ISSN: 2638-1605

Madridge Journal of Nursing

Research Article

Open Access

Prevalence of Childhood Obesity and its Predisposing Factors among Primary School Children in Willayat of Nizwa, Al-Dakhylliya Governorate, Sultanate of Oman

Mohamed MK, Abbas ON, and **Hameed Swadi Hassan***

School of Pharmacy, College of Pharmacy and Nursing, University of Nizwa, Birkat Al-Mouz, Nizwa, Sultanate of Oman, Oman

Article Info

***Corresponding author:**
Hameed Swadi Hassan
Associate Professor
College of Pharmacy and Nursing
University of Nizwa
Oman
E-mail: hameed@unizwa.edu.om

Received: February 15, 2022
Accepted: February 28, 2022
Published: March 04, 2022

Citation: Mohamed MK, Abbas ON, Hassan HS. Prevalence of Childhood Obesity and its Predisposing Factors among Primary School Children in Willayat of Nizwa, Al-Dakhylliya Governorate, Sultanate of Oman. *Madridge J Nurs.* 2022; 7(1): 187-193.
doi: 10.18689/mjn-1000134

Copyright: © 2022 The Author(s). This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Published by Madridge Publishers

Abstract

Background: Since obesity is a global medical condition which affect adults and children of both sexes and lead to many diseases including hypertension, stroke and diabetes mellitus-2, it is chosen to assess the prevalence of the obesity and its predisposing factors among the primary school children in Willayat of Nizwa, AL-Dakhylliya Governorate, Sultanate of Oman during the period of November 2019 – February 2020.

Methods: This study was carried out in four different primary schools; 2 boy's and 2 girl's primary schools by using a self-administered questionnaires for 270 males and 270 females (grades 5th and 6th) school children whose ages range from 11 and 12 years. The study was approved by the School of Pharmacy, College of Pharmacy and Nursing, University of Nizwa as a graduation project and permitted by the General Directorate of Education in Al-Dakhylliya Governorate. The questionnaires included demographic parameters and other variables for the school's children, in addition to separate questionnaires for the teachers of the schools and the parents or the guardians of the school children. These questionnaires were chosen from previous similar studies and modified in order to obtain the required information for the study. Consent forms were prepared to seek the permission of the guardians and the school teachers to perform this study for ethical considerations. All findings are illustrated in a histogram and the important related issues are discussed.

Results: Out of the total number of the 540 primary school children and of equal number of boys and girls investigated in this study (270 each), it was found that the average values of the overweight are 10.25%, Obesity-1 equals to 3.45%, obesity-2 is 2.45%. Normal values of BMI are 27.5% and the underweight is 57.5%. The majority of the school children (81% females and 51% males) in the schools investigated reported that they do not have a family history of obesity.

Keywords: Obesity; BMI; Primary school children; Nizwa; Sultanate of Oman.

Introduction

Obesity is a medical condition which can be defined as accumulation of large amount of fat in human body. Obesity increases the risk of diseases such as heart diseases, diabetes-2, high blood pressure, and stroke [1].

Body Mass Index (BMI) is a tool used to assess if the person has an appropriate weight according to his age, sex, and expressed as weight in kilogram/square of height in meters. Also, there are some strength and weak points for the use of BMI; the strength point is that the BMI is cheap and easy to use. But the weakness of the BMI includes that the BMI is not widely used and it does not help to define the medical conditions [2].

Obesity is divided into three classifications and it is different from overweight. Obesity is defined when the BMI ranges from 30.0 and 40.0 (or above) and expressed as class 1,2 and 3, while overweight is explained when the BMI is equal to 25-29.9 However, normal weight is usually expressed when the BMI is equal to 18.5-24.9 and the underweight is below 18.5 as shown in table-1 [3].

Table: 1. Categorization of overweight and obesity.

BMI categorization of overweight and obesity:	
Underweight	<18.5
Normal weight	18.5-24.9
Overweight	25-29.9
Obesity Class 1	30-34.9
Obesity Class 2	35-39.9
Extreme Obesity Class 3	>40

Childhood obesity is one of the most worldwide public health challenges of the 21st century. During the last 40 years the number of children in school age with obesity has increased more than 10 folds, from 11 million to 124 million in 2016 ratings. In addition, a rated 216 million were classified as overweight but not obese in the same year (2016). In 2017 the condition also affected younger kids, with over 38 million kids aged fewer than 5 years living with obesity or overweight [3]. Childhood obesity often leads to health problems which in the past were considered only for adults (e.g., self-esteem, depression). Also, the percentage of obese children to become obese adult increases when one or both of the parents suffers from obesity [4].

