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Psychological Impact of Overweight/Obesity among Pediatric Age Group Before and During COVID-19 Lockdown in Saudi Arabia

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Abstract

Objectives: Obesity is a primary public health concern in Saudi Arabia. The COVID-19 pandemic has profoundly affected people's lives, putting considerable pressure on children and adolescents, leading to psychological problems. Therefore, we aimed to assess obesity's psychological and behavioral impact among children and adolescents before and during the COVID-19 lockdown in Jeddah. **Materials and Methods:** A cross-sectional study was conducted in the pediatric endocrine outpatient clinic at King Abdulaziz University Hospital (KAUH). The sample included 360 participants. Data were collected through clinical interviews by telecommunication from April to June 2020. Demographic factors and answers to questions about behavior, feelings, and daily life (pre and during home quarantine) were assessed against the participants' body mass index (BMI) and reported daily life difficulties. The BMI standard deviation was calculated based on the Center of Disease Control and Prevention standards. **Results:** Compared to other groups, a significantly higher percentage of overweight/obese participants reported low self-confidence (22.1%), 61.7% reported that their friends or family rarely bullied or picked on them and 66.4% reported that the people who they lived with rarely made fun of or bullied them due to their weight before home quarantine. **Conclusion:** Children with a higher BMI reported lower self-confidence than their average weight peers before home quarantine. However, a higher BMI did not increase the risk of being bullied by family members and friends. The majority of the participants changed for the worse in every research aspect during quarantine.

Keywords: Children, COVID-19, lockdown, obesity, overweight, psychological impact

Résumé

Objectifs: L'obésité est un problème de santé publique majeur en Arabie Saoudite. La pandémie du COVID-19 a profondément affecté la vie des gens, mettant une pression considérable sur les enfants et les adolescents, et entraînant des problèmes psychologiques. Par conséquent, nous avons cherché à évaluer l'impact psychologique et comportementale de l'obésité chez enfants et adolescents avant et pendant le confinement du COVID-19 à Jeddah. **Matériaux et méthodes:** une étude transversal a été menée dans la clinique externe endocrinienne pédiatrique au l'Hôpital De l'Université Du Roi Abdulaziz. L'échantillon comprenait 360 participants. Les données ont été collectées par des entretiens cliniques par télécommunication d'Avril à Juin 2020. Les Facteurs démographiques, les réponses aux questions sur le comportement, les sentiments et la vie quotidienne (avant et pendant la quarantaine à domicile) ont été évalués par rapport à l'indice de masse corporelle (IMC) des participants et les difficultés rapportées sur la vie quotidienne. L'écart type de l'IMC a été calculé sur la base des normes du Center of Disease Control and Prevention. **Résultats:** comparés à d'autres groupes, un pourcentage significativement plus élevé de participants en surpoids / obèses a déclaré une faible confiance en soi (22,1%), 61,7% ont déclaré qu'ils rarement harcelés par leurs amis ou leur famille et 66,4% ont déclaré que les personnes avec qui ils vivaient se moquaient ou se faisaient rarement harceler en raison de leur poids avant la mise en quarantaine à domicile. **Conclusion:** les enfants ayant un IMC plus élevé ont déclaré une confiance en soi inférieure à leur pairs de poids moyen avant la mise en quarantaine à domicile. Cependant, un IMC

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plus élevé n'augmente pas le risque d'être intimidé par les membres de la famille et les amis. La majorité des participants a changé pour le pire dans tous les aspects de la recherche pendant la quarantaine.

Mots-clés: Enfants, COVID-19, confinement, obésité, surpoids, impact psychologique

INTRODUCTION

Obesity is one of the major public health concerns in Saudi Arabia, and it is continuously increasing.^[1] Overweight and obesity are defined as abnormal or excessive accumulation of fat, potentially affecting health.^[2] In 2016, the World Health Organization (WHO) reported an 18% obesity prevalence rate for children and adolescents aged 5–19 years.^[3] It has been estimated that by 2025 the number of obese or overweight children will increase to 70 million if no preventative measures are put in place.^[4,5] The obesity prevalence in eastern Mediterranean countries has been ranked second in the world, after the Americas.^[6] Moreover, a 2015 study among Saudi children and adolescents indicated that the prevalence rate for being overweight was 13.4% and the prevalence rate for obesity was 18.2%.^[1]

