Comparative study of nutritional status, body composition and eating practices in two high schools students

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Abstract

Blackground: The prevalence of Overweight and Obesity is a public health problem that affects the adolescent population. Healthy eating practices are optimized with motivation, resources and knowledge and thus favor growth, physical and mental development. Unhealthy eating practices can induce different types of nutritional disorders. Objective: Determine the relationship between eating practices, body mass index, and body fat composition in students from two public and private high schools.

Methodology: 500 students participated, the instruments used CVUJU-R and CAR, assesses eating practices, sociodemographic variables and by anthropometry: mass index and body fat composition, for statistical analysis Student's t, ANOVA, Pearson $p<.05$ was used. Results. It was observed that they consume a variety of foods 1 to 3 times a week (47.6% to 67%), more than half do not practice a healthy diet related to motivation, knowledge and resources. They present a body mass index with: overweight (30.2%) and obesity (12%) when buying the body fat composition was higher: overweight (32%) and obesity due to adiposity (47%) in private high school women. The higher proportion in body fat composition and lower in body mass index stand out in the mean score. Contrasting the relationships: educational establishment, sex, age, percentage of body fat and body mass index was significant $p=<.05$. Discussion. Studies report unhealthy eating behaviors in overweight and obese populations as well as an increase in fat mass composition.

Conclusions. The conditions show, dietary risk and standards to evaluate body mass composition. Strengthen nursing interventions to promote healthy eating behaviors in adolescents.

Keywords: Eating Behavior, Body Mass Index, Body Fat Composition, Adolescents, (DeCS)

Introduction

Adolescents number around 1,200 million in the world, which represents 16% of the population, in Mexico it constitutes 22.8 million, which is 18.1% of the population [1-2]. The World Health Organization (WHO) identifies adolescents between the ages of 10 and 19 [3]. The WHO together with UNICEF (United Nations Children's Fund) emphasize the rights of adolescents, mainly health, as well as ensuring their quality of life for the achievement of integral well-being, however, in Mexico there is a lag in adolescent care and addressing health and nutrition needs is minimal, it is only taken into account when it has already caused damage to health, placing it in a vulnerable condition, due to the scarcity of primary care in health promotion and prevention [1-4].

Growth and development is a continuous phenomenon that begins at the moment of conception and culminates at the end of adolescence, a period during which maturity is reached in its physical, psychosocial and reproductive aspects. The increase in body size and mass is the result of cell hypertrophy and hyperplasia, a process known as growth, and changes in the organization and functional differentiation of tissues, organs and systems are the result of the process of development or maturation and adaptation. The hereditary and eating pattern establishes a specific growth and development rhythm, which can be modified by various factors, which depend on changes in the physical, psychosocial and sociocultural environment. Their interaction may or may not create risky conditions for contracting a disease. The nutritional evaluation, as well as the control of growth and development,

which is the best indicator to establish the health conditions of the person [5].

Nutrient and energy needs during adolescence increase due to growth, development, and changes in body composition associated with puberty, the time of life when both sexes have the highest growth rate. There are factors that affect the proper choice of foods, some are lack of knowledge and inadequate consumption of nutrients that cause alteration of the nutritional state. On the other hand, the socioeconomic limitations to obtain food in variety and quantity that are required to achieve a balance and thus satisfy nutritional needs, which leads to risky eating behaviors for overweight and obesity [6-7].

Obesity defined as an entity in excess body fat that affects health and well-being, it is adipose tissue (visceral fat) instead of muscle in its oxidation, the natural physiology of adipocytes favors the homeostasis of body energy, sensitivity by insulin and carbohydrate and lipid metabolism [7-8].

The epidemiological panorama worldwide indicates that more than 340 million children and adolescents between the ages of 5 and 19 were overweight or obese in 20163,7, a situation that has become a global public health emergency and a challenge of the 21st century. The WHO3 highlights a significant prevalence of childhood obesity of 31.5 million in the population group aged 5 to 19 years, which has multiplied by 10 in the world in the last four decades, and adolescents who are overweight are 213 million they are projected at the obesity threshold, reflected in some countries 1 in 33, by 2022. In the child and adolescent population with obesity it is higher than moderate or severe underweight [4].