The global obesity epidemic is worsening around the world and unless major interventions take place, the implications will be ominous. The prevalence of overweight and obesity is increasing not only in the US but also globally. Apart from tobacco, obesity is likely the highest threat to collective health in America. Globally it has a major health impact and effects on individuals [5].

The causes of childhood obesity and overweight are an imbalance between energy intake and expenditure. This imbalance happens around the world because of life style habits that include dietary habits; where sugar beverages consumption is more and fast food intake which is rich in calories but poor in nutrients or sedentary life where most of the time the child sits watching TV or plays videogames. Environmental factors; the easy access to the high calorie food in the restaurants or at home and lack of play grounds and physical activities in the area that the human live in [6]. Genetic factors; where there are two kinds of genetic effects; the first one is the additive genetic effect and the second is genotype environment interaction effect. Both of them have some effect on the obesity because of the suggestion that sensitivity of individuals to change in body fat following overfeeding is genotype-dependent.

Schools provide a high chance to tackle childhood obesity by enhancing nutrition for children and adolescents by offering healthy food and drink choices, fostering physical activities, and offering health education. Governments can take various measures to create a healthy environment in the school; prohibit certain products or forms of retail, set nutritional standards for school meals, and restrict the marketing of food and non-alcoholic drinks in and around schools to minimize exposure to high-fat, sugar and salt food advertising [7].

In 2010, overweight and obesity were estimated at 43 million kids (35 million in developing nations). Global childhood overweight and obesity incidence rose from 4.2% in 1990 to 6.7% in 2010. It is anticipated that this trend will increase in the following years. The incidence in Asia is smaller than in Africa (4.9% in 2010), but the number of kids impacted in Asia is greater [8].

A research examining kids aged 9-14 years from 1996-1998 showed that sugar beverage consumption increases the BMI by tiny quantities over the years. Sugary beverages are another factor considered as a potential contributing factor to obesity. Many studies have examined the connection between sugar beverage consumption and weight and have been discovered to be a continual contributing factor to overweight. Sugary beverages are less filling than food and can be eaten faster, resulting in greater caloric intake [9].

In a research study about overweigh and obesity, it was found that overweight and obese kids were four times more probable than their ordinary weight peers to report issues at school. They are also more likely to miss school more often, particularly those with chronic health circumstances such as diabetes and asthma, which can also influence academic achievement [10].

Across the United States, 13.6% of students were at risk for becoming overweight. Overall male students (15.5%) were significantly more likely than female students (11.7%) to be at risk for becoming overweight. Overall students in grade 9 (15.7%) were significantly more likely than students in grade 12 (11.8%) to be at risk for becoming overweight. Prevalence of being at risk for becoming overweight ranged from 8.4% to 15.9% across state survey and from 11.5%-18.7% across local survey [11].

Arabic-language primary school children (42% males and 63% female) of obese school-age kids were also adult obese according to data collected between 1970 and 1992. This means that early-age obesity monitoring can help predict, and possibly limits the obesity later in life [12].

Parent's obesity can affect or have some side effect on the obesity of their children. The risk of obesity in the young child or children under three years of age is going down if the parents do not have obesity. Also, for children who have more than three years of obesity; the parent's obesity increases the risk of obesity among both obese and non-obese children by the double [13].

Ogden, CL., et al. (2014) have conducted a study about the obesity to know the recent estimation of childhood obesity and to determine if the percent of obesity among the adult and children have been changed. They found that there is no change in the percent of obesity in the adult and the children from 2003-2004 and 2011-2012 as well as the percent of obesity is still high among them [14].

In 2015, Sahoo K, et al. reported the risk factors and causes of obesity; many factors can contribute to obesity and overweight like sugary beverages, snack foods, activity level, environmental factors and eating disorder symptoms. The obesity develops from the imbalance between the energy intake and expenditure with an increase in positive energy balance which is associated with the life style and dietary intake [6].