Overweight and obesity substantially correlate with physical and psychological complications.^[1,7] Although not considered a psychiatric condition, obesity may manifest many psychological symptoms, including anxiety, feelings of worthlessness, low self-esteem, aggression, social withdrawal, and depression.^[8] In addition, weight stigma (from peers, educators, or parents) negatively affects academic performance, emotions, or social relationships.^[9,10] One study reported that 58% of obese children were diagnosed with at least one psychological disorder, mostly an anxiety disorder.^[11] Furthermore, a study conducted in the United States found that there is an association between a child being overweight and having emotional/behavioral problems. Children who perceived themselves as being overweight were twice as likely to have emotional or behavioral problems compared to those who did not.^[8] However, Rankin *et al.* reported that despite extensive research over the past decade, it remains unclear whether psychiatric disorders and psychological problems are a cause of childhood obesity, or a consequence thereof.^[12]

In December 2019, the WHO was informed about multiple cases of pneumonia of unknown etiology in Wuhan, China. The Coronavirus Disease 2019 (COVID-19) outbreak (declared a pandemic by the WHO on March 11) was later discovered to be caused by Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2).^[13]

The first COVID-19 case in the Kingdom of Saudi Arabia was identified on March 2, 2020^[14,15] and the Ministry of Health implemented gradual, yet stern measures including school closures (on March 8), social distancing, and home quarantine (which included 10–24 h lockdowns) to control the spread of the disease. In addition, extensive multi-platform campaigns were launched to increase public awareness about COVID-19.^[16] The pandemic has profoundly affected children,

adolescents, and their families, potentially resulting in mental health problems.^[17,18]

Few studies have been conducted to evaluate the effect of the lockdown on children's psychological well-being and behavior. We aimed to study the psychological and behavioral impact of obesity among children and adolescents before and during the COVID-19 lockdown Jeddah, Saudi Arabia.

MATERIALS AND METHODS

Selection and description of participants

The Institutional Review Board (Reference 297-20) of King Abdulaziz University Hospital (KAUH) in Jeddah, and the chairman of the Pediatric Endocrine Department approved this cross-sectional study. Participants ($n = 360$) were boys and girls aged 6–18 years, representing all ethnic groups living in Saudi Arabia, who were patients of the endocrine outpatient clinic of the King Abdulaziz University Hospital (KAUH). Patients with a history of premorbid psychological or behavioral disorders, cognitive disability, syndromes affecting intellectual ability, chronic diseases, and use of medications (including antipsychotics) were excluded from the research.

Due to the COVID-19 pandemic lockdown, we interviewed 360 patients through telecommunication, between April and June 2020. The researchers collected participants' personal data (age, sex, and date of birth) and anthropometric measurements (height and weight). Participants were questioned about any changes that occurred during lockdown in the following variables, compared to before lockdown: (1) feeding patterns (frequency, amount, and quality), (2) screen time, (3) physical activity, (4) psychological well-being (being considerate, thoughtful, anxious, angry, popular, sociable, friendly, attentive, compliant, aggressive, controlling, emotional, self-confident, bullied, belittled, and having phobias), (5) school performance (in relation to weight, online teaching, and the lockdown period), (6) activities (in relation to weight, the lockdown period, sleeping difficulties), and (7) relationship difficulties.

Statistical analysis

SPSS version 21 (Armonk, NY, IBM corp) was used to analyze the data. Moreover, numbers and percentages to express the qualitative data, and the Chi-square test to assess the relationship between body mass index (BMI) categories (A = underweight, B = healthy weight, and C = overweight or obese) and other variables were used. Quantitative data were expressed as M (standard deviation). Furthermore, the Kruskal–Wallis test was applied for nonparametric variables, and the Spearman's test for correlations analysis. Statistical significance was considered with a $P < 0.05$.

RESULTS

Demographic and personal data

This study examined the psychological and behavioral impact of obesity among children and adolescents before and during the COVID-19 lockdown in Saudi Arabia at KAUH, Jeddah. A total of 360 participants (female = 51.4%, male = 48.6%) were interviewed remotely. The prevalence rate was 8.9% ($n = 32$) for underweight, 49.7% ($n = 179$) for average weight, and 41.4% ($n = 149$) for overweight/obese. The mean age was 12.8 (3.7) years, the mean weight was 50.6 (20.75) kg, and the mean BMI was 33.15 (10.6) kg/m².

