، ركوب الدراجة، الرقص، السباحة، كرة السلة وكرة القدم.
بخصوص السؤالين التاليين احسب كل الأزمنة التي كنت بها نشيطا من ناحية بدنية خلال كل اليوم. لا تشمل دروس الرياضة (التربية الرياضية) في نطاق المدرسة.

Q

خلال الـ 7 أيام الأخيرة، في كم يوم قمت بنشاط جسماني استمر إجمالاً على الأقل 60 دقيقة في اليوم؟
(أشر إلى خانة واحدة فقط)

☐ ☐	☐	☐	☐	☐	☐	☐	☐
0 أيام	1	2	3	4	5	6	7 أيام

Q 27 **عادة كم من الوقت تحتاج/ين في الطريق للذهاب من بيتك للمدرسة ؟ (أختر أجابة واحدة فقط)**

1 ☐ أقل من 5 دقائق
2 ☐ 5-14 دقائق
3 ☐ 15-29 دقيقة
4 ☐ 30 دقيقة الى 1 ساعة
5 ☐ أكثر من ساعة

Q28 : كم ساعة في اليوم تشاهد/ تشاهدين التلفزيون عادة (بما في ذلك الفيديو و ال DVD) في وقت فراغك؟ (أشر إجابة للأيام العادية وإجابة لأيام العطلة الأسبوعية)

	في أيام الأسبوع	**Q29**	**في أيام العطلة الأسبوعية**
1 ☐	لا أشاهد التلفاز بتاتاً	1 ☐	لا أشاهد التلفاز بتاتاً
2 ☐	اقل من ساعة في اليوم	2 ☐	اقل من ساعة في اليوم
3 ☐	1- 2 ساعة في اليوم	3 ☐	1- 2 ساعة في اليوم
4 ☐	3 - 4 ساعة في اليوم	4 ☐	3 - 4 ساعة في اليوم
5 ☐	5- 6 ساعات في اليوم	5 ☐	5- 6 ساعات في اليوم
6 ☐	حوالي 7 ساعات في اليوم أو أكثر	6 ☐	حوالي 7 ساعات في اليوم أو أكثر

Q30 : كم ساعة في اليوم تقوم/تقومين عادة بحل وظائفك البيتية و الدراسة، بعد ساعات الدوام الدراسي؟
(أشر إجابة للأيام العادية وإجابة لأيام نهاية الأسبوع)

	في أيام الأسبوع
1 ☐	لا أحل وظائفي بتاتاً
2 ☐	اقل من ساعة في اليوم
3 ☐	1- 2 ساعة في اليوم
4 ☐	3 - 4 ساعة في اليوم
5 ☐	5- 6 ساعات في اليوم
6 ☐	حوالي 7 ساعات في اليوم أو أكثر

Q31	في أيام العطلة الأسبوعية
1 ☐	لا أحل وظائفي بتاتاً
2 ☐	اقل من ساعة في اليوم
3 ☐	1- 2 ساعة في اليوم
4 ☐	3 - 4 ساعة في اليوم
5 ☐	5- 6 ساعات في اليوم
6 ☐	حوالي 7 ساعات في اليوم أو أكثر

الصحة النفسية والجسدية

Q32 **كيف تصف/تصفين حالتك الصحية؟ (أشر إلى خانة واحدة فقط)**

1 ☐ ممتازة

2 ☐ جيدة

3 ☐ مقبولة

4 ☐ غير جيدة

Q33:

فيما يلي مخطط لسلم.

في الطرف الأعلى من السلم هنالك العدد "10" الذي يشير إلى الحياة الأفضل الممكنة بالنسبة لك. وفي الطرف الأسفل هنالك الرقم "0" الذي يشير إلى الحياة الأسوأ بالنسبة لك.

بشكل عام، على أي درجة من السلم تشعر/ين أنك موجود/ة حاليا؟

الرجاء ضع اشارة X بجانب الرقم الذي يعبر عن شعورك بشكل أفضل.