Morandi, A., et al. (2012) found an equation (BMI-obesity-associated polymorphism) that can predict the obesity in the newborns from the traditional factors (birth weight, and behavior and social indicators) and a genetic score. This study shows the first important tools to predict the obesity in children and also shows that the genetic variation has a little use for the obesity prediction. Also they said that the combat of the obesity should begin quickly after the birth to prevent the world obesity epidemic [15].

In 1999, Must A, and Strauss RS, reported about the risks which come with the obesity in three age stages. In the childhood stage the risk is short-term (e.g., orthopedic, neurological, pulmonary, gastroenterological, and endocrine conditions) but it is only limited to the severely overweight children. In the teenager stage, the obesity effect in the psychological status of the teenager (e.g., self-esteem, depression) and this effect can be permanent and can lead to development of cardiovascular risks and obesity in adulthood period [16].

The diseases that might be associated with the obesity have also been recognized. George A. Bray, in 1985 has reported about these diseases and he classified them into two types; the first one is well-known complications which they include hypertension, diabetes and some type of cancer and the other type is the less well-known complications which include hepatic steatosis, gallbladder diseases, and pulmonary function impairment [17].

Socio-economic effects, where they have been found, have a profound effect on development of obesity. The family factors also increase the obesity, because of the type of food that is available at home. Also the family members can influence the type of food consumed and the type of food that the child takes. The percent of obesity in children increases in the family when one or both of the parents suffer from obesity [5] and lastly, the psychological factors where a relationship between eating a lot of food with the psychological state of the child. Most of the students feel of hunger when they feel depressed or anxious. However, this relationship is not unidirectional; depression may be both a cause and consequence of obesity [5]. Medications also seem to be associated with obesity. There are many medications that increase the risk of obesity because they treat some diseases but they also increases the appetite or increase the fat clumps in the body like some lithium and corticosteroid [18].

Obesity can be diagnosed by some tests or exams to ensure that the patient is suffering from obesity or not [19]. These exams and test generally include laboratory tests for some enzymes and hormones that can cause obesity like: endocrine evaluation which includes the serum thyroid-stimulating hormone and corticosteroids. Also the assessment of medical consequences and metabolic syndrome by testing blood pressure- fasting glucose- LDL and HDL- Triglyceride levels. At the end diagnosis procedures include two methods; calculation of BMI and measurement of waist circumference.

Some medical hazards that might be associated with the obesity and can lead to death in some cases have been reported by Pi-Sunyer FX (1993). These risks include insulin resistant diabetes mellitus, and hyper triglyceridemia. Also it was reported that the obesity is associated with some forms of cancer and with sleep apnea [20].

The relationship between the distribution of body fat and the risk factors of developing of noninsulin-dependent diabetes mellitus and cardiovascular diseases has been assessed by Despores JP (1993). He also reported that there is a relationship between abdominal fat deposition and metabolic complications [21].

The treatment of obesity can be achieved by three steps; healthy life style, exercise, and medications. There are two medications that approved at 2012 to be used in treatment of obesity (phentermine-topiramate and Lorcaserin) but both of them need to be used with the healthy life style [13]. Also bariatric surgery which is considered to be the most effective way to lose weight and considered to be long-term treatment but it is only used in people with moderate or severe obesity [22].

Oman is an Arabic country that lies on the eastern side of Arabian Peninsula. It has a total population of 5,327,895 million by Feb.2022. Around 3,356,763 are Omanis and the remaining 1,971,321 are expatriates [4]. It represents 27% of the world population rate of most obese countries [23]. About 87% of the Omanis are urban and the life expectancy is 78.58 years. The native Omanis are of various ethnic groups some of which have ancestral roots in different countries [24].

Aim of the study

Since obesity, is a worldwide problem affecting so many individuals of varying ages in the communities and associated with so many risk factors or diseases and because the childhood obesity has not been investigated in Oman, it is chosen to study the prevalence of the childhood obesity and its predisposing factors (which might affect the children academic performance) among the school children in Willayat of Nizwa, Al-Dakhylliya Governorate, Sultanate of Oman. The teacher's and the parent's awareness about the childhood obesity and its predisposing factors has also been chosen to be studied.