Eating habits before and during home quarantine

Among the study participants, 60.7% consumed three (2.73 [0.63]) main meals daily before home quarantine. However, 47.2% of participants reported a change in the number of main meals (2.89 [1.4]) during home quarantine. In terms of daily snacks, 2.8% consumed one snack and 42.8% consumed two snacks per day (1.77 [0.83]). However, 56.4% of participants reported a change in the number of snacks consumed daily during home quarantine (2.63 [1.19]). About half (50.8%) of the participants ate fast food once weekly before lockdown, and 53.3% reported a change in the number of times per week they consumed fast food meals during home quarantine (2.04 [1.24]).

The Spearman correlation analysis indicated a significant positive correlation between BMI and the weekly number of snacks and fast food meals before home quarantine, and the number of daily hours spent in front of electronics before and during the home quarantine period ($P < 0.05$).

Daily use of electronics and exercising before and during home quarantine

Results showed that 38.1% of the participants spent 2-4 h daily in front of electronic devices prior to home quarantine, and 66.4% reported an increase in the number of daily hours of screen time during quarantine (7.28 [2.68]). When asked about exercise habits before home quarantine, 35.3% answered “rarely,” 47.8% “sometimes,” and 16.9% exercised daily. In regards to the exercise habits of the participants during quarantine, 55.3% reported a change.

Psychological feelings and behavior before and during home quarantine in relation to weight

Tables 1 and 2 show the participant distribution according to their BMI with regard to psychological questions about their behavior, feelings, and daily life before and during home quarantine. Responses to each of the questions revealed that the majority of participants (82.8%) felt their situations worsened during home quarantine. Nevertheless, compared to other weight groups, a significantly higher percentage of the overweight/obese participants (45.6%) rarely preferred isolation and spending time alone ($P = 0.002$). In addition, the percentage of overweight/obese participants (26.8%) that rated their self-confidence as high was significantly lower than those who were underweight (59.4%) or average weight (53.6%).

Moreover, a higher percentage of obese/overweight (22.1%) participants reported low self-confidence, compared to underweight (9.4%) and average weight (7.3%) respondents. They (namely, the underweight and average weight groups), also reported that friends or family rarely bullied or picked on them (underweight group, 61.7%), and people they live with rarely made fun of or bullied them (average weight group, 66.4%) due to their weight ($P \leq 0.05$).

Difficulties in daily life due to weight

Table 3 describes the daily life difficulties faced by participants due to their weight, and the effect of home quarantine on them. Results showed 90% of participants reported that their weight slightly affected their academic performance before home quarantine. However, compared to other groups, a significantly higher portion of the average weight group (64.8%, $P = 0.008$) reported that their academic performance had been negatively affected by online and distance education during home quarantine.

A significantly high percentage (38.3%) of overweight/obese participants reported that weight slightly affected their activity level before home quarantine ($P = 0.007$). Moreover, the majority of the overweight/obese participants (70.5%) reported that home and physical activity difficulties did not increase during home quarantine.

In addition, among the overweight/obese participants, 63.8% reported difficulties in sleep, studies, personal relationships, and daily life difficulties during home quarantine. Moreover, no significant difference was found between the BMI categories and the other daily life difficulties due to weight change ($P > 0.05$).

DISCUSSION

This study is one of the few studies that investigated the psychological impact of childhood obesity on mental health simultaneously with the impact of COVID-19 on children and adolescents in Saudi Arabia. Our study suggested that the lockdown had an important effect on overweight/obese children and adolescents' emotions and behaviors. Among the overweight/obese participants, 35.6% were physically inactive and 38.3% were slightly active before home quarantine. A recent study highlighted that children avoided exercise due to feelings of discomfort, and they often pondered previous negative experiences that occurred during physical education classes.^[19] Similarly, our results showed that participants' physical inactivity has worsened during lockdown due to home confinement.

In this study, there was a highly significant relationship between self-confidence and weight, a higher percentage of obese than average weight participants reported low self-confidence due to weight. Several studies have found a significant relationship between low self-confidence and increased weight.^[20,21] Our results found that overweight/obese participants (71.1%) reported diminished self-confidence during the lockdown. This

