

Nutritional and psychosocial behavior during coronavirus disease 2019 pandemic among children and adolescents during the curfew in Saudi Arabia: A cross-sectional study

Inas R. El-Alameey^{a,b}, Nosibh H. Aljohani^a, Fatimah T. Alharbi^a, Ghadi A. Fallatah^a, Ghidaa I. Aldakhil^a, Bothainah L. Alahmadi^a, Razan H. Alqayidi^a

^aDepartment of Clinical Nutrition, College of Applied Medical Sciences, Taibah University, Al Madinah Al Munawara, Saudi Arabia,

^bDepartment of Child Health, Medical Research and Clinical Studies Institute, National Research Centre, Cairo, Egypt

Correspondence to Inas R. El-Alameey PhD, Clinical Nutrition Department, College of Applied Medical Sciences, Taibah University, Al Madinah Al Munawara 12612, Saudi Arabia. Tel: +0020 100 185 8378; 0096 655 241 1033; e-mail: ielalameey@taibahu.edu.sa

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Background/aim

The coronavirus disease 2019 pandemic has forced governments around the world to impose national curfew measures, which in turn have changed the dietary and lifestyle habits and psychosocial health of the world's population, especially children and adolescents. Thus, this study was conducted in an attempt to assess the impact of coronavirus disease 2019 pandemic on the nutritional and psychosocial behavior among children and adolescents during the curfew in Saudi Arabia.

Patients and methods

This cross-sectional analytical observational study was conducted through an online questionnaire using Google Forms with a total sample of 1000 Saudi children and adolescents aged from 8 to 19 years old. Chi-square was used to compare adolescents and children in terms of dietary habits and psychosocial changes. Multivariate logistic regression was used to predict the risk factors for depression, inattention, hyperactivity, and aggression using sociodemographic characteristics.

Results

In this study, a significant association was found between age groups and changes in dietary habits ($P < 0.001$) in children and adolescents during curfew. The frequency of depression ($P < 0.001$), inattention, and hyperactivity ($P < 0.001$) was significantly higher in the adolescents compared with the children, while aggressive behavior was significantly higher in the children ($P = 0.001$) compared with adolescents during curfew.

Conclusion

This study reveals a significant disruption in both dietary habits and psychosocial health that occurred in adolescents and children during the curfew period. The findings underscore the need to develop comprehensive strategies aimed at supporting the nutritional and mental health needs of this group during these unprecedented times.

Keywords:

Adolescents, children, coronavirus disease 2019, curfew, dietary, psychosocial, Saudi Arabia

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Introduction

The coronavirus disease 2019 (COVID-19) disease is a newly discovered infectious pandemic disease caused by the coronavirus [1]. Millions of cases have been recorded around the world related to this disease [2]. The COVID-19 pandemic has had a significant social, physical, and economic impact on families all over the world as it continues to spread [3]. There is a lack of knowledge about the risk factors that can lead to serious illnesses, and no specific treatment exists to prevent or cure the disease. As a result, CDC recommendations have emphasized maintaining good hygiene, social distancing, and only leaving the house, when necessary, in order to avoid contracting the virus [4].

In April 2020, nearly half of the world's population went into lockdown as their governments requested, they stay home in more than 90 countries or regions to

reduce the spread of the disease [5]. The Kingdom of Saudi Arabia has suspended all schools and universities, and work has become remote, except for emergency services, in accordance with international activities and to combat the spread of COVID-19 [6].

The COVID-19 pandemic and the Kingdom of Saudi Arabia's measures to stem its spread resulted in increased stress induced by the disruption of daily routines, as well as fear and anxiety about the disease's spread and its implications for people's finances, work, families, and personal lives. In comparison with adults, children and adolescents are

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more likely to suffer from negative nutritional and psychosocial consequences because of these curfew measures [7]. The impact on these age groups is determined by several risk factors, including developmental age, current educational status, having special needs, preexisting mental health conditions, being economically underprivileged, and the child or parent being quarantined due to the fear of contracting the virus [8].

Several international studies have been reviewed to produce information about dietary habits and lifestyle behaviors during the COVID-19 pandemic. However, it is important to note that only a limited number of studies were conducted in Saudi Arabia regarding this topic. Sleep disturbances affect children and adolescents, increasing their risk of cardiovascular disease, anxiety, and mood swings [9,10]. Insufficient sleep can affect attention span, emotional health, immune function, and academic performance [11,12]. Children aged 5–17 are recommended to have nine to eleven hours of uninterrupted sleep [13]. Besides, peer relationships, physical activity, and outdoor activities are becoming increasingly important to children and adolescents. Losing these activities leads to decreased physical activity and increased screen time. Furthermore, these variables have a direct impact on sleep duration, quality, and the regularity of sleep patterns [13]. Low sleep rates during curfew are associated with weight gain and the development of unhealthy habits [14].

Exercise is an indispensable component of the physical and mental health development of children and adolescents [3]. Staying at home for long periods during the curfew results in a rise in sedentary behaviors and increased screen time [15]. Obesity, type-2 diabetes, hypertension, and many other noncommunicable diseases are all linked to a lack of physical activity and excessive screen time [16].

