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ORIGINAL ARTICLE

Risk Factors for Childhood and Teenage Obesity and Overweight During the COVID-19 Pandemic

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ABSTRACT

Background: *Malnutrition is defined as deficient or unbalanced nutrition resulting from a poor or excessive diet; it is one of the largest contributors to the global burden of disease, with more than one-third of childhood illnesses worldwide attributed to under nutrition, with poverty being one of the main causes.*
Objective: *to assess the correlation between dietary practices, familial eating behaviors, lifestyles, and perceptions of eating habits with a likelihood of overweight and obesity in youngsters and teens throughout the COVID-19 pandemic.*
Method: *In this cross-sectional study, the data of 1081 children and adolescents aged 2 to 18 years for the period between first of May 2021 to the end of April 2022 were reviewd, of these data a convinient sample of 661 was obtained corresponding to those parents who self-reported the weight and height of their children for the assessment of nutritional status.*
Results: *It was found that 37.5% of children were presented with malnutrition due to excess in this study. Lifestyles such as sleeping, the recommended hours according to age and having familiar behaviors healthy decreased by 49.0% and 10.8% respectively with significant differences. Parents' perception of weight gain during the pandemic, the distortion of the nutritional status and the risk to the health of the nutritional status of their children increased 4.8, 8.5, and 3.8 times respectively, the risk of malnutrition due to excess in children and teenagers.*
Conclusion: *the COVID-19 lockdown and the closure of schools could have affected the lifestyles. In addition, the role of parents in the perception of nutritional status and behaviors is fundamental family foods, as they could be a predictor of the risk of overweight and obesity.*

Keywords: ***Eating behaviors, COVID-19 pandemic, childhood and teenage obesity, Perception.***

1. INTRODUCTION

The coronavirus (COVID-19) outbreak has been considered one of the main threats to health, causing a global public health emergency. First reported in December 2019 in China, spreading rapidly. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 as a pandemic (1,2). To prevent the spread of the disease, the health authorities of many countries adopted strict measures, one of the main strategies was national and international confinement (3). The closure of schools, physical distancing and isolation has had a great influence on children and adolescents, impacting their health, mental, physical and emotional development (4). These restrictions of daily activities in children can increase the hours of screens, mainly affect sleep quality and influence sedentary behaviors, increasing the risk of unhealthy food consumption (5). In addition, various studies show that during the lockdown many households consumed more ultra-processed and high-calorie foods than usual (6,7). Added to this, the scarce economic resources, parents overloaded with household chores that are often added to telecommuting, can affect the behavior and dietary patterns of this population, which leads to the search and consumption of ready-made and easily prepared foods, being able to influence the nutritional status or weight changes in children, increasing the risk of overweight and obesity (8). Obesity is one of the most important public health problems in the United States and other countries around the world, which is why it is considered a pandemic. According to the World Health Organization (WHO), the prevalence of obesity has almost tripled since 1975. Currently, 1 in 3 children and adolescents is affected by overweight or obesity in the United States (9-11). Childhood obesity is associated with the development of comorbidities previously considered “adult diseases,” such as high blood pressure, type 2 diabetes mellitus, non-alcoholic fatty liver disease, obstructive sleep apnea, and dyslipidemia, among others. Because of these consequences, obesity should be identified and treated (12,13). Malnutrition due to excess, which includes overweight and obesity, has been increasing worldwide, these findings warrant particular consideration, as childhood obesity is causally linked to the continuation of this condition into adulthood and an increased prevalence of associated comorbidities, including type 2 diabetes mellitus, hypertensive blood pressure, dyslipidemia, cardiac diseases, and a inactive standard of living, among others

(14,15). The following study aims to assess the correlation between dietary practices, familial eating behaviors, lifestyles, and perceptions of eating habits with a likelihood of overweight and obesity in youngsters and teens throughout the COVID-19 pandemic.

2. METHODOLOGY

Study design.

In this cross-sectional study, the data of 1081 children and adolescents aged 2 to 18 years for the period between first of May 2021 to the end of April 2022 were reviewd, of these data a convinient sample of 661 was obtained corresponding to those parents who self-reported the weight and height of their children for the assessment of nutritional status.

The study was conducted using a questionnaire validated by 5 experts from the area of nutrition, this validation consisted in evaluating the wording and understanding of each of the questions asked in the questionnaire, by Likert scale, the questionnaire was validated with 80% excellent response in each of the items.

The questionnaire consisted of 5 sections, including a general description of the purpose of the study and the informed consent to participate, socio-demographic data; self-report of weight and height; food intake patterns; activity data physics, sleep, and screen time; and perceptual data of the nutritional status of the parents and/or caregivers. The questionnaire was designed to be answered between 10 and 15 minutes.

