Research Article

Impact of Covid-19 Lockdown on the Unhealthy Dietary Habits and Physical Activity of Children and Adolescents Living in the Kingdom of Saudi Arabia

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Abstract

Objectives: This study is determining the effect of the COVID-19 lockdown on dietary habits and physical activity among children and adolescents living in the Kingdom of Saudi Arabia (KSA). **Methods:** Cross-sectional descriptive data were collected from April–June 2020 through clinical interview questions *via* telecommunication at a virtual pediatric endocrine clinic. **Results:** More than half (58.4%) had appetite changes. Moreover, 39.4% had difficulty maintaining a healthy, balanced diet during the pandemic, including an increase in the consumption of simple carbohydrates, fried foods, and soft drinks. Those with a higher socio-economic status had increased snack food consumption ($p<0.047$). There was a significant decrease in physical activity among 58.2% of the children/adolescents, 42% did not exercise, and 28.2% exercised <30 minutes per day. Over one-third (35%) had a significant increase (4–8 hours) in screen time. Girls reported more changes to their daily chores than did boys ($p<0.036$). Online learning affected boys' activity levels more so than girls' ($p<0.011$). Conclusion: This study confirmed the negative impact of COVID-19 lockdown on weight, dietary habits among children/adolescents living in the KSA, highlighting possible adverse health outcomes in the future.

Keywords: COVID-19; Activity; Appetite; Diet; Children

Introduction

Owing to the COVID-19 lockdown that began in March 2020, performing simple daily activities is more complicated than it was before. [1] Because of the high transmissibility rate of COVID-19, [2] most of the world was shut down, forcing people to stay at home and limiting social and physical activities. [3] Social distancing and self-quarantine, among other preventive measures, were suggested by the government to help eradicate this global pandemic [4,5]; however, these measures impacted individuals' behavior and mental and social health, [6] especially among children and adolescents. [7]

Evidence suggests children and adolescents are likely to experience higher rates of depression and anxiety following the pandemic compared to the adult population. [8] This will also affect their behavioral habits and psychological and emotional well-being. [9] Individuals' physical activity levels were also reduced during the pandemic, and the amount of time spent on screens/electronic devices increased dramatically. [10] Physical activity plays a vital role in improving individuals' immunity and preventing chronic health diseases such as hypertension, diabetes, and obesity. [11,12] Similarly, consuming a healthy balanced diet full of nutrients promotes individuals' immunity and makes them less susceptible to infections and diseases. [13] Dietary habits were also unfortunately affected by this global pandemic, as homes were more likely to be filled with processed, calorie-dense, comfort foods. [14] Diet, physical activity, and sedentary behavior may all combine in different ways and lead to the development of a greater health issues such as obesity. [15] A number of studies conducted in worldwide suggested the significant impact this pandemic has had on the number of meals, types of food consumed, appetite, and weight changes in children and adolescents. [16-18] Additionally, studies show significant changes in physical activity levels, and increased screen time and sleep time. [19,10]

Although evidence shows that the lifestyles of children and adolescents have been impacted by the COVID-19 pandemic, [20] in the Kingdom of Saudi Arabia (KSA), we still do not know the extent of its impact on children's and adolescents' lives. There are a limited number of studies in the KSA regarding the impact of self-quarantine on the younger population. The KSA started introducing social distancing and preventive measures right before the kingdom confirmed its first case, and these included: cancelling religious, entertainment, and sporting events as well as mass gatherings. We inferred that during the lockdown, the two most significant behavioral aspects altered in children and adolescents between 2-18 years would be their dietary habits and physical activity levels. Since this pandemic is still ongoing, it is our role as healthcare workers to notify the public about how such changes in behavior that can affect children's lives and health. This research will give physicians, parents and

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even policymakers a chance to make better decisions during lockdown for the younger population. This study is aiming to study the effect of the COVID-19 lockdown on dietary habits and physical activity among children and adolescents living in the KSA.

Methodology

Study design, population, and ethical considerations

A cross-sectional descriptive study was conducted at King Abdul-Aziz University Hospital, Jeddah, KSA. Data concerning children/adolescents were collected from parents/adolescents from central, eastern, southern and northwestern regions of the kingdom through virtual endocrine clinics *via* telecommunication from April–June 2020; total study duration is six months.