Table 1: Participant distribution according to psychological feelings and behavior before and during home quarantine with relation to body mass index categories

| Parameter | n (%) | A (underweight), n (%) | B (average weight), n (%) | C (overweight/obese), n (%) |
|-------------------------------------------------------------|------------|------------------------|---------------------------|-----------------------------|
| I am nice to other people and I care about their feelings | | | | |
| Rarely | 14 (3.9) | 2 (6.3) | 3 (1.7) | 9 (6) |
| Sometimes | 112 (31.1) | 8 (25) | 60 (33.5) | 44 (29.5) |
| Always | 234 (65) | 22 (68.8) | 116 (64.8) | 96 (64.4) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 63 (17.5) | 6 (18.8) | 31 (17.3) | 26 (17.4) |
| Yes, for the worse | 265 (73.6) | 25 (78.1) | 130 (72.6) | 110 (73.8) |
| No | 32 (8.9) | 1 (3.1) | 18 (10.1) | 13 (8.7) |
| I usually share my belongings with others | | | | |
| Rarely | 39 (10.8) | 6 (18.8) | 15 (8.4) | 18 (12.1) |
| Sometimes | 170 (47.2) | 18 (56.3) | 84 (46.9) | 68 (45.6) |
| Always | 151 (41.9) | 8 (25) | 80 (44.7) | 63 (42.3) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 45 (12.5) | 4 (12.5) | 23 (12.8) | 18 (12.1) |
| Yes, for the worse | 299 (83.1) | 28 (87.5) | 148 (82.7) | 123 (82.6) |
| No | 16 (4.4) | 0 | 8 (4.5) | 8 (5.4) |
| I get very angry and often lose my temper | | | | |
| Rarely | 152 (42.2) | 15 (46.9) | 83 (46.4) | 54 (36.2) |
| Sometimes | 173 (48.1) | 14 (43.8) | 80 (44.7) | 79 (53) |
| Always | 35 (9.7) | 3 (9.4) | 16 (8.9) | 16 (10.7) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 35 (9.7) | 3 (9.4) | 17 (9.5) | 15 (10.1) |
| Yes, for the worse | 252 (70) | 20 (62.5) | 130 (72.6) | 102 (68.5) |
| No | 73 (20.3) | 9 (28.1) | 32 (17.9) | 32 (21.5) |
| I enjoy spending time with myself, and prefer playing alone | | | | |
| Rarely | 168 (46.7) | 24 (75) | 76 (42.5) | 68 (45.6) |
| Sometimes | 136 (37.8) | 8 (25) | 77 (43) | 51 (34.2) |
| Always | 56 (15.6) | 0 | 26 (14.5) | 30 (20.1) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 35 (9.7) | 5 (15.6) | 15 (8.4) | 15 (10.1) |
| Yes, for the worse | 298 (82.8) | 27 (84.4) | 150 (83.8) | 121 (81.2) |
| No | 27 (7.5) | 0 | 14 (7.8) | 13 (8.7) |
| I obey and do what older people ask me to do | | | | |
| Rarely | 18 (5) | 1 (3.1) | 8 (4.5) | 9 (6.0) |
| Sometimes | 147 (40.8) | 13 (40.6) | 70 (39.1) | 64 (43.0) |
| Always | 195 (54.2) | 18 (56.3) | 101 (56.4) | 76 (51.0) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 42 (11.7) | 6 (18.8) | 16 (8.9) | 20 (13.4) |
| Yes, for the worse | 294 (81.7) | 26 (81.3) | 153 (85.5) | 115 (77.2) |
| No | 24 (6.7) | 0 (0.0) | 10 (5.6) | 14 (9.4) |
| I feel anxious and worry a lot | | | | |
| Rarely | 150 (41.7) | 14 (43.8) | 79 (44.1) | 57 (38.3) |
| Sometimes | 175 (48.6) | 16 (50.0) | 86 (48.0) | 73 (49.0) |
| Always | 35 (9.7) | 2 (6.3) | 14 (7.8) | 19 (12.8) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 34 (9.4) | 3 (9.4) | 16 (8.9) | 15 (10.1) |
| Yes, for the worse | 271 (75.3) | 25 (78.1) | 133 (74.3) | 113 (75.8) |
| No | 55 (15.3) | 4 (12.5) | 30 (16.8) | 21 (14.1) |
| I love making new friends, and I have a lot of friends | | | | |
| Not true | 43 (11.9) | 3 (9.4) | 20 (11.2) | 20 (13.4) |

Contd...