There is a close relationship between the diet of the Body Mass Index (BMI) and Body Fat Composition (CGC), therefore a diet with an energy balance of macro and micronutrients is required, the contribution due to deficit can cause malnutrition and excess obesity [9].

The criteria and strategies of attention. The clinical assessment and questioning of eating practices and anthropometric measurements are useful to evaluate the nutritional status of the person [10-11], in the Mexican population of adolescents, timely diagnosis before the installation of chronic non-communicable diseases becomes a priority since early age 12. Alteration in BMI and CGC are determined as preventable risks, therefore, the need is generated to bring adolescents closer to health services to promote a culture of prevention [13-14].

On the other hand, the positive aspect in the behaviors of adolescents is the practice of physical exercise in 20%, the school environment is an effective setting to implement health promotion programs, integrate into their lifestyle with physical activity and food healthy [10]. The adolescent increases the consumption of more food, however, there is a lower proportion of fruits and vegetables and, on the contrary, greater consumption of fatty and sugary foods attributed to the taste and the influence of their friends who like fast or junk foods (foods not recommended) [6].

The presence of obesity leads adolescents to risky eating behavior (binge eating, bulimia or anorexia), and can develop due to a combination of emotional and psychological, interpersonal, social and behavioral factors [15-17], expressed by social representations and established perception by family, education, society, economy, body image that favor risky eating behaviors [17-18].

Study in Mexico describes risky eating behaviors in adolescents, reveals a statistical significance with overweight or obesity, in those who carry out activities simultaneously with the consumption of food, eat without company, do not eat fruits, do not drink milk, be a woman, do not eat breakfast. Another aspect is the practice of consuming food and distractors. The consumption of food that the adolescents practiced was different from their knowledge, they were healthy, but the consumption of vegetables, fruits, legumes was lower and the consumption of sugars, lipids and soft drinks was higher [19].

In adolescent eating behavior, frequent habits such as: skipping some of the meals, eating snacks, consuming fast foods, not eating as a family, following diets without medical indication, starting intense physical activity without adequate recommendation, another marked factor is sedentary lifestyle. from the habit of spending many hours in front of the television or computer screen [20].

To make the diagnosis of overweight and obesity, it is necessary to have anthropometric indicators that are associated with adiposity. Body Mass Index (BMI), (BMI Kg/m2), has been useful for the evaluation in adults, and in recent times it has been recommended for the evaluation of children and adolescents, due to the correlation with the percentage of fat mass (CGC) [20-21]. Furthermore, BMI related to age and sex is a universally accepted indicator for estimating obesity in children aged 2 to 18 years, in epidemiological studies and for clinical screening [20]. The WHO has provided a calculator for measuring BMI in children and adolescents (WHO Anthro calculator), the BMI is obtained, individually, for the analysis of nutritional status, proposed by Mercedes de Onis for the (WHO) in 2007 [22-23], body fat composition (percentage) based on the standardized method of the International Society for the Advancement of Kinanthropometry (ISAK) electrical bioimpedance, bio-electrical method are based on the measurement of resistance, or impedance that measures the different tissues of the body Concentric layers of fat, muscle and bone offer the passage of electric current through electrodes, perform the assessment of body composition in the most functional and valid way possible (precise and exact) [22-24].

For this reason, nursing interventions at the first level of care are a priority, especially inviting adolescents to use health services, aimed at promoting their well-being and not only at disease care [25]. The purpose of this study is to analyze the differences between body mass indexes and body fat composition related to practices, resources and motivation of eating habits in students from two public and private high schools.

Methodology
Cross-sectional, descriptive and correlation study. Non-probabilistic convenience sampling with 250 students from each high school, public and private school, from Cuernavaca, Morelos, Mexico, from August to November 2018.

Students, both sexes between 14 and 19 years old, who agreed to participate voluntarily in the study were included. 1st. moment the management of permits with the authorities of the schools, 2nd. Contact with students and invitation to participate through signed parental consent and informed consent of students 3rd. Questionnaire is delivered to answer previous instructions and accompaniment to answer your questions, 4th. Moment, it is taken from anthropometric measurements. The approval of the bioethics committee no. 37FCN2017.