Inclusion criteria: children and adolescents of 2–18 years of age, both genders and Saudis. Exclusion criteria: Since the research is emphasized on children and youngsters, for this reason; individuals above 18 years were ignored for the research. The sample size selected for the study is 452 participants. The reason behind the selection of 452 participants was based on the presence of time and budget constraint. Another reason behind selecting this sample size was that we wanted to keep our sample size less than 500 individuals to gather data and then analyze it accordingly easily. The participants' data were kept safe in the principal investigator's secured office, ensuring the protection and anonymity of patients' identities and the data were only accessed by the authors, no names or ID numbers were recorded to complete the data collection form. The Research and Ethics Committee from King Abdul-Aziz University Hospital approved this study, and it was conducted following the Helsinki Declaration. Verbal and written consent was obtained from adolescents and their parents prior to starting the clinical interview. Clinical interviews *via* telecommunication were conducted at a virtual pediatric endocrine clinic during the 3 months duration with children above 10 and the parents of those below ten years of age. Data were obtained by the Interviews which were conducted in Arabic and consisted of three parts. The first part included participants' personal information: residency, socio-economic status, gender, age, weight, and height prior to the pandemic. The second part focused on the effect of the COVID-19 pandemic on children and adolescents' dietary habits such as changes in appetite; weight; number of meals; snacks; type of cooking; and the increased consumption of simple carbohydrates, soft drinks, and fast food. The third part included questions concerning physical activity. Parents and adolescents were questioned regarding any physical activity changes such as time spent exercising prior to and during the pandemic; type of exercises; amount of time spent on electronics, television, and social media; sleep changes; and changes in daily chores.

Statistical analysis

The data entry and statistical analyses were performed with SPSS© Statistics version 21 (IBM© Corp.; Armonk, NY, USA); Continuous data were presented as mean ± SD, while categorical data were expressed as frequencies and percentages. To study the association between socio-demographical profile and changes in diet and physical activity, chi-square tests were performed to identify significant changes. P-values <.05 were deemed significant.

Reliability and validity

Reliability and validity of any research is based on understanding the authenticity of the results and analysis being carried by the researcher. However, these two measures played vitally for meeting the core standards related to the results of the study. Individually, reliability refers to explain the consistency of measure whereas validity is used for defining the accuracy of the measure. In this concern, it is believed that suitable reliability and validity tests were included in this research. The reliability and validity of the result obtained from the primary research were tested by conducting Cronbach's alpha test of reliability. This will be helpful in understanding the authenticity of the dataset and outcomes associated with it.

Results

Conbach's alpha test

With the help of reliability statistics, it can be seen that the outcomes associated with the selected dataset are acceptable or not [Table 1]. The value of Cronbach's alpha is interpreted in a way that if the value is greater than 0.7, it represents the outcomes are good. Here the value of Cronbach alpha is 0.738, which indicates that the dataset has high reliability.

Sample characteristics

Participants' socio-demographic characteristics are shown in Table 2. When distributing children according to age, the mean weights for the people within the range of 2 to 6 years were 15.88 kg; for people aged between 7 and 12 years, the average weights were 31.1 kg, and for the participants aged between 13 and 18 years, the average weight was 53.5 kg.

Table 1: Output for reliability test statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.738	0.737	7

Table 2: Participants' demographic characteristics (*N*= 452).

Variable	Category	N	%	Mean	SD
Gender	Male	227	50.2		
	Female	225	49.8		
Age (2-6 years)				4.6	4.15
Weight (kilograms)				15.88	19.1
Age (7-12 years)				9.5	2.15
Weight (kilograms)				31.1	20.11
Age (13-18years)				15.5	3.21
Weight (kilograms)				53.5	15.44
Place of residency	Central region	219	48.5		
	Eastern region	167	36.9		
	South & north western regions	66	14.6		
Economic status	High> 20,000 SR	11	2.4		
	Average 10,000-20,000 SR	264	58.4		
	Low<10,000 SR	177	39.2		

Descriptive data

Physical changes: The physical changes observed during and before covid-19 can be seen with the help of column chart displayed below:

The difference in walking can be seen that 35.2% people walk before covid-19; however, it increases during the Covid-19 to 38.3% [Figure 1].