Table 1: Contd...

| Parameter | n (%) | A (underweight), n (%) | B (average weight), n (%) | C (overweight/obese), n (%) |
|----------------------------------------------------|------------|------------------------|---------------------------|-----------------------------|
| Somewhat true | 186 (51.7) | 16 (50.0) | 90 (50.3) | 80 (53.7) |
| Certainly true | 131 (36.4) | 13 (40.6) | 69 (38.5) | 49 (32.9) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 28 (7.8) | 3 (9.4) | 15 (8.4) | 10 (6.7) |
| Yes, for the worse | 305 (84.7) | 29 (90.6) | 151 (84.4) | 125 (83.9) |
| No | 27 (7.5) | 0 (0.0) | 13 (7.3) | 14 (9.4) |
| Generally, I'm loved by the people around me | | | | |
| Not true | 3 (0.8) | 0 | 2 (1.1) | 1 (0.7) |
| Somewhat true | 108 (30) | 10 (31.3) | 49 (27.4) | 49 (32.9) |
| Certainly true | 249 (69.2) | 22 (68.8) | 128 (71.5) | 99 (66.4) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 31 (8.6) | 3 (9.4) | 17 (9.5) | 11 (7.4) |
| Yes, for the worse | 323 (89.7) | 29 (90.6) | 158 (88.3) | 136 (91.3) |
| No | 6 (1.7) | 0 | 4 (2.2) | 2 (1.3) |
| When I'm offended, I react by fighting with others | | | | |
| Rarely | 121 (33.6) | 15 (46.9) | 63 (35.2) | 43 (28.9) |
| Sometimes | 176 (48.9) | 12 (37.5) | 91 (50.8) | 73 (49) |
| Always | 63 (17.5) | 5 (15.6) | 25 (14) | 33 (22.1) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 25 (6.9) | 2 (6.3) | 13 (7.3) | 10 (6.7) |
| Yes, for the worse | 303 (84.2) | 28 (87.5) | 152 (84.9) | 123 (82.6) |
| No | 32 (8.9) | 2 (6.3) | 14 (7.8) | 16 (10.7) |

may be due to the increased meal/snack consumption during home quarantine contributing to weight gain and decreased self-confidence. In this regard, a study from the COVID-19 period showed that 22% of participants reported weight gain, stress eating, and snacking during quarantine.^[22]

Contrary to many studies that reported obesity as a predictor of bullying,^[23,24] our results showed that overweight/obese participants were not bullied by their families and friends before the home quarantine; 92 out of 149 (61.7%) answered "rarely" for having been bullied. The majority of overweight/obese participants (66.4%) answered "certainly true" when asked if they felt loved by the people around them. This is a surprisingly positive perspective considering that multiple Chinese and Taiwanese studies have reported that overweight/obese children face hatred, bullying, low self-confidence, and some emotional neglect.^[25,26] This study's finding is interesting, which possibly stemmed from years of educational bullying campaigns. However, bullying worsened for the majority of overweight/obese participants during home quarantine.

Most overweight/obese children love making new friends and having many friends. This finding matched that of a study conducted in the United Kingdom that failed to demonstrate that overweight girls had fewer friends and were less popular.^[27] In contrast, an American study found that obese children and adolescents have difficulties with peer relationships.^[28] In addition, this study found a significant relationship between being overweight/obese and self-isolation before lockdown;

a higher percentage of participants who said that they always prefer spending time alone were overweight/obese. A previous study reported an association between obesity and loneliness, which was related to depressive symptoms, stigmatization, and discrimination.^[29] However, 81.2% of the overweight/obese participants in our study became more self-isolated during quarantine, similar to 82.8% of the total participants that also reported their psychosocial symptoms worsened during the lockdown.

Studies conducted before the COVID-19 pandemic showed that there was a significantly higher anxiety rate in obese/overweight children.^[30] Research conducted during the pandemic has shown that one in three children displayed nervousness when hearing news about the pandemic, and students' anxiety levels increased (due to online teaching) during lockdown.^[31,32] All three BMI groups in this study showed increased anxiousness and developed phobias during lockdown due to coronavirus-related fears, concerns for the health of loved ones, extra precautions, and online studying. Furthermore, one study suggested that increased coronavirus media exposure could heighten fear.^[33]

Depression among youth can stem from increased BMI, considering research, which reported that depression scores were highest among adolescents who had the greatest BMI increase.^[34] In this study, the overweight/obese participants conveyed that they often felt unhappy. Strikingly, most of the overweight/obese participants admitted that their unhappiness increased during quarantine. A Chinese study found that 20%