Material and methods

The present study is to assess the prevalence of the childhood obesity and its predisposing factors among the school children in Willayat of Nizwa, Al-Dakhylliya governorate, Sultanate of Oman, by the use of questionnaires. This study was accepted by the graduation project committee of the School of Pharmacy, College of Pharmacy and Nursing, University of Nizwa (as a graduation project study) and approved by the Dean of the College. An official letter from the University (Public Relation) has been addressed to the General Directorate of the Education in Nizwa Governorate to allow the access to the schools to conduct the study.

Four primary schools were chosen in Willyat of Nizwa, Sultanate of Oman during Nov. 2019 – Feb. 2020. These primary schools include Jawaher Al Adab and Al-Bashir Bin Al Monther (for boys) and Sultan Bin Saif and Hafsa Bint Omar (for girls). A total of 600 questionnaires were distributed to the students and additional, specific, questionnaires were distributed to the student's teachers and the parents/guardian of the school children. But only 540 questionnaires with complete information; 270 students from Jawaher Al-Adab and Sultan Bin Saif and 270 students from Al Bashir Bin Al-Mother and Hafsa Bint Omar schools were included in the study. Sixty questionnaires in the four schools were discarded because they contain incomplete information or the students and/or their guardians did not respond to the study. The students have been chosen from 5th and 6th grades (advanced levels in the primary schools) whose ages ranged from 11-12 years. The prepared structured questionnaires for such purposes were chosen to include various parameters for the students; including demographic parameters that deals with age, gender, level of education, residence, parent's education, length, weight and other variables that deals with dietary habit and engagement in sport activities. Specific and separate questionnaires were addressed to the teachers as well as the parents/guardians of the students. The majority of the information used in this study were obtained from the parents/guardian's questionnaires because they contain most of the required and necessary information, for this study. These questionnaires were translated in Arabic (the local language) and validated. The validity was established by checking in a small population of subjects. Consent forms were prepared and attached to seek the permission of the school teachers and the parents/guardians to perform this study for ethical considerations. The BMI was calculated for each student, in the four schools, by using the standard equation (weight in kilogram/square of height in meters). All findings are illustrated in a histogram using Excel program and the important related issues are discussed.

Results

Based on the data collected from the distributed questionnaires, it was found that out of 540 students investigated in this study; there were 130 students from Jawaher Al Adab and 140 students from Al Bashir Bin Al Monther (for boys) and 130 students from Sultan Bin Saif and 140 from Hafsa Bint Omar (for girls) primary schools. So, 50% for each gender from the four primary schools were selected in this study whose age group ranged from 11-12 years.

For the Body Mass index (BMI), it was found that the values for the underweight were varied and represent 61% and 47% for the boys in Jawaher Al Adab and Al Bashir Bin Al Monther respectively. The values for girl's underweight were 65% and 60% in Sultan Bin Saif and Hafsa Bint Omar respectively. The normal weight represented approximate (or similar) values i.e. 25% and 27% for boys and 25% and 27% for girls in the four schools respectively. For class-1 obesity the values were found to represent 3% and 7% for boys and 1% and 0% for girls and the class-2 obesity represented 2% and 4% for boys and 1.9% and 3% for girls in the four investigated schools as appeared in the figure below.

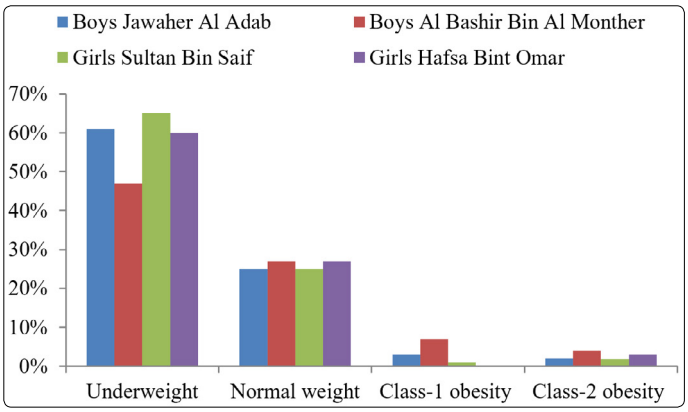

Figure 1. BMI categories among the investigated School children

The main reasons for the obesity were reported by about 40% of the students in all investigated schools and represented by lack of the daily exercise, sedentary life and watching TV and playing videogames for long time. About 80% of boys and 60% of girls were found to practice daily exercise (Walking). Also, about 60% of males and 58% of females like the fast food because they are delicious and of good taste. 82% of male students and 85% of female students reported that they eat fruits and vegetables and the majority of the students (about 51% of boys and 81% of girls) reported that they do not have a family history of obesity.