Dietary habits changes

The change in dietary habits during covid-19 can be checked by using pie chart provided below:

It can be seen that there is 36% increase in simple carbohydrates, 12% increase in fried foods consumption, 25% increase in other dietary habits other than carbohydrates, fried foods, sweetened artificial juices, soft drink and fast food [Figure 2].

Age and Weights

The mean age of the participants selected in the study is 11 years and 7 months, as the mean value is 11.7. However, the age starts from 2 and ends at 18, and hence considered as the minimum and maximum points for the demographic information of the dataset. While the average weight of the participants is 44.65 kilograms.

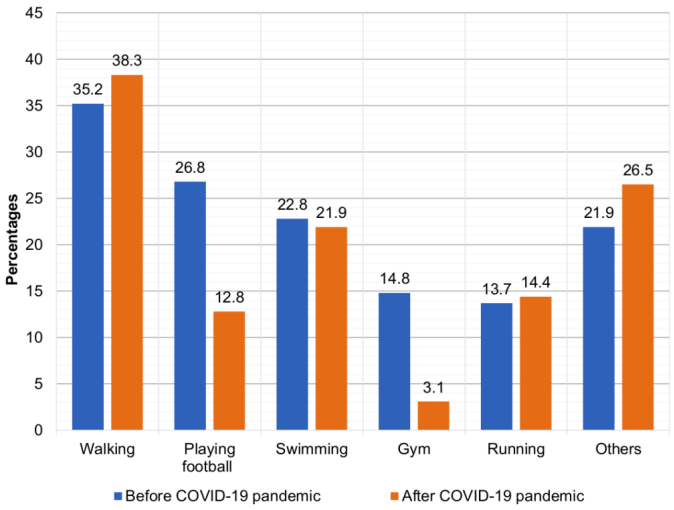

Figure 1: Physical activity changes before and during the COVID-19 pandemic.

Outcome data

Duration of physical activity: The situation of regular physical activity can be assessed from the frequency table displayed in the Table 3. It can be seen that 22% of the people aged less than 13-18 years does not exercise before this outbreak. However, during covid-19 the situation has slightly changed where 19% of them do not exercise. While for the entire age bracket of 2-18 years, 43% does not exercise before covid-19 whereas 42% are those who do not exercise during covid-19. On the other hand, 6% were the adolescents that exercised on daily basis for more than 60 minutes before this outbreak. The situation is almost the same amid the outbreak where 5% of them exercise more than 60 min daily.

Screen Time: There was a significant increase in time spent on electronic devices, social media, and television. Before the pandemic, 15% of people aged 13-18 years spent 2–4 hours daily, 10% spent 1–2 hours daily, 14% 4–8 hours daily, 7% spent more than 8 hours daily, and 2% spent less than 1 hour daily. During the pandemic, the daily duration of time spent on electronics changed as follows: 11% of people aged 13-18 years

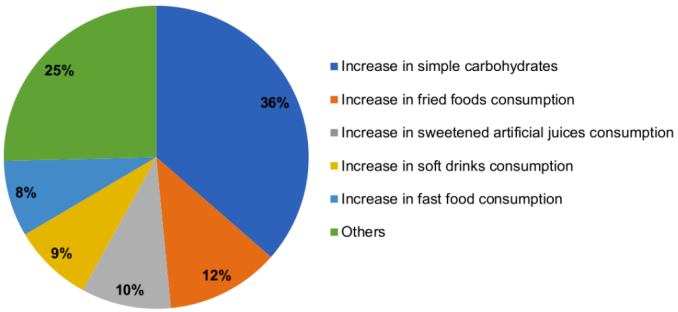

Figure 2: Dietary changes that occurred during the COVID-19 pandemic.

Table 3: Time spent in regular physical activity before and during the COVID-19 according to age groups.

	Time that child/adolescent spend in regular physical activity before the COVID-19			Time that child/adolescent spend in regular physical activity during COVID-19 pandemic		
	2 - 6 years	7 - 12 years	13 - 18 years	2 - 6 years	7 - 12 years	13 - 18 years
Does not exercise	4%	17%	22%	5%	18%	19%
Less than 30 min daily	2%	10%	13%	3%	11%	15%
From 30-60 min daily	5%	10%	9%	4%	9%	12%
More than 60 min daily	2%	2%	2%	2%	2%	1%
Grand Total			**100%**			**100%**

Table 4: Change in child/adolescents' physical activity during the covid-19 pandemic according to age groups.