Table 2: Participant distribution according to psychological feelings and behavior before and during home quarantine with relation to body mass index categories

| Parameter | Total, n (%) | A (underweight), n (%) | B (average weight), n (%) | C (overweight/ obese), n (%) |
|---------------------------------------------------------------------------------------|-----------------|---------------------------|------------------------------|---------------------------------|
| When I deal with others, they must follow my rules | | | | |
| Not true | 114 (31.7) | 10 (31.3) | 61 (34.1) | 43 (28.9) |
| Somewhat true | 214 (59.4) | 17 (53.1) | 103 (57.5) | 94 (63.1) |
| Certainly true | 32 (8.9) | 5 (15.6) | 15 (8.4) | 12 (8.1) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 19 (5.3) | 3 (9.4) | 6 (3.4) | 10 (6.7) |
| Yes, for the worse | 331 (91.9) | 28 (87.5) | 167 (93.3) | 136 (91.3) |
| No | 10 (2.8) | 1 (3.1) | 6 (3.4) | 3 (2.0) |
| I often feel unhappy, or easily tearful | | | | |
| Rarely | 125 (34.7) | 8 (25.0) | 68 (38.0) | 49 (32.9) |
| Sometimes | 165 (45.8) | 17 (53.1) | 80 (44.7) | 68 (45.6) |
| Always | 70 (19.4) | 7 (21.9) | 31 (17.3) | 32 (21.5) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 23 (6.4) | 2 (6.3) | 12 (6.7) | 9 (6.0) |
| Yes, for the worse | 283 (78.6) | 26 (81.3) | 138 (77.1) | 119 (79.9) |
| No | 54 (15.0) | 4 (12.5) | 29 (16.2) | 21 (14.1) |
| When facing new situations, I easily lose my temper | | | | |
| Rarely | 152 (42.2) | 15 (46.9) | 83 (46.4) | 54 (36.2) |
| Sometimes | 173 (48.1) | 14 (43.8) | 80 (44.7) | 79 (53.0) |
| Always | 35 (9.7) | 3 (9.4) | 16 (8.9) | 16 (10.7) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 35 (9.7) | 3 (9.4) | 17 (9.5) | 15 (10.1) |
| Yes, for the worse | 252 (70.0) | 20 (62.5) | 130 (72.6) | 102 (68.5) |
| No | 73 (20.3) | 9 (28.1) | 32 (17.9) | 32 (21.5) |
| How would you rate your self-confidence because of your weight? | | | | |
| High | 155 (43.1) | 19 (59.4) | 96 (53.6) | 40 (26.8) |
| Average | 156 (43.3) | 10 (31.3) | 70 (39.1) | 76 (51.0) |
| Low | 49 (13.6) | 3 (9.4) | 13 (7.3) | 33 (22.1) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 44 (12.2) | 3 (9.4) | 23 (12.8) | 18 (12.1) |
| Yes, for the worse | 274 (76.1) | 28 (87.5) | 140 (78.2) | 106 (71.1) |
| No | 42 (11.7) | 1 (3.1) | 16 (8.9) | 25 (16.8) |
| Do friends and family pick on you or bully you because of your weight? | | | | |
| Rarely | 274 (76.1) | 24 (75.0) | 158 (88.3) | 92 (61.7) |
| Sometimes | 72 (20.0) | 8 (25.0) | 17 (9.5) | 47 (31.5) |
| Always | 14 (3.9) | 0 | 4 (2.2) | 10 (6.7) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 29 (8.1) | 1 (3.1) | 9 (5.0) | 19 (12.8) |
| Yes, for the worse | 324 (90) | 30 (93.8) | 167 (93.3) | 127 (85.2) |
| No | 7 (1.9) | 1 (3.1) | 3 (1.7) | 3 (2.0) |
| My family and the people who I live with make fun of or bully me because of my weight | | | | |
| Rarely | 276 (76.7) | 27 (84.4) | 150 (83.8) | 99 (66.4) |
| Sometimes | 72 (20) | 4 (12.5) | 25 (14.0) | 43 (28.9) |
| Always | 12 (3.3) | 1 (3.1) | 4 (2.2) | 7 (4.7) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 32 (8.9) | 2 (6.3) | 15 (8.4) | 15 (10.1) |
| Yes, for the worse | 315 (87.5) | 30 (93.8) | 156 (87.2) | 129 (86.6) |
| No | 13 (3.6) | 0 | 8 (4.5) | 5 (3.4) |
| I love to help others (such as parents, teachers, other children) | | | | |
| Rarely | 18 (5) | 1 (3.1) | 6 (3.4) | 11 (7.4) |

Contd...