Informed consent was obtained on the first page of the survey. anthropometric measurements were carried by the researchers. Z-score of the Index was calculated of Body Mass (BMI) by age, for children over 5 years, Weight/Height z-score in children from 2 years to 5 years and z-score for Height/Age of all children and adolescents.

Perception of parents among the dietary status of their children. The perception was assessed of the parents about the nutritional status of their children through a questionnaire, through the question what did you think was the nutritional status of your child: underweight, normal, overweight or obese?

In Addition, asked himself if believed that the current nutritional status of her son was putting his health at risk. Instrument. A questionnaire was designed to evaluate eating habits.

Educational level of the parents: basic/secondary, university or postgraduate degree; sex of the child or adolescent: female and male; number of members of the family group: from 2 members to ≥ 6 members; age group of children: preschool (2-5 years), school (6-10 years) and adolescents (11-18 years).

For eating habits was considered the frequency of consumption of the different groups of food (fruits, vegetables, fish, legumes, dairy, liquids, salty and sweet snacks, fast food, water and processed meats), have breakfast, number of daily meals, types of snacks and eating during the night. For family eating behaviors are considered: meal preparation, participation in the preparation of meals, looking at screens during food and check the warning seals. Every question it was thoroughly categorized and analyzed as to the implementation of the national recommendations and international lifestyle. Compliance is defined for each of the following 13 questions:

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. All participants in the study a signed informed consent at the beginning of the study before answer the inquiry form.

Statistical analysis

The qualitative variables are presented by absolute and relative frequency, while the quantitative ones were expressed as mean and standard deviation. By means of univariate regressions unconditioned logistics was analyzed the risk of malnutrition due to excess associated with the main variables studied. Subsequently, it was carried out a multifactorial logistic regression analysis with the procedure backwards, considering as a criterion of inclusion a probability of 0.05 and of elimination of 0.1. The proposed model allowed to predict the effect set of exposure to such factors, the size of which it was determined by calculating Odds Ratios (OR). Additionally, the goodness of fit of the regression model. All analyses were performed using the SPSS 25.0 software considering a p value of 0.05.

3. RESULTS

A total of 661 responses were obtained from children and teenagers. The average age was 9.7 years, teenagers predominating (42.8%), and the normal nutritional status (52.2%). It should be noted that the high proportion of children and adolescents with overweight and obesity, which accounted for 37.5% of over nutrition, (Tables 1 & 2).

In (Table 3), the eating habits are shown, familial dietary practices, habits, and perceptions concerning the nutritional health of their offspring. It observed that 73.8% performed less than an hour a day of physical activity, 46.7% spent more than 4 hours in front the screen, 40.0% of the parents had a distortion in the perception of the nutritional status of their children (12,4% overestimated and 27.6% underestimated) and 40.2% believe that their children's weight has increased, while only the 20.7% believe that their child's nutritional status may be a risk to your health. The risk of over nutrition according to the socio-demographic variables, eating habits, dietary behavior of family, lifestyles and the perception of parents and/or caregivers of the nutritional status of their children/ as, using univariate and multivariates logistic regression models and are presented in (Table 4 and Table 5), respectively. First of all, it can be observed for the lifestyles, the risk of over nutrition of sleeping children more than 6 hours was 49.0%, lower than the children who they sleep less than 6 hours (OR= 0.510, p= <0.001). Have healthy family eating behaviors decreased by 10.8% the risk ME compared to those who had unhealthy family behaviors (OR= 0.892, p= 0.01). In (Table 5), the results of multivariate analysis were shown, it can be observed that, for each year completed by the children the additional risk of overweight and obesity decreased by 5% (OR= 0.955, p = 0.01). Perception of the child parents about the body weight increase of children's during the pandemic increased by 4.8 times the risk of over nutrition with significant difference, compared with those who had no variation in weight. The distorted perception of the nutritional status of their children and not perceiving the health risk that can cause the nutritional status of their children increased significantly by 8.5 times and 3.8 times the risk of over nutrition respectively, compared to those who do not presented a distortion of the nutritional status and that no they think it's a health risk.

Table 1. Sociodemographic characteristics and nutritional status of children and adolescents (N= 661).