The COVID-19 curfew has been associated with adverse mental health consequences for children and adolescents [7]. The stress they face due to the curfew affects their psychological health, educational performance, and developmental achievement [15]. More than 91% of the world's student population has been negatively impacted due to closing schools and activities [16]. Studies show that children exhibit more restlessness, sleep nightmares, less attention, and significant separation problems [17–19].

Adequate nutrition is thought to be a factor in good health, particularly in childhood and adolescence [19].

It is essential to acquire healthy eating behaviors in the stage of transition from childhood to adulthood because they concomitantly influence current health status [20]. The World Health Organization (WHO) has published that following a healthy diet during the period of isolation can help in the prevention and treatment of COVID-19 disease [21].

By the end of March 2020, more than 150 million children and adolescents around the world had been affected by the curfew [22]. Furthermore, hearing or reading about COVID-19 on social media on a regular basis can cause stress, which can lead to overeating and 'food cravings' [3]. Cravings for carbohydrates can reduce stress by secreting serotonin, which has a positive effect on mood [23]. However, there is a proportional relationship between food craving and glycemic index, which is linked to an increased risk of developing cardiovascular disease and being overweight [24,25].

The purpose of this study is to investigate the changes in nutritional and psychosocial behavior that occur in children and adolescents before and during the curfew period, Saudi Arabia, as well as to determine the effect of the COVID-19 curfew on the dietary habits, psychosocial behavior, and lifestyle behavior of children and adolescents. Also, the possible negative effect of the COVID-19 pandemic on these vulnerable age groups helps establish a base on which protective measures can be initiated to prevent this negative effect. Moreover, the study will raise awareness among parents about this effect.

Patients and methods

Patients and study design

This cross-sectional analytical observational study was conducted among Saudi children and adolescents aged from 8 to 19 years old to observe the changes in dietary patterns, eating behavior, physical activity, and psychosocial problems. The recruitment of subjects started on October 16th, 2020, and ended on January 17th, 2021, via an online survey created by the Google Forms web survey platform. The online survey was shared through social media (WhatsApp, Twitter, Telegram, etc.). Additionally, the participants who filled out the survey were asked to share the survey link to increase the number of study participants (snowball technique).

After filtering the participants using the exclusion criteria, all children and adolescents who met the inclusion criteria were enrolled. The inclusion

criteria comprise Saudi children and adolescents aged 8–19 years old, while the exclusion criteria include participants suffering from diseases.

Ethical approval

Ethical approval for this study was obtained from the Ethical Committee of the College of Applied Medical Sciences at Taibah University, Al-Madinah Al-Munawara, Saudi Arabia, with approval number 2020/59/206 CLN. The digital consent form was obtained before the start of data collection.

Sample size

The targeted sample size for this study was 1067 participants, as estimated by Epi Info (Epi Info, CDC, Atlanta), with a 95% confidence level, 50% expected changes in food intake, and a 3% margin of error [25]. A total of 1043 participants were recruited from various regions in Saudi Arabia. However, only 1000 children and adolescents were valid. People who suffer from diseases ($n=26$, 2.5%) and people with missing data ($n=17$, 1.6%) were excluded from the final analysis.

Data collection instrument (questionnaire)

Before the start of the questionnaire, the participants were given a brief description of the study and its aim. The questionnaire consisted of 20 questions and was divided into three main sections. It assessed a variety of lifestyle behaviors, such as dietary habits, physical activity, screen time, and sleep patterns, as well as sociodemographic factors and sources of stress during the curfew. All the questions were written in such a way that they could be answered directly in comparison with 'before' or 'during' the curfew period, and they were translated from English into Arabic and back-translated from Arabic into English by two bilingual experts.

The first section was about the sociodemographic characteristics, including participants' age, gender, parental educational level, parental employment status, family income, and the effect of the COVID-19 pandemic on the families' income.

The second section was about the changes in dietary and lifestyle practices before and during the curfew. The questions were adapted to include the main food groups on the healthy food palm of the Saudi Dietary Guidelines (cereals and bread, vegetables, fruits, milk and dairy products, meat, and legumes). Additional food items were included, including salty snacks, sugary drinks, sweets, fast food, and canned food. Moreover, questions about the changes in weight, appetite, and

water consumption, as well as the changes in physical activity, sleep, and screen time hours, were included. The choices given were increased, reduced, or no alterations. The reliability of the adapted questionnaire was tested through a pilot before the survey was administered.

The final section was related to psychosocial behaviors before and during the curfew. The emotional and behavioral problems were assessed using the Pediatric Symptom Checklist-17 [26]. It is a psychosocial screen designed to identify hyperactivity, attention, emotional conduct, relational difficulties with peers, depression, and aggressive behavior. A total score of 15 or higher suggests the presence of significant behavioral or emotional problems. The PSC-17 subscales have obtained a reasonable agreement with validated and accepted instruments for internalizing (depression), externalizing (aggression), hyperactivity, and attention problems.

Statistical analysis

Data analysis was performed using Statistical Package for the Social Sciences, version 