Table 2: Contd...

| Parameter | Total, n (%) | A (underweight), n (%) | B (average weight), n (%) | C (overweight/ obese), n (%) |
|--------------------------------------------------------------------------------------------------------|-----------------|---------------------------|------------------------------|---------------------------------|
| Sometimes | 115 (31.9) | 12 (37.5) | 54 (30.2) | 49 (32.9) |
| Always | 227 (63.1) | 19 (59.4) | 119 (66.5) | 89 (59.7) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 49 (13.6) | 6 (18.8) | 20 (11.2) | 23 (15.4) |
| Yes, for the worse | 303 (84.2) | 26 (81.3) | 153 (85.5) | 124 (83.2) |
| No | 8 (2.2) | 0 | 6 (3.4) | 2 (1.3) |
| I have many fears (phobias) for example, meeting new people, visiting new places or fear of heights | | | | |
| Rarely | 207 (57.5) | 20 (62.5) | 107 (59.8) | 80 (53.7) |
| Sometimes | 120 (33.3) | 9 (28.1) | 57 (31.8) | 54 (36.2) |
| Always | 33 (9.2) | 3 (9.4) | 15 (8.4) | 15 (10.1) |
| Have you changed during lockdown? | | | | |
| Yes, for the better | 26 (7.2) | 2 (6.3) | 15 (8.4) | 9 (6.0) |
| Yes, for the worse | 324 (90) | 30 (93.8) | 159 (88.8) | 135 (90.6) |
| No | 10 (2.8) | 0 | 5 (2.8) | 5 (3.4) |

Table 3: Relationship between participants' weight and difficulties in daily life

| Parameter | n (%) | A (overweight), n (%) | B (average weight), n (%) | C (overweight/ obese), n (%) |
|-------------------------------------------------------------------------------------------------------|------------|--------------------------|------------------------------|---------------------------------|
| Weight affected studying and the concentration level? (before lockdown) | | | | |
| No | 249 (69.3) | 21 (65.6) | 125 (69.8) | 103 (69.1) |
| Slightly | 68 (18.8) | 7 (21.8) | 32 (17.9) | 29 (19.5) |
| Moderately | 31 (8.6) | 2 (6.3) | 17 (9.5) | 12 (8.1) |
| Severely | 12 (3.3) | 2 (6.3) | 5 (2.8) | 5 (3.4) |
| Online and distance education during home quarantine affected study level and academic activity | | | | |
| Yes, worsened | 206 (57.2) | 13 (40.6) | 116 (64.8) | 77 (51.7) |
| No | 154 (42.8) | 19 (59.4) | 63 (35.2) | 72 (48.3) |
| Weight affected home and physical activity before home quarantine | | | | |
| No | 103 (28.6) | 10 (31.3) | 40 (22.3) | 53 (35.6) |
| Slightly | 180 (50) | 15 (46.9) | 108 (60.3) | 57 (38.3) |
| Moderately | 49 (13.6) | 6 (18.8) | 19 (10.6) | 24 (16.1) |
| Severely | 28 (7.8) | 1 (3.1) | 12 (6.7) | 15 (10.1) |
| Home and physical difficulties increased during home quarantine | | | | |
| Yes, worsened | 95 (2.6) | 6 (18.8) | 45 (25.1) | 44 (29.5) |
| No | 265 (73.6) | 26 (81.3) | 134 (74.9) | 105 (70.5) |
| Did you have any sleeping difficulties before home quarantine? | | | | |
| No | 82 (22.8) | 7 (21.9) | 43 (24.0) | 32 (21.5) |
| Slightly | 234 (65) | 21 (65.6) | 113 (63.1) | 100 (67.1) |
| Moderately | 25 (69) | 2 (6.3) | 14 (7.8) | 9 (6.0) |
| Severe | 19 (5.3) | 2 (6.3) | 9 (5.0) | 8 (5.4) |
| Did sleeping difficulties increase during home quarantine? | | | | |
| Yes, worsened | 74 (20.6) | 7 (21.9) | 37 (20.7) | 30 (20.1) |
| No | 286 (79.4) | 25 (78.1) | 142 (79.3) | 119 (79.9) |
| Did you have difficulties in your personal relationships (with family) before the home quarantine? | | | | |
| No | 276 (76.7) | 26 (81.3) | 134 (74.9) | 116 (77.9) |
| Rarely | 56 (15.6) | 4 (12.5) | 29 (16.2) | 23 (15.4) |
| Moderately | 18 (5) | 2 (6.3) | 10 (5.6) | 6 (4.0) |
| Severe | 10 (2.8) | 0 (0.0) | 6 (3.4) | 4 (2.7) |
| Did difficulties in your personal relationships increase during home quarantine? | | | | |
| Yes, worsened | 57 (15.8) | 4 (12.5) | 26 (14.5) | 27 (18.1) |

Contd...