Change in child/adolescents' physical activity during the covid-19 pandemic?			
	2 - 6 years	7 - 12 years	13 - 18 years
Yes, increased	5%	26%	27%
Yes, Decreased	3%	7%	6%
No Change	5%	7%	13%

Table 5: Duration spent on electronic devices/social medial/TV daily before and during COVID-19 pandemic according to age groups.

	Duration that child/adolescent spends on electronic devices/ social medial/TV daily before COVID-19 pandemic			Duration that the child/adolescent spend on electronic devices/social medial/TV during the covid-19 pandemic?		
	2 - 6 years	7 - 12 years	13 - 18 years	2 - 6 years	7 - 12 years	13 - 18 years
< 1 hour daily	3%	7%	2%	1%	1%	1%
1 - 2 hours daily	6%	13%	10%	2%	4%	4%
2 - 4 hours daily	3%	13%	15%	4%	13%	11%
4 - 8 hours daily	0%	2%	14%	3%	13%	17%
More than 8 hours daily	1%	2%	7%	2%	7%	16%
Grand Total			**100%**			**100%**

Table 6: Hours of sleep child/adolescent used to get before and during COVID-19 pandemic daily according to different age groups.

	Hours of sleep child/adolescent used to get before COVID-19 pandemic daily?			Hours of sleep the child/adolescent gets during the covid-19 pandemic daily?		
	2 - 6 years	7 - 12 years	13 - 18 years	2 - 6 years	7 - 12 years	13 - 18 years
6 hours daily	0%	2%	2%	6%	8%	8%
7 - 8 hours daily	4%	14%	25%	6%	6%	12%
9 - 10 hours daily	8%	22%	18%	6%	18%	15%
More than 10 hours daily	1%	2%	2%	4%	5%	6%
Sum	13%	40%	47%	22%	37%	41%
Grand Total			**100%**			**100%**

spent 2–4 hours daily, 4% spent 1–2 hours daily, 17% 4–8 hours daily, 16% spent more than 8 hours daily, and 1% spent less than 1 hour daily. No significant difference was found between gender nor socio-economic status and screen time [Table 4].

Furthermore, there was a relationship between the child's age and how long they used to spend daily on electronic devices/ social media/TV before the pandemic, with children above 10 years of age spending much more time on electronics than younger children. Refer to Table 5 for changes in screen time across different age groups.

Sleep time: Many children/adolescents reported sleeping 8–10 hours prior to the pandemic 48% and during (39%) the lockdown. Others reported sleeping 6–8 hours prior to (43%) and during (24%) the lockdown or more than 10 hours prior to (5%) and during (15%) the lockdown. Refer to Table 6 for changes in sleep time across different age groups.

Discussion

Since the start of the lockdown in March 2020, [21] several studies reported its impact on the lifestyles of children and adolescents worldwide, and may lead to a lasting impact on physical activity patterns and dietary habits; this current study examined the COVID-19 lockdown period from April-June 2020. [16,17,22,23] It explored the impact of the lockdown on children and adolescents living in the KSA. Major study findings in this study, was weight increment in (41.6%) of the sample, appetite changes in more than half of the sample (58.8%) and decreased physical activity levels in (58.2%).

The results confirmed that almost half the participants reported weight gain during the confinement, which coincides with data collected from a recent Italian survey that reported a weight gain in 46.6% of its sample.16 It is believed that amounts food consumed and level of physical activity is what mainly contributed to this gain in weight. In addition, evidence from a US study that measured weight gain showed that 22% of young participants gained 5–10 pounds, 18 which are comparable to the current results. If their weight continues to increase, the percentage of overweight/obese individuals may show a significant increase by the next year.

Regarding appetite and dietary changes, the reported increase in appetite among the Saudi population was similar to the results found in another study conducted in Europe, which reported an appetite increase in 34.4% of the respondents.16 In contrast to the guidance of the British Dietetic Association, simple carbohydrate consumption increased dramatically during the lockdown. Consistently, several worldwide online surveys noted that food consumption and dietary patterns during confinement were unhealthier. [24] This puts individuals' wellbeing. [25] This is another aspect we should take into consideration to explain our findings; as psychological factors influence behavior. [26] Furthermore, an Italian study revealed an increase in comfort food consumption such as chocolate, ice cream, desserts, and salty snacks during the lockdown; and this increase was attributed to individuals' anxieties and mood.19 Which is most likely contributed to the fact that people are not keeping themselves busy during quarantine and food is one of the first things that they go to whenever boredom strikes.