From the teacher's side, about 40% of the teachers, in the four investigated schools, think that obesity is widely spread among the children in the Sultanate of Oman and the vast majority of the teachers (95%) recommend the development of sports educational curricula in the schools to reduce the occurrence or the prevalence of obesity in school children.

Around 63% of the teachers in all investigated schools agreed that obesity affect the child's education achievement or level and the majority (72%) think that the educational institution does not provide any support or attention to help the students that suffer from obesity. Also, about 67% of the school teachers agreed that the school cafeteria food increase the incidence of obesity of the school children.

From the parent's side, about 85% of the parents appeared to follow their children eating habits because they think it is very important to look for their children health and can

control their children food habits and diets. Also, most of parents (75%) think that they can use punishment to force their children to avoid unhealthy food.

The vast majority (99%), if not all of the parents, agreed that practicing light activity can help their children to prevent obesity and 81 % of parents agreed that the recent technology and video games have bad effects on the health of the child because the child will not practice any other required activity if there is no control on the use of modern technology and this will increase the food consumption and decrease the desire to sport and will lead to obesity. 90% of the parents agreed that the obesity will prevent the child from doing their daily activity and the same agreed that the obesity will affect the psychology of the children.

Discussion

Over the past decades, the obesity in children has become a worldwide problem affecting so many countries. Because of such increase in the prevalence of the obesity, the world tried to solve this problem which has so many effects on the child in so many ways including his health and level of education. According to our results it has been shown that about 54% of boys and 62.5% of girls are under weight, and 26% of both boys and girls are of normal weight. Only about 12% of boys and 7% of girls are overweight. The remaining 5% boys and 0.5% of girls represent class-1 obesity and 3% boys and 2.5% girls with class-2 obesity. These results are approximate to those reported from Tehran during 2007 in ages between 10-15 years which showed that overweight represent 16% but slightly lower than what is recorded for obesity (i.e.10%) among study population of 398 students [25]. Union Territory of Puducherry in India reported 7.8% overweight and 3.8% obesity among study population of 342 students in 5th grade and 4.8 overweight and 2.1 % obesity in study population of 185 students in grade 6 [26]. When these figures compared to our results, they appeared to be approximate.

When our results are compared to those reported in Kuwait (Kuwait Nutrition Surveillance System in 2004), we find different results from those reported in Kuwait. In Kuwait, the results showed that about 22.6 % over weight and 17.3% obesity among male and female population of the same age group of our study [27]. This difference could be attributed to the dietary habits or healthy life style habit where about 80% of boys and 60% of girls, in our sample, were found to practice daily exercise and eat fruits and vegetables and the majority has no family history of obesity. However, the prevalence of obesity in the nearby UAE (United Arab Emirate) appears slightly lower (8%) than that obtained in our results [28].

On the other hand, the prevalence of underweight, i.e., 54% for boys and 62.5 for girls, in our sample, also appeared approximate to those reported for underweight, overweight and obesity among primary school learners in the Eastern Cape Province, South Africa especially for girls (in our results) where the study shows that 62.7% of 267 school children between 11-12 years are underweight [29].

The weight average prevalence of low body weight (LBW) in Eastern Mediterranean Region was estimated at 19.32%. LBW Prevalence was > 30% in Sudan and Pakistan and reached 45% in Yemen. The lowest rates of LBW were reported from Morocco, the UAE, and the Islamic republic of Iran, Tunisia, Kuwait and Libya. Overtime an increasing trend in LBW prevalence was noted in Yemen, Pakistan, Lebanon, Oman, Somalia and the Syrian Arab Republic. The remaining countries have mostly witnessed stabilization or a decrease in LBW rates. The decrease was noticeable in the UAE, Morocco and Djibouti [30].

So from our results it appeared that there is no prevalence of obesity recorded in our sample. There are many results in our questionnaires which might give a logical explanation for this such as the high percentage of the students who do sports constantly (80% of boys and 60% of girls).

From the parent's questionnaires we can observe that 85% of parents are following the healthy food habits at home, and the parents are playing an important role in children eating habits. Thus, the parents have good awareness and good responsibility towards their children. Furthermore, the vast majority (99%) of the parents are aware of the role of sports or light activities for their children which will improve the child health and prevent the obesity.