Instruments: Questionnaire, Lifestyle behaviors in young university students CEVJU-R [26]. It evaluates in its dimensions the frequency of food consumption with a Likert-type scale and healthy and unhealthy practical aspects, motivations, satisfaction and resources that enable or hinder the practices, with a cut-off point of 17.5, when it is higher: eating practices are healthy and lower eating practices are unhealthy. In relation to frequency and variety of food consumption with three answer options: Daily, one to three times a week or never. The brief questionnaire of Risk Eating Behaviors CAR [27] was applied, which assesses the risk: high, moderate and no risk. The validation of the scale in the Mexican population obtained a Cronbach's Alpha of .812.

Sociodemographic variables: Family and personal pathological history, chronic non-communicable diseases NCD, anthropometric measurements (weight/height/age/sex) were performed, obtaining BMI27, body fat composition (percentage) based on the standardized method ISAK [21,27]. A Tanita® scale was used. The technique: with minimal clothing and no shoes, in an upright position, with heels and toes together. Height was obtained using a Seca® stadiometer placed on the wall, standing, forming a 90 ° angle in the Frankfort plane, with no objects on the head. For BMI assessment by Onis (WHO) in 2007 [23-24], define Low weight=values less than–2 standard deviation (SD); overweight as+1 SD and obesity a +2 SD. Body fat distribution assessment with cut-off point: Men: Low percentage of slim fat -8.0%; Optimum normal 8.1 to 15.9%; Slight overweight due to adiposity 16.0 to 20.9%; Overweight due to adiposity 21.0 to 24.9%; Obesity due to adiposity equal to or greater than 25.0%. Women: Low percentage of slim fat -15.0%; Optimal normal 15.1 to 20.9%; Slight excess fat 21.0 to 24.9%; Overweight due to adiposity 25.0 to 31.9%; Obesity due to adiposity equal to or greater than 32.0% 28-29.

Statistic analysis: The SPSS V-22 statistical program was used. Descriptive statistics. For the comparison and correlation of the variables, ANOVA, t student for independent samples and Pearson $p<.05$.

This research was carried out in adherence to the International ethical guidelines for Biomedical Research in human subjects and the Declaration of Helsinki, regarding: Make each subject a personalized invitation to participate in the study, comment that their participation is voluntary, that You can feel free to refuse to participate and withdraw from the research, provide information about the purpose of the research and the procedures that the researcher and the subject will carry out, noting that these do not carry risk. Said information will be given to you verbally and in writing (informed consent). The protection of your data is guaranteed, as well as all the information collected about you, will be protected by the researchers. The study findings will only be disclosed to the scientific community and reported to the participating institutions.

Results

500 students participated, 50%, from each high school, public and private. 1st. year 41%, 2nd. 26.2% and 3rd. year 32.8%. The mean age of 16.72 and a range of 14-19 years (SD 1.08). 28.2% men, 71.8% women. Table 1 mentions that they and their family members suffer from chronic diseases, as well as overweight and obesity. In relation to eating habits, they consume 1 to 3 times a week: fruits, vegetables, cereals, milk and derivatives, meats, legumes, average sugars 59% and junk food 74%, we can infer, the consumption of healthy foods is low, Table 2.

Table 1: Damage to personal and family health.

	Personal	Mother	Faher	Sibilings
Pathologies:	%	%	%	%
Mellitus diabetes	0	9	8.8	0
Arterial hypertension	0.4	4.8	3.8	0
Cancer	0	1.4	0.8	0
Heart disease	1	1.8	4	1.6
Psychiatric illness	0.8	1.2	0.6	0.4
Overweight	8.8	10.8	5.2	5.6
Obesity	4.2	2	2.2	1.2

Table 2: Food consumption frequency and variety.

	Daily	1-3 times per week	Never
Variety:	%	%	%
Fruit	36.6	62.4	1.0
Vegetables and veggies	34.8	62.4	2.8
Cereals	37.6	56.6	5.8
Milk and derivatives	48.4	48.2	3.4
Meat	39.6	59.6	.8
Legumes	29.0	67.4	3.6
Sugars	43.2	53.0	3.8
Junk food	19.2	74.0	6.8

Table 3: Eating behavior: Practices, motives, and resources.