Table 3: Contd...

| Parameter | n (%) | A (overweight), n (%) | B (average weight), n (%) | C (overweight/ obese), n (%) |
|-------------------------------------------------------------------------------------------------------------------------|------------|--------------------------|------------------------------|---------------------------------|
| No | 303 (84.2) | 28 (87.5) | 153 (85.5) | 122 (81.9) |
| How long ago did any of these difficulties (such as studying, physical or home activities, sleep, relationships) start? | | | | |
| Only during home quarantine | 240 (66.7) | 25 (78.1) | 120 (67.0) | 95 (63.8) |
| Less than a month | 22 (6.1) | 0 (0.0) | 17 (9.5) | 5 (3.4) |
| 1-5 months | 27 (7.5) | 2 (6.3) | 15 (8.4) | 10 (6.7) |
| 6-12 months | 10 (2.8) | 0 (0.0) | 6 (3.4) | 4 (2.7) |
| More than a year | 61 (16.9) | 5 (15.6) | 21 (11.7) | 35 (23.5) |
| How long ago did any of these difficulties (such as studying, physical or home activities, sleep, relationships) start? | | | | |
| Only during home quarantine | 240 (66.7) | 25 (78.1) | 120 (67.0) | 95 (63.8) |
| Less than a month | 22 (6.1) | 0 (0.0) | 17 (9.5) | 5 (3.4) |
| 1-5 months | 27 (7.5) | 2 (6.3) | 15 (8.4) | 10 (6.7) |
| 6-12 months | 10 (2.8) | 0 (0.0) | 6 (3.4) | 4 (2.7) |
| More than a year | 61 (16.9) | 5 (15.6) | 21 (11.7) | 35 (23.5) |

of a sample of 1,800 children, regardless of their weight, had depression or anxiety symptoms due to quarantine.^[35]

Similar to a Taiwanese study that reported no relation between weight and anger,^[26] our results showed no significant correlation between weight and anger. Moreover, 70% of the participants reported less anger control during the lockdown. These expected results were compatible with several studies conducted during both the SARS, 2004,^[36] and COVID-19, lockdowns.^[37]

In addition, previous studies indicated that cognitive performance declines with physical inactivity, and increased BMI,^[38,39] perhaps explaining why 19.5% of overweight/obese participants answered that weight “slightly” affected their studying level before quarantine. However, it could also be explained by other individual characteristics (including parental schooling and the home environment), suggesting that being overweight was a predictor but not a causal factor.^[40] Moreover, 206 (57.2%) participants, of which 77 (51.7%) were overweight/obese, answered that their study level and academic activity changed for the worse during online and distance education under home quarantine. This may have been due to many factors, including not having a proper separate studying room for the child/youth that possibly spent less time studying due to many distractions.^[33]

Results further showed that 66.7% of participants reported that their difficulties (sleep, study, personal relationships, and daily life) started during home quarantine. An Italian study revealed similar COVID-19 pandemic-related effects on children's emotions and behaviors, such as increased irritability, intolerance to rules, mood changes, sleep problems, and agitation.^[31]

Limitations

First, this study had a cross-sectional design and clinical interviews were conducted one time to obtain answers about the periods before and during the COVID-19 lockdown.

Furthermore, no preliminary or follow-up interviews were conducted to compare the results. Moreover, the data were based on participant's recall of information and not based on the objective documentation. Second, we studied a small sample size due to telecommunication-interviewing and the consequent inability to reach everyone. Third, the ongoing COVID-19 pandemic affects everyone in many ways, and the clinical interviews were conducted while children/youth were still living at home during quarantine through the peak months. Finally, the data showed that the psychological characteristics for obese children changed during the lockdown. However, we cannot exclude the magnifying impact of social, genetic, and physiological factors on these symptoms.

CONCLUSION

This study revealed that the COVID-19 pandemic, including forced quarantine, had a significant negative effect on the behavior of overweight/obese children and adolescents. The results demonstrated that childhood is a very critical age and thus special care should be given to children.

Recommendations

Considering this study's results, we urge families to decrease their children/adolescents' exposure to the COVID-19-crisis media coverage, since studies have shown that it may increase anxiety. In addition, measures should be taken to increase awareness of the psychological and behavioral difficulties children/adolescents face because of their weight and help them through it. We recommend further research about these behavioral and psychological changes to ascertain whether they persist, intensify, or are temporary.

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Conflicts of interest

There are no conflicts of interest.

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