☐	10	الحياة الأفضل
☐	9	
☐	8	
☐	7	
☐	6	
☐	5	
☐	4	
☐	3	
☐	2	
☐	1	
☐	0	الحياة الأسوأ

Q34: هل تشعر بالوحدة؟

1 ☐ نعم، دائما

☐ 2 نعم، معظم الأحيان

☐ 3 نعم، أحياناً

☐ 4 لا، أبدا

Q35 : كم مره يتركك ويتخلى عنك زملاؤك الطلاب في المدرسة مما يجعلك تشعر بالوحدة خلال الفصل الدراسي الحالي؟

☐ 1 لم يحدث ذلك لي في هذا الفصل

☐ 2 مرة أو مرتين

☐ 3 أحياناً

☐ 4 تقريباً مرة في الأسبوع

☐ 5 عدة مرات في الأسبوع

Appendix VII. The RSE scale

Age…… Sex…… Grade……

Weight……kg Height …….cm

1= Strongly Agree
2= Agree
3= Disagree
4= Strongly Disagree

		Answer here
1	On the whole I am satisfied with myself	……
2	At times I think I am no good at all	…….
3	I feel I have a number of good qualities	…….
4	I am able to do things as well as most other people	…….
5	I feel I do not have much to be proud of	…….
6	I certainly feel useless at times	……
7	I feel that I am a person of worth	……
8	I wish I could have more respect for myself	……
9	All in all, I am inclined to think that I am a failure	……
10	I take a positive attitude toward myself	……..

Appendix VIII. The RSE scale (Arabic translation)

الاجـــابة

1- انا مقتنع بمظهري بشكل عام ……

2- احيانا اشعر بان مظهري ليس جيدا على الاطلاق ……

3- اشعر بان لدي العديد من المهارات الجيدة ……

4- انا قادر على فعل الاشياء، كما هو حال الاخرين ……

5- لا اشعر بان لدي الكثير مما افتخر به ……

6- بالتاكيد اشعر احيانا باني غير مفيد ……

7- اشعر باني شخص ذو قيمة ……

8-

	اتمنى لو كان لدي احترام اكثر لمظهري	....
9-	بشكل عام اميل الى الاعتقاد باني فاشل	....
- 10	لدي نظرة ايجابية تجاه مظهري	....

مقيـــــاس الثـــــقة بالنفـــــس

العمر **الجنس**

المرحله الدراسيه

الوزن التقريبي بالكيلو غرام **الطول التقريبي (سم)**

من فضلك اجب على كل سوال بطريقة توضح الي اي حد تتفق معه:

1- اتفق بقوة

2- اتفق

3- لا اتفق

4- لا اتفق مطلقا

Appendix IX. The BSQ

		Never					
		|	Rarely				
		|	|	Sometimes			
		|	|	|	Often		
		|	|	|	|	Very often	
		|	|	|	|	|	Always
		|	|	|	|	|	|
1.	Has feeling bored made you brood about your shape?.....	1	2	3	4	5	6
2.	Have you been so worried about your shape that you have been feeling you ought to diet?.....	1	2	3	4	5	6
3.	Have you thought that your thighs, hips or bottom are too large for the rest of you?.....	1	2	3	4	5	6
4.	Have you been afraid that you might become fat (or fatter)?.....	1	2	3	4	5	6
5.	Have you worried about your flesh being not firm enough?.....	1	2	3	4	5	6
6.	Has feeling full (e.g. after eating a large meal) made you feel fat?.....	1	2	3	4	5	6
7.	Have you felt so bad about your shape that you have cried?.....	1	2	3	4	5	6
8.	Have you avoided running because your flesh might wobble?.....	1	2	3	4	5	6