Feeding practices:	sometimes/never	sometimes/never
	%	**%**
Eat fast foods (hamburgers, hot-dogs, etc.) Fried foods, sweets or treats and skip some of the main meals	38.0	62.0
Consume carbonated or artificial drinks	46.2	53.8
Breakfast, lunch, and dinner at regular times	38.0	61.0
Stop eating, even if you are hungry	15.4	84.6
Overeating, even if you are not hungry	10.8	89.2
Vomiting or taking laxatives after overeating	4.6	95.4
Main reason to eat properly:		
	f	%
Lose weight	88	17.6
Improve your performance (physical and mental).	130	26.0
Maintain health, figure, and fear of gaining weight	190	38.0
Reasons for not eating properly:		
You don't like to be restricted in what you eat.	134	26.8
Can't control what you eat.	85	17.0
He does not recognize the consequences of poor nutrition, he is satisfied.	110	22.0
He could change them, but he doesn't know if he/she will.	191	38.2
Resources:		
Money to buy healthy food	226	45.2
Availability of healthy food and spaces	83	16.6
Knowledge to choose healthy foods	172	34.4
Availability of healthy food at home	111	22.2
Food practices:		
Healthy eating practices	237	47.4
Unhealthy eating practices	263	52.6
Risk for eating behaviors		
Low or free risk	319	63.3
Medium risk	130	26.2
High risk	51	10.5

Findings found in frequency of food consumption related to practices, motives and resources: Table 3 shows that more than half consume fast foods and omit a main meal 62%, carbonated or artificial drinks 63.8%, consume foods rich in carbohydrates and fats and low in protein, vitamins, fiber and water intake, among others.

The main reasons to eat healthy are: lose weight, improve your physical and mental performance, and maintain your health and/or figure. Adolescents acknowledge not eating healthy foods, they are not controlled in what they eat and its consequences, they are satisfied with their practices and do not think they are problematic, but when they are pointed out healthy vs. deficient eating, they mention that they do not know how to do it. change their healthy eating habits from 17.6% to 38.2%.

In relation to CGC and BMI, there is a significant correlation with healthy and unhealthy eating practices, by age, sex, being male, and private educational establishment.

In relation to the Analysis of Variance (ANOVA) in the t test for independent samples, the mean scores higher PGC with: healthy eating practices, women in private school and age 19 years.

Table 5 shows the comparative analysis by schools where it can be observed that the CGC and BMI in relation to the mean score higher in healthy eating practices, women, private school. In age, CGC shows 19-year-old students and BMI those of 17 years with representative differences between both schools.

The Pearson correlation coefficient obtained confirms that BMI

and CGC influence eating behaviors p=<.000; as well as sex men p=<.020; private educational establishment p=<.000 and age p=<.009.

Table 4: Comparison in: high schools in body mass index and Score Z n500 index

Body mass index by school - women - men					
	Female high school 1 147	Male high school 1 103	Female high school 2 212	Male high school 2 38	
	%	%	%	%	*Average*
Under weight – 2 to -1 SD	1.4	1.0	0	0	1.2
Normal weight 1 SD	59.8	63.5	53.1	52.6	57.2
Overweight +1 SD	28.6	22.1	33.8	39.5	30.2
Obesity+ 2 SD	10.2	13.4	13.1	7.9	12.0
Diagnosis of body fat percentage by electrical bioimpedance					
	%	%	%	%	*Average*
Slim Low % Fat	0.7	1.0	1.4	0	1.2
Normal	5.6	8.7	3.3	7.9	5.0
Slight excess fat	15.8	21.2	13.1	15.8	14.8
Overweight	34.2	25.0	33.8	18.4	32
Obesity due to adiposity	43.7	44.1	48.4	57.9	47
Body mass index and body fat composition - women - men					
		IMC	PGC	IMC	PGC
		Female		Male	
		%	%	%	%
Under weight - 2 SD	DBPG	0.55	1.1	0.7	0.7
Normal weight -1 SD	N	55.9	4.2	60.4	8.5
Slight excess fat 1 SD	LEG	-	14.2	-	19.7
Overweight +1 to -2 SD	SA	31.7	34.3	26.9	23.1
Obesity 2 to +2 SD	OA	11.85	46.2	12	48