Concerning the dramatic decrease in physical activity, a prior study found that time spent playing sports decreased by 2.30 hours per week during the pandemic, [27] which is consistent with our results. We believe that lockdown limited children/ adolescents from practicing outdoor activities/hobbies, and physical activity was considered a relief for children to release their energies into something beneficial rather than spending time on something else. Moreover, there was a shift in the

types of physical exercises performed during the pandemic toward walking outdoors and running, and away from team sports. Some children might find it harder to perform any part of physical activity on their own and would rather engage in team activities such as football and swimming classes, which could be another reason we saw a decrease in physical activity. Concerning screen time, several recent studies were consistent with our results—screen time increased dramatically. [28] This was due to the fact that children are connected to video games, electronic devices, TVs more than ever, because they have fewer entertainment choices during quarantine. This is why we recommend parents look for other fun activities that can be carried out during quarantine away from electronic devices. Most participants reported that their sleeping duration did not change; nevertheless, a recent Italian study reported an increase in sleep time by 0.65 hours/day since kids were spending more time at home, in their rooms, and beds with no definitive schedule. [29] This also coincided with a decrease in physical activity levels. In addition, performing daily chores such as gardening, cleaning the house, and washing cars could provide the chance for children/adolescents to burn calories and gain muscle strength, and promote their sense of responsibility from an early age. [30-32] In our study, girls' daily chores changed more as compared to boys; girls generally were more involved in household activities in the KSA, and boys seemed to be less involved in daily chores. This is why we think that males may experience a greater impact during lockdown. Lastly, regarding online learning and its effect on physical activity levels, many individuals agreed that having online classes impacted their physical activity. In fact, in a recent Spanish study, physical education teachers questioned the real purpose and identity of online physical education classes with the limitation of movement and group activities. [32] Although much research already exists on these concepts worldwide, few studies have been carried out in the KSA regarding this matter. The current study indicates the need to raise people's awareness and educate the public on these topics and their consequences more than ever, especially concerning children's and adolescents' health. [33].

Health at risk. The number of meals, snacking, and type of cooking were also associated with participants' dietary habits. Recent evidence from a French study noted that, during the lockdown, people were making unhealthier choices and had trouble keeping a regular mealtime schedule. [26] We believe many factors contributed to these changes; houses are probably full of comfort foods and snacks, and feelings like boredom, anxiety, and mood changes probably contribute to changes in eating habits. One study conducted in the KSA during the quarantine examined the psychological impact of self-quarantine on children; they concluded that quarantine is a difficult psychological experience for children, as it can significantly affect their psychological health and

Limitations

The main limitation of this study was the selection of design and instrumentation. Also, this study was conducted as an interview rather than pencil and paper survey which might have caused social-desirability bias. This study used self-report methods for some children (above 10 years) and parent report for others which introduce the respondent bias. Other limitations include the limited area covered and the small sample size. Additionally, quantitative measures of weight and activity levels were not accurately measured prior to the pandemic. Additionally, we did not use a standardized instrument, due to the fact that the pandemic was still ongoing. For future research we would recommend using a standardized, validated instrument to measure changes in physical activity and dietary habits levels. Additionally, future research should evaluate the psychosocial aspect in children and adolescents along with its impact on dietary habits and physical activity in Saudi children and adolescents.

Conclusion

The COVID-19 pandemic is still ongoing; however, it has negatively impacted the physical activity and dietary habits of children and adolescents in KSA. Thus, more attention should be drawn to children's and adolescents' lifestyles. The increase in weight and reduced physical activity in children and adolescent could be prevented by taking the correct actions like controlling the portions of foods our children have each day and engaging children and adolescents in daily physical activity.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Declaration Statements

This paper is the original work of the authors and not copied, in whole or in part, from any other work. The authors declare that this work has not been previously published or under simultaneous consideration by another journal.

Declarations of Interest

None.

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