9.	Has being with thin women made you feel self-conscious about your shape?.....	1	2	3	4	5	6
10.	Have you worried about your thighs spreading out when sitting down?	1	2	3	4	5	6
11.	Has eating even a small amount of food made you feel fat?.....	1	2	3	4	5	6
12.	Have you noticed the shape of other women and felt that your own shape compared unfavourably?.....	1	2	3	4	5	6
13.	Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?.....	1	2	3	4	5	6
14.	Has being naked, such as when taking a bath, made you feel fat?.....	1	2	3	4	5	6
15.	Have you avoided wearing clothes which make you particularly aware of the shape of your body?.....	1	2	3	4	5	6
16.	Have you imagined cutting off fleshy areas of your body?.....	1	2	3	4	5	6
17.	Has eating sweets, cakes, or other high calorie food made you feel fat?	1	2	3	4	5	6
18.	Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?.....	1	2	3	4	5	6
19.	Have you felt excessively large and rounded?.....	1	2	3	4	5	6
20.	Have you felt ashamed of your body?.....	1	2	3	4	5	6
21.	Has worry about your shape made you diet?.....	1	2	3	4	5	6

22. Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?.....	1	2	3	4	5	6
23. Have you thought that you are in the shape you are because you lack self-control?.....	1	2	3	4	5	6
24. Have you worried about other people seeing rolls of fat around your waist or stomach?.....	1	2	3	4	5	6
25. Have you felt that it is not fair that other women are thinner than you?.	1	2	3	4	5	6
26. Have you vomited in order to feel thinner?.....	1	2	3	4	5	6
27. When in company have your worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?.....	1	2	3	4	5	6
28. Have you worried about your flesh being dimply?.....	1	2	3	4	5	6
29. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?.....	1	2	3	4	5	6
30. Have you pinched areas of your body to see how much fat there is?.....	1	2	3	4	5	6
31. Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?.....	1	2	3	4	5	6
32. Have you taken laxatives in order to feel thinner?.....	1	2	3	4	5	6
33. Have you been particularly self-conscious about your shape when in the company of other people?.....	1	2	3	4	5	6
34. Has worry about your shape made you feel you ought to exercise?.....	1	2	3	4	5	6

Appendix X. The BSQ (Arabic translation)

مجلس الدراسات العليا

كلية الدراسات الأنسانية والأداب واللغات والتربية

رسالة الدكتوراه: الغذاء والحمية والبدانة لدى عينة من طلبة ابو ظبي

مقدمة

لجامعة لندن متروبلتن- المملكه المتحدة

استبيان (القناعة) والقبول بالمظهر

يرجى قراءة فقرات هذا الأستبيان والأجابه عن جميع فقراته بعنايه وامعان رجاءا.....

تحاول فقرات الأستبيان الحالي(والذي هو جزء من اطروحة لنيل شهادة الدكتوراه سيتم تقديمها لجامعة لندن مترولتان عن موضوع الغذاء والحميه والبدانه عند الأفراد) التعرف على مدى قبول الفرد وقناعته بمظهره العام وقبول ذاته. يرجى الاجابه على جميع الفقرات الموجوده في هذا الأستبيان ووضع دائره حول الاجابه التي تعتقد بانها الاكثر ملائمه معك . تذكر باننا نرغب بالتعرف على مدى قناعة الفرد بمظهره العام وقبول ذاته والتي هي جزء من محفزات الحميه ومواجهة البدانه. من المهم ان تحاول الأجابه على جميع الاسئله.

نشكركم كثيرا تعاونكم في المساهمه في أنجاز هذه الرساله (البحث) العلمي الذي سيقدم كجزء من نيل شهادة الدكتوراه المزمع تقديمها لجامعة لندن متروبلتن عن موضوع التغديه والبدانه.

عموما صمم هذا الاستبيان والذي يحتوي على فقرات من المكن ان توصف قناعات تمتلكها انت حول نفسك بشكل عام . يرجى التفضل بالأجابه عن كل فقرة من الفقرات الاتية بالتاشير الى المدى الذي تعتقد بان الفقره تعطي وصف دقيق لاعتقادك او قناعتك.

مقيـــــــــاس القناعـــــــــة والقبول بالمظهر

العمر ..... الجنس ..... المرحله الدراسيه .....

الوزن التقريبي بالكيلو غرام .....(كغم) الطول التقريبي..... (سم)

عدد افراد العائله .....