Female public high school (M High School 1), Male public high school (H High School 1), Female private high school (M High School 2), Male private high school (M High School 2). Body Mass Index (BMI): DBPG= Low Weight-2 SD Thin: -2 to -1 SD; N=Normal Weight 1 SD: 1SD; Overweight 1 to +1 SD+1 SD; Obesity 2 to + 2 SD: + 2 SD. OA; Diagnosis of Fat Percentage (DPG); -Slim Low Fat Percentage (DBPG); Normal (N); Slight Excess Fat (LEG); Overweight due to Adiposity (SA); Obesity due to Adiposity (OA). Body Fat Percentage (PGC); Men: Low percent body fat -8.0%; Optimal normal 8.1 to 15.9%; Slight overweight due to adiposity 16.0 to 20.9%; Overweight due to adiposity 21.0 to 24.9%; Obesity due to adiposity equal to or greater than 25.0%. Women: Low fat percentage lean -15.0%; Optimal normal 15.1 to 20.9%; Slight excess fat 21.0 to 24.9%; Overweight due to adiposity 25.0 to 31.9%; Obesity due to adiposity equal to or greater than 32.0%.

	CGC Mean	Standard deviation	BMI Average	Standard deviation	Value p= >.05
PAS	4.33	0.844	2.61	0.749	p=0.000
PANS	4.13	0.974	2.51	0.692	p= 0.000
Male	4.09	1.038	2.50	0.713	p= 0.020
Female	4.23	0.904	2.55	0.707	
P PUB	4.18	0.966	2.51	0.724	
P PRIV	4.20	0.926	2.56	0.693	p= 0.000
Age					p=0.009
14	4.25	1.211	2.50	1.002	p= 0.005
15	4.06	-	2.46	-	-
16	4.24	-	2.48	-	-
17	4.20	-	2.59	-	-
18	4.13	-	2.55	-	-
19	4.34	-	2.51	-	-
BMI	-	-			p=0.000

Source: Anthropometric measurements high school students. Healthy Eating Practice (PAS); Unhealthy Eating Practice (PANS); Public High School (P PUB); Private High School (PPRIV): Body Mass Index (BMI); Body Fat Composition (BFC).

Discussion

From the data, the results explain the relationships between medium and high risk dietary practices linked to motivation, resources with body mass index (BMI) and body fat composition (CGC). The comparisons between a public and a private school that, although there was a difference is weak, does not determine that the behavior of adolescents is similar to the presence of nutritional alterations due to the ways of eating, visible in the BMI and CGC. Empirical evidence shows transition factors from a traditional diet to an industrialized one, with high sugar content and refined flours, influencing the prevalence of overweight and obesity [30]. Food consumption differs according to NOM-04334, since the consumption of food that the adolescents practiced was different from that recommended for being healthy and was lower in vegetables, fruits and legumes and higher in sugars, lipids and carbonated beverages [16].

According to the study Banna, Buchthal, Delormier, Creed and Penny (2016), it highlights individual attributions in behavior, they included the lack of economic resources to buy food and concerns about body image, the socio-environmental level, however, the Parents promoted healthy eating by giving them advice on the selection of foods and homemade meals and the importance of foods with nutritional contribution [31]. Regarding the consumption of food in its variety and quantity, a similar study is found in Argentina and it is above half and their eating practices are not healthy and their families have diabetes mellitus and high blood pressure, overweight and obesity [32].

The environment influenced intake, and the foods available in schools are low in nutrients and dense in energy. It is evident that adolescents used the Internet to obtain nutritional information, which they consider credible, as well as they lack knowledge of what types of food include a healthy diet related to what type of activities, in our population it is customary to eat food rich in fat, flours and low in protein fruits and vegetables as mentioned by some other studies [33].

The consumption of food practiced by the adolescents was different from the knowledge they have and they remain healthy, but the consumption of vegetables and fruits, legumes and higher in lipid sugars and carbonated beverages was lower, inferring that there is an association of BMI with behaviors risk eating habits and no coherence was found with the adolescents who reported eating according to their knowledge and its consonance with body image [19,30].