Variable		No.	%
Age group	Preschool	192	29.1
	School	186	28.1
	Adolescent	283	42.8
Gender	Male	317	48.0
	Female	344	52.0
Nutritional status	Malnutrition	11	1.7
	Risk of malnutrition	57	8.6
	Normal	345	52.2
	Overweight	161	24.4
	Obesity	75	11.3
	Severe Obesity	12	1.8
Total		661	100.0

Table 2. Mean values, standard deviation (SD) and 95% confidence interval of scale variables of the studied group (N= 661)

Variable	Mean	SD	95% CI of the mean
Age (years)	9.7	4.8	9.3 - 10.1
Weight (kg)	37.9	18.9	36.5 - 39.4
Height (cm)	135.8	27.2	133.7 - 137.9
BMI (kg/m²)	20.6	3.8	20.3 - 20.9

Kg: kilograms; cm: centimeters. SD: standard deviation. CI: confidence interval

Table 3. Eating habits and perception.

Variables	No.	%
Healthy eating habits	188	28.4
Healthy family eating behaviors	633	95.8
Screen hours (more than 4 hours per day)	309	46.7
Hours of physical activity (less than 1 hour per day)	488	73.8
Hours of sleep (less than 6 hours a day)	16	2.4
Your child's perception of weight gain in pandemic	266	40.2
Distorted perception parents and caregivers about the nutritional status of their children	264	40.0
Parents' assessment of the health risks associated with their children's dietary status	137	20.7

Table 4. Results of Logistic regression, univariates analysis for the Risk of overweight and obesity in relation to sociodemographic and eating variables.

Variables	β	P	OR	95% CI
Adult age	-0.018	0.09	0.982	0.962-1.003
Number of family members	-0.029	0.76	0.972	0.808-1.169
Educational level of parents	0.029	0.67	1.029	0.901-1.176
Gender of the child (male)	0.312	0.05	1.366	0.996-1.874
Child's age	-0.041	0.01	0.960	0.928-0.993
Hours of screens per day (more than 4 hours per day)	0.054	0.73	1.055	0.770-1.446
Hours of physical activity (less than one hour per day)	-0.321	0.05	0.726	0.525-1.003
Sleeping hours (less than 6 hours a day)	-0.673	<0.001	0.510	0.359-0.725
Your child's perception of weight gain in pandemic	1,571	<0.001	4.812	3.430-6.750
Distorted parent and caregiver perception of status	2.001	<0.001	7.396	5.195-10.430
nutrition of their children Parents' and caregivers' perception of the state's health risk	1.573	<0.001	4.823	3.224-7.214
nutrition of their children Healthy eating habits	-0.032	0.05	0.968	0.938-1.000
Healthy family eating behavior	-0.115	0.01	0.892	0.816-0.975

β = Beta coefficient; OR= odds ratio; CI= confidence interval. Univariate logistic regression (p>0.05).

Table 5. Results of Logistic regression Multivariate analysis for the risk of overweight and obesity. In relation to sociodemographic factors and parents' perception of the nutritional status of their children

Variable	β	P	OR	95% CI
Age of the child	-0.055	0.01	0.946	0.906-0.988
Perception of weight gain of your child in pandemic	1.578	<0.001	4.846	3.188-7.366
Perception parents distorted about the nutritional status of their children	2.149	<0.001	8.580	5.678-12.964
Parents' assessment of the health risks associated with their children's dietary status	1.342	<0.001	3.826	2.332-6.276

4. DISCUSSION

The prevalence of obesity among children and adolescents has escalated quickly on a global scale. The epidemic of obesity in this group has become a significant public health issue in developed nations, mostly due to its health repercussions in adulthood, including chronic diseases (diabetes mellitus type 2, arterial hypertension, and CVD). It was possible to observe a high prevalence of overweight and obesity in our findings (37.5%), such prevalence is lower compared to the last overweight update and obesity in Iraq, which corresponds to 58.3%14. This can be explained by the high percentage of parent with university, undergraduate and postgraduate educational level, which is directly related to the socio-economic level and the latter with lower prevalence of overweight and obesity (16). This is how a study observed a lower prevalence of obesity in girls of medium-high socioeconomic status in all age groups compared to low socioeconomic state, similar to what was observed in our research. While a difference between intake and physical activity is one of the main causes of over nutrition, the factors the environment and the environment are a risk to the development of over nutrition in children and adolescents (17, 18). Given that interactions between parents and children can affect the behavior of children and the home environment, together with dietary choices and physical activity levels, plays a pivotal influence in childhood obesity (19). Therefore, an obesogenic environment is a major contributor to overeating and a sedentary lifestyle in children, since they have less autonomy during this phase of development and they are influenced by familiar environmental signals (20). Our findings showed that having behaviors healthy eating decreased the risk by 10.8% of overweight and obesity in children and adolescents, in in the same vein, a study showed that living with mothers overweight and a single-parent household was associated to childhood obesity (21). Another study conducted, in which food habits, behavior and HOMA-IR profile of obese children whose mothers attended regular nutritional consultation, it was observed that the intervention education for mothers improved eating habits in the home and the HOMA-IR levels of the children, which can be considered as an additional management in obesity infantile (22). Therefore, the obesogenic environment at home may be a risk factor for over nutrition, as has been it showed in our results. On the other hand, globally the COVID-19 outbreak it has compelled many countries to develop strong social distancing measures and hygienic regimes. The people were