Whitaker RC. et al (1997) have reported that the obesity of the parents (of more than 3 years) increases the risk of the obesity in children and the non-obese parents increase the percentage of non-obese child [13]. When these results compared with our result we can see that 51% of male and 81% of female students do not have family history of obesity (no obese parents). So such high prevalence of non-obese parents is difficult to be compared with our results because the majority of the students are underweight (54% boys and 62.5% girls) and only 3% appeared to be obese boys and 2.5% obese girls and we do not know whether the parents are of normal weight or underweight.

According to [14] who reported, about the percentage of the obesity among the child whether has been changed or not, they mentioned it has not changed in 2003-2004 and 2011-2012 and the percentage is still high. But according to our results we found that the percentage of the obesity is not high among the investigated children but the problem start to go to another way. The majority of the children, in our study, now are underweight (54% for boys and 62.5% for girls) which also become a problem which need to be fully investigated like the obesity.

On the other hand [6], have reported that some factors can cause obesity like fatty food and sugar beverages; they mentioned that the obesity results from the imbalance between the energy intake and expenditure with an increase in positive energy. But when compared with the present study only 60% of the males and 58% of female students like to eat fatty food. Also the majority of the students i.e. 82% boys and 85%girls'students eat healthy food like fruits and vegetable. In addition, the majority of the students (80% males and 64% females) in our investigated sample, practicing sports. So, in

general, the balance between the energy intake and energy consumption and expenditure might be accepted in this regard.

In regards to the relation between the abdominal fat and some metabolic complications which has been reported by [21], we didn't find any metabolic complication among the children investigated because of their weight. This may be attributed to low % of obesity among the children investigated in this study.

So, in our study, we can observe that there is a big gap between the overweight (12% for boys and 7% for girls) and underweight results (54% for boys and 62.5% for girls). This could be attributed to the high percent of students who practicing so many sports (80% boys and 60% girls) or could be due to other unexplained reasons and we hope that the future studies will concentrate more on this problem to find the main reason of underweight and to make it easily explained.

Conclusion

In summary, our aim was to assess the prevalence of childhood obesity and its predisposing factors among the school children (in four primary schools; 2 for boys and 2 for girls from 5^{th} – 6^{th}grades) in Willayat of Nizwa, Sultanate of Oman and as shown, in our study, that there is no high prevalence of obesity and overweight in our study sample. On the contrary, we observed, unexpected, slight higher prevalence of underweight. So, further studies are needed to identify the risk factors involved in the development of underweight in these investigated school children and other primary schools in Nizwa and other Governorates to achieve a reasonable explanation for such prevalence of underweight if it is encountered.

Limitations

1- Take a lot of time to measure the weight and high of 540 students

2- There is no enough cooperation from some parents.

1. Most of the students were not good enough conscious about the research importance that was why some of them didn't help.
2. We didn't find school records that contained BMI or weight and length, so we had to calculate the weight and length of each student separately to obtain their BMI.
3. When distributing parent's surveys to students for the first time they didn't return only 100 questionnaires out of the distributed 300 questionnaires and we have been forced to distribute another sample. After that we stopped distributing another sample due to COVID-19.
4. The lack of previous similar research limits the scope of our analysis.