Risk eating behaviors are present in 5.67% of the sample; Exercise stands out as compensatory behavior for binge-eating, 65.54% of the students present normal BMI, however, 80.85% perceived themselves with normal weight, without having it; There is no correlation between BMI and risky eating behaviors, the study specifies that young people do not know BMI and CGC in their normal values [18].

The ENSANUT describes the adult population 75.2% of Mexicans suffer from obesity and 10.3% diabetes [13,33], Clifford, Doherty, Barnett, Muldoon (2006), mention some personal limiting factors in eating behavior such as: physical and psychological reinforcement, perceptions of food and perceptions of contradictory social pressures36. In unhealthy eating behaviors, 62% mention authors who omit some main food, 20% did not eat breakfast and 16% eat their food with a distractor or some simultaneous activity, eat without company, do not eat fruits, milk and the relationship did not show overweight and obesity33. We can infer that the eating practices of adolescents are located from childhood, family

dynamics, as well as school experiences, are the factors that can determine said behavior, among others [10,29].

The findings of overweight-obesity was 42% by BMI, but in CGC it was almost double 78%. Results by ENSANUT reveal that the Mexican population of adolescents 38.4% has a higher consumption of foods with high energy density, and less physical activity, a risk factor for the development of non-communicable chronic diseases, such as diabetes mellitus, arterial hypertension, and cardiovascular diseases [33].

Study in Spain in the population aged 5 to 19 years is overweight and obese 34.1%, determined by analysis of the percentage of body fat through clinical studies, also mention that these discrepancies in BMI and presence of obesity related to eating habits [34].

The normal percentage for young men of fat mass is less than 25% and for young women less than 35%, the relationship BMI-CGC is not uniform for all populations, so it is important to establish in each population to which BMI belongs the definition threshold of obesity in relation to the percentage of fat mass [35,37].

In relation to the percentage of body fat, 75% of adolescents are unaware of this measurement in relation to BMI, it could be in this the key point for risky eating behaviors, which show malnutrition or overweight-obesity due to adiposity due to the choice of the type of food they eat [35-37].

The anthropometric calculation for body mass index and body fat composition, we find that the private high school is, there is a higher percentage in these two measurements (BMI, CGC), in the public high school it showed higher CGC percentages, evidencing women for having higher BMI and CGC, as well as the older the older the increase in overweight and obesity related to other studies, the results were similar [38-40].

Conclusion

The obesity problem has been studied from the perspective of epidemiology for several decades, leaving its prevention in second place, affected by food marketing, it is necessary to incorporate the economic perspective that locates its structural causes, according to the modalities of consumption of foods that make up a hegemonic pattern leading to chronic diseases from an early age. The contribution of the results of this study confirms an association between BMI-CGC and risky eating behaviors, supported by other studies reflected in the literature review.

On the other hand, the use of special scales that measure BMI by electrical bioimpedance has an advantage in identifying the percentiles of fat percentage, among others, and thus being able to adapt a healthy diet, obtain a better diagnosis and people will take their measurements according to the scope of food. Contrasts normal BMI, but in body composition it was almost double, from which we can infer that people who have normal weight are overweight and people who are overweight actually suffer from obesity, determined by analysis of the percentage of body fat through clinical studies.

The findings show a high percentage of adolescents who are concerned about gaining weight and make diets to lose weight,

motivation is a means of research in participation-action to have healthy eating habits, among others.

Exercise of moderate or vigorous intensity that is appropriate for the development phase and consists of various activities that favor them in their physical, mental and social development. Place the Good Food Practice Guides: intra-school hours, nutrition and diet quality workshops, promote the consumption of fruits, vegetables, legumes, whole grains and reduce the intake of fats and sugars, psychological support in groups with the presence of eating behaviors risk to correct eating disorders that persist in the population.

Take into account social programs to promote health and public policies that promote food safety, improvement in the infrastructure of schools, the development of individual skills as a strategy to self-assess their body weight, as well as their foods that they consume with emphasis to healthy eating that promotes good health and reduces the risk of obesity and chronic diseases.

The contribution of this research shows a relationship between diet and the risk of developing overweight-obesity, it is necessary to establish reference standards that serve as a guide to guarantee an adequate nutritional state (pleasure and culture), and that food contributes to health well-being and nutrition. Recommends, to give continuity with other investigations and actions that improve the state of health in nutrition.