من فضلك ضع دائرة حول احد الارقام من (1-6) والتي تعكس قناعتك بشكل دقيق:

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

1- هل الشعور بالملل يجعلك تفكر بعمق حول مظهرك وبدنك؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

2- هل قلقك من مظهرك الخارجي يجعلك تشعر بوجوب اللجوء الى الحمية ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

3- هل تعتقد بان حجم بعض مناطق جسمك اكبر بكثير من بقية اجزاء جسمك الأخرى ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

4- هل تشعر بالخوف من ان تصبح بدينا ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

5- هل تشعر بالقلق من كون الاجزاء البدينه في جسمك غير متناسقة مع بقية الجسم ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

6- هل الشعور بالتخمه اثناء الأكل يجعلك تشعر بالسمنة ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

7- هل تشعر بالانزعاج من مظهرك ما يجعلك تبكي ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

8- هل تتجنب الركض بسبب اهتزاز الاجزاء البدينه في جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

9- هل وجودك مع اشخاص غير بدينين يجعلك تشعر بعدم الارتياح لمظهرك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

10- هل تشعر بالقلق بسبب ترهل الاجزاء البدينه في جسمك حينما تكون جالسا ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

11- هل تناول وجبة صغيرة من الطعام يجعلك تشعر بالسمنة ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

12- هل دعتك ملاحظتك لمظهر الاخرين الى الشعور بعدم الارتياح لمظهرك بالمقارنه معهم ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

13- هل يتعارض تفكيرك بمظهرك مع قدرتك على التفكير على سبيل المثال (اثناء مشاهدة التلفاز او اثناء القراءة او الاستماع الى محادثة) ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

14- هل تشعربالسمنة حينما تكون عاريا على سبيل المثال (اثناء الاستحمام) ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

15- هل تتجنب ارتداء الملابس التي تظهر تفاصيل جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

16- هل تتخيل يوما ان تقوم بعمليات جراحيه لقطع الاجزاء البدينه من جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

17- هل تناولك للحلوى او المعجنات او الاغذية المحتوية على سعرات حرارية عالية تشعرك بالسمنة ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

18- هل تتجنب الذهاب الى مناسبة عامة بسبب عدم ارتياحك من مظهر جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

19- هل تشعر بانك بدين بافراط ؟

1- ابدا 2- نادرا 3- في بعض الاحيان 4- غالبا 5- في كثير من الاحيان 6- دائما

20- هل تشعر بالخجل من مظهر جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

21- هل شعورك بالقلق من مظهرك يدفعك الى الحمية ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

22- هل تشعر بالارتياح بمظهرك حينما تكون معدتك خالية على سبيل المثال (عند الصباح) ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

23- هل ضعف سيطرك تجعلك تشعر بالبدانة في مظهرك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

24- هل تشعر بعدم الارتياح حينما يرى الاخرون بدانة خصرك او بطنك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحيان 6- دائما

25- هل تشعر بعدم الانصاف كون الاخرين اكثر رشاقة منك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

26- هل تلجا الى التقيؤ كي تشعر بالراحه و بانك اكثر نحافة ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

27- هل تشعر بعدم الارتياح عندما تكون بين اصدقائك وكون جسمك اكبر مساحة اكبر من الاخرين؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

28- هل تشعر بالقلق بسبب االنتفاخات اجزاء طبقاتك من جسمك ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

29- هل تشعر بعدم الارتياح حينما ترى مظهرك امام المراة او واجهة المحلات ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

30- هل تمسك ببعض مناطق جسمك كي ترى مستوى بدانتك؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

31- هل تتجنب المواقف التي يتمكن فيها الناس من رؤية مظهر جسمك على سبيل المثال (المسابح او غرف تبديل الملابس) ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

32- هل تتناول المسهلات كي تشعر بكونك اقل بدانة ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

33- هل تشعر اكثر بعدم الارتياح عند تواجدك بين الاخرين ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما

34- هل الشعور بالقلق من مظهرك يجعلك تشعر بوجوب ممارسة التمارين الرياضية ؟

1- ابدا 2- نادرا 3- في بعض الاحي ان 4- غالبا 5- في كثير من الاحي ان 6- دائما