References

1. Hubbard VS. Defining overweight and obesity: what are the issues? *Am J Clin Nutr*. 2000; 72(5): 1067-1068. doi: 10.1093/ajcn/72.5.1067
2. Daniels SR. The use of BMI in the clinical setting. *Pediatrics*. 2009; 124(Supply_1): S35-41. doi: 10.1542/peds.2008-3586F
3. In: Endotext (Internet): Dietary Treatment of Obesity: Johanna T Dwyer, Kathleen J Melanson, Utchima Sriprachy-anunt, Paige Cross, and Madelyn Wilson. South Dartmouth (MA): MD Text.com, Inc: 2000-2015 Feb 28.
4. Obesity in Children and Teens-American Academy of Child. (Facts-for-Families). FFF Guide.
5. Mehrzad R. The global impact of obesity. *Obesity*. 2020; (pp. 55-72). doi:10.1016/B978-0-12-818839-2.00005-3
6. Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: causes and consequences. *J Family Med Prim Care*. 2015; 4(2): 187-92. doi: 10.4103/2249-4863.154628
7. Taking Act on Childhood Obesity. World Obesity: World Health Organization.
8. De Onis M, Blössner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr*. 2010; 92(5): 1257-64. doi: 10.3945/ajcn.2010.29786
9. The Nutrition Source. Harvard College.
10. Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *Jama*. 2003; 289(14): 1813-9. doi: 10.1001/jama.289.14.1813
11. Jo Anne Grunbaum, Laura Kann, Kinchen SA, et al. Youth Risk Behavior Surveillance- United States, 2001. *MMWR Surveill Summ*. 2002; 51(4): 1-62.
12. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev med*. 1993; 22(2): 167-77. doi: 10.1006/pmed.1993.1014
13. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med*. 1997; 337(13): 869-73. doi: 10.1056/NEJM199709253371301
14. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *Jama*. 2014; 311(8): 806-14. doi: 10.1056/NEJM199709253371301
15. Morandi A, Meyre D, Lobbens S, et al. Estimation of newborn risk for child or adolescent obesity: lessons from longitudinal birth cohorts. *PloS one*. 2012; 7(11): e49919. doi: 10.1371/journal.pone.0049919
16. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. *Int J Obes Relat Metab Disord*. 1999; 23(2): S2-11. doi: 10.1038/sj.ijo.0800852
17. Bray GA. Complications of obesity. *Ann Intern Med*. 1985; 103(6_Part_2): 1052-62. doi: 10.7326/0003-4819-103-6-1052
18. Cheskin LJ, Bartlett SJ, Zayas R, Twilley CH, Allison DB, Contoreggi C. Prescription medications: a modifiable contributor to obesity. *South Med J*. 1999; 92(9): 898-904. doi: 10.1097/00007611-199909000-00009
19. Papadakis MA, McPhee SJ, Bernstein J. Quick medical Diagnosis and treatment 2019, [New York, N.Y.]: McGraw-Hill Education LLC., 2019.
20. Pi-Sunyer FX. Medical hazards of obesity. *Ann Intern Med*. 1993; 119(7_Part_2): 655-60. doi: 10.7326/0003-4819-119-7_part_2-199310011-00006
21. Després JP. Abdominal obesity as important component of insulin-resistance syndrome. *Nutrition*. (Burbank, Los Angeles County, Calif.). 1993; 9(5): 452-9.
22. Kushner RF. Weight loss strategies for treatment of obesity. *Progcardiovasc Dis*. Jan-Feb 2014; 56(4): 465-72. doi: 10.1016/j.pcad.2013.09.005
23. Oman Population (2022)-Worldmeter. Oman.

24. Sarhan MA, Saleh KA, Bin-Dajem SM. Distribution of ABO blood groups and rhesus factor in Southwest Saudi Arabia. *Saudi Med J*. 2009; 30(1): 116-9.

25. Amini M, Omidvar N, Kimiagar M. Prevalence of overweight and obesity among junior high school students in a district of Tehran. *Journal of Research in Medical Sciences*. 2007; 12(6): 315-319.

26. Mahajan PB, Purty AJ, Singh Z, et al. Study of childhood obesity among school children aged 6 to 12 years in union territory of Puducherry. *Indian J Community Med*. 2011; 36(1): 45. doi: 10.4103/0970-0218.80793

27. Nutrition Country Profile State of Kuwait. Kuwait Nutrition Surveillance System. Jan-Dec. 2004(MOH2004).

28. Al-Hadad F, Al-Nuaimi Y, little BB, Thabit M. Prevalence of obesity among school children in UAE. *America J Hum Biol*. 2000; 12(4): 498-502. doi: 10.1002/1520-6300(200007/08)12:4<498::AID-AJHB9>3.0.CO;2-P

29. Gomwe H, Seekoe E, Goon D, Lyoka P, Marange C. The Prevalence of Underweight, Overweight and Obesity among Primary School Learners in the Eastern Cape Province, South Africa. *Pakistan Journal of Nutrition*. 2019; 18(7): 644-649. doi: 10.3923/pjn.2019.644.649

30. Nasreddine L, Ayoub JJ, Jawaldeh AA. Review of the nutrition in the Eastern Mediterranean Region. *EMHJ*. 2018; 24(1).