References
1. Fondo de las Naciones Unidas para la Infancia (UNICEF). Adolescents, Overview. (consultada 13 de junio 2020). Available from: https://data.unicef.org/topic/adolescents/overview/.
2. INEGI, Población. 2015 (consultada 30 de junio 2020). https://www.inegi.org.mx/temas/estructura/
3. Organización Mundial de la Salud (OMS) (2017) La obesidad entre los niños y los adolescentes se ha multiplicado por 10 en los cuatro últimos decenios.
4. Avitia GC, Portillo Reyes V, Reyes Leal G, Loya Méndez Y (2018) Relación del índice de masa corporal con felicidad, autoestima y depresión en adultos jóvenes. Revista de ciencias sociales y humanidades 27(53)51-63.
5. González V, Nasrallah E (2021) Crecimiento y desarrollo, Capítulo 1. Manual de pediatría. Mc Graw Hill Médica.
6. Demory-Luce D, Motil KJ, Adolescent eating habits. 2021 UpTo Date, Inc.
7. Rössner S (2003) Obesity:The Disease of the Twenty-First Century. Int J Obesity 26(4):S2-4.
8. Suárez-Carmona W, Sánchez-Oliver AJ, González-Jurado JA (2017) Fisiopatología de la obesidad: Perspectiva actual. Rev

chil Nutr 44(3):226-233.

9. lhan N, Peker K, Yıldırım G, Baykut G, Bayraktar M, Yıldırım H (2012) Desarrollo de la conducta alimentaria y sus alteraciones en bajo peso y obesidad en adolescentes: relación de la adiposidad con el índice de masa corporal y la conducta alimentaria. Inicio Ediciones (62)2.

10. Ippolito-Shepherd J, Cerqueira MT (2003) OPS/OMS. Las escuelas promotoras de la salud en las Américas: una iniciativa regional fna/ana 2003; 33.

11. İlhan N, Peker K, Yildirim G, Baykut G, Bayraktar M, Yildirim H (2019) Relationship between healthy lifestyle behaviors and health related quality of life in turkish school-going adolescents. Niger J Clin Pract 22:1742-51.

12. Cruz J, González R, Reyes P, Mayorga L, Nájera O, Ramos N (2019) y Cols. Ingesta alimentaria y composición corporal asociadas a síndrome metabólico en estudiantes universitarios. Rev. Mex. de trastor. Aliment 10(1):42-52.

13. Factores de riesgo para los trastornos de la conducta alimentaria. INEGI. Encuesta Nacional de Salud y Nutrición 2018. ENSANUT. Diseño conceptual. 2019.

14. De Jesús-Reyes D, Menkes-Bancet C y Meza-Palmero JA (2016) Acceso y atención en servicios de salud en adolescentes de escuelas públicas de Nuevo León, México 13(2).

15. Guerrero Montoya LR, León Salazar AR (2010) Estilo de vida y salud. Educere 14(48):13-19.

16. Revista mexicana de trastornos alimentarios versión On-line ISSN 2007-1523

17. National Collaborating Centre for Mental Health (UK) (2004) Eating Disorders: Core Interventions in the Treatment and Management of Anorexia Nervosa, Bulimia Nervosa and Related Eating Disorders. Leicester (UK): British Psychological Society (UK) 9.(2),

18. Díaz MC, Bilbao y Morcelle GM, Unikel C, Muñoz A, Escalante EI, Parra A (2019) Relación entre estatus nutricional, insatisfacción corporal y conductas alimentarias de riesgo en estudiantes de nutrición Rev. Mex. de trastor. Aliment 1.

19. Gutiérrez-Pliego LE, Camarillo-Romero E, Montenegro-Morales, LP Garduño-García JJ (2016) Patrones dietéticos asociados al índice de masa corporal (IMC) y estilo de vida en adolescentes mexicanos. BMC Public Health (16):850.

20. Martín S, Marcos E (2008) La nutrición en el adolescente hábitos saludables. Rev. Farmacia Profesional 22(19):42-48.

21. Porras-Ruiz M, Viloria M, López-Salazar R (2021) Conductas alimentarias de riesgo, IMC y satisfacción corporal en jóvenes estudiantes de nuevo Casas Grandes chihuahua, México 31(58).