locked up and working remotely, educating children at home and confronting obstacles for quarantine linked to dietary habits, time to sleep, physical inactivity and stress. In Addition, several studies have shown that the quarantine by COVID-19 caused breaches of eating habits healthy, promoting obesogenic eating habits and negatives (23,24). As evidenced in our study that only 28.4% of children and adolescents were in compliance with healthy eating habits and a 73.8% was doing less than an hour of physical activity a day. In Addition, Pujia R, et al. (25) observed that 59.7% of the children reported a body weight gain, with teenagers being the ones who they gained more weight. These could be reflected with parents' perception of the weight variation of their children found in our study, where it was observed that this perception of weight variation may increase 3.2 times the risk of overweight and obesity of children and teenagers during the pandemic. We have shown that the risk of over nutrition decreased 49% by meeting the appropriate hours of sleep. Studies conducted during the COVID-19 pandemic have observed a delay in bedtime, disorders of sleep and inadequate sleep hours in children and adolescents (25,26). Bonanno et al. pointed out that the duration and the quality of sleep may present a risk factor of overweight and obesity in adults and children. Therefore, it it requires enough sleep to maintain a normal weight. Children who sleep less have an increase in risk of obesity and overweight with eating behaviors dysfunctional, decreased physical activity, and changes metabolic (27). During the confinement, the delay in bedtime hours, as well as the hours of inadequate sleep, could be due, in part, to a greater exposure to screens, as the night-time exposure in bright light suppresses the production of melatonin (26). Our study showed that failure to comply with the recommendation of physical activity is not a factor a risk to me. This is consistent with a study who observed that the importance attached by the parents their children's physical activity is low and they have under knowledge of the subject, and by associating the variable BMI and no significant differences were found in physical activity (28). Finally, it was evidenced in our study that a 40.2% of parents and caregivers have a perception distorted about the dietary status of the child, in addition that such distortion of perception increased 8.5 times the risk of me. A study conducted by Pedroso et al. on perception with the use of silhouette scale, revealed that more than quarter of child moms misjudged the food status of their kids, whereas less than half of them know about it (29). The evidence on the awareness of the

dietary status of children and adolescents throughout the pandemic is infrequent. Our results obtained on the perception parents about the nutritional status of their children and the risk of over nutrition, are similar to those obtained in the study performed by Chavez et al. where it was noted that the parents' perception of the nutritional status of their children presented an OR= 2.1, p= 0.002 for obesity and a OR=4.42, p=<0.0001 for overweight, concluding that such underestimation on the part of parents can be a factor of significant risk to the development of over nutrition in their children (30).

Strengths and Limitations.

Within the main strengths highlights the lack of evidence on the factors of overweight and obesity risk associated with the changes occurred during the COVID-19 lockdown and the impact that the pandemic has had on children and adolescents. The present study also has some limitations. Convenience sampling should be considered, which was not representative of all children and adolescents of Iraqi people; therefore, the results cannot be extrapolated to the entire population of this age group of the country. The questionnaire was disseminated by the authors themselves; it is possible that there will be a selection bias of the participants recruited and socially desirable responses.

5. CONCLUSIONS

This study concluded that there are factors that increase the risk of over nutrition, mainly the weight variation of the children during the pandemic, the distorted perception parents about the nutritional status of their children and the not perceiving the health risk of their nutritional status. However, there are factors that reduce the risk of overweight and obesity, having eating behaviors healthy family members and sleep the hours recommended by age group. The COVID-19 lockdown and the lockdown of the schools could have affected the lifestyles and eating habits in this age group. But in turn, it is the role of parents in habits and behaviors food, as it has a great impact on the quality and amount of food received by their children, being able to be a fundamental factor in the risk of overweight and obesity. Therefore, children and adolescents are groups of high risk, and these results warrant further investigation future to design plans and programs so as to avoid the negative consequences related to overweight and obesity, the result of different obesogenic factors during the COVID-19 restrictions.

Ethical Approval:

All ethical issues were approved by the authors. Data collection and patient's enrollment were in accordance with Declaration of Helsinki of World Medical Association, 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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