22. Kaufer-Horwitz M, Toussaint Gm (2008) Indicadores antropométricos para evaluar sobrepeso y obesidad en pediatría. Bol. Med. Hosp. Infant. Mex 65(6):502-518.

23. de Onis M, Onyango AW, Borghi E, et al. (2007) Desarrollo de una referencia de crecimiento de la OMS para niños y adolescentes en edad escolar. Bull World Health Organ 85:660-667.

24. Porta J, Bescós R (2009) El método antropométrico versus diferentes sistemas BIA para la estimación de la grasa corporal en deportistas. Archivos Medicina del Deporte 2009:(XXVI)131;187-193.

25. Elizondo-Montemayor L, Gutiérrez NG, Moreno Sánchez DM, Monsiváis Rodríguez FV, Martínez Ubaldo N, et al. (2014) Intervención para promover hábitos saludables y reducir obesidad en adolescentes de preparatoria. Estudios sociales (Hermosillo, Son.) 22(43):217-239.

26. Salazar I, Varela MT, Lema LF, Tamayo JA, Duarte C (2010) Evaluación de las conductas de salud en jóvenes universitarios (CEVJU-R) Revista de Salud Pública 12(4)599-611.

27. Unikel C, Bojórquez L, Carreño S (2004) Validación de un cuestionario breve para medir conductas alimentarias de riesgo. (CAR) Rev Salud pública de México 46(6).

28. Patrones de crecimiento infantil de la OMS, 2021.

29. Rodríguez IJ (2016) Valoración de la composición corporal antropometría por bioimpedancia eléctrica. Universidad Francisco de Vitoria, Madrid.

30. Torres F, y Rojas A (2018) Obesidad y salud pública en México: transformación del patrón hegemónico de oferta-demanda de alimentos. Rev. Scielo (49)193.

31. Banna JC, Buchthal OV, Delormier T, Creed-Kanashiro HM, Penny ME (2016) Influencias en la alimentación: un estudio cualitativo de adolescentes de una zona periurbana de Lima, Perú. Salud Pública de BMC 16:40.

32. Delbino C (2013) Conocimientos y actitudes y practicas alimentarias en adolescentes concurrentes al colegio FASTA. Tesis 2013. Mar de Plata Argentina.

33. ENSANUT 2012-2018 https://politica.expansion.mx/mexico/2019/12/09/el-75-2-de-los-mexicanos-padece-obesidad-y-10-3-diabetes-ensanut

34. Norma Oficial Mexicana NOM-043-SSA2-2012, Servicios básicos de salud. Promoción y educación para la salud en materia alimentaria. Consultada. 2020.

35. Clifford S, Doherty G, Barnett J, Muldoon O (2007) Adolescents´views of food and eating: Identifying barriers to healthy eating. J Adolescents 30(3):417-434.

36. Prevalencia de sobrepeso y obesidad en España en el informe "The heavy burden of obesity" (OCDE 2019) y en otras fuentes de datos (12/11/2019)

37. Zhu Q, Huang B, Li Q, Huang L, Shu W, et al. (2019) Percentage Body Fat is As a Good Indicator for Determining Adolescents Who Are Overweight or Obese: A Cross-Sectional Study in Vietnam. J Physiol Anthropol 10(2):108-114.

38. Cabello Garza ML, Ávila Ortiz MN, Garza Montoya BG (2004) La problemática de los grupos vulnerables: Visiones de la realidad. Obesidad: Los problemas de los grupos vulnerables. Ed Nueva Era 73-87.

39. Ramírez R, Escobar GD, Correa JE, González E, Schmidt J (2016) Percentiles de grasa corporal por bioimpedancia eléctrica en niños y adolescentes de Bogotá, Colombia: estudio FUPRECOL. CEMA, Bogotá, Colombia.

40. Golec J, Kmiotek EK, Czechowska D, Szczygieł E, Masłoń A, et al. (2014) Analysis of body Composition among children and adolescents - a cross-sectional study of the Polish population and comparison of body fat measurement methods. J Pediatr Endocrinol Metab 27(7-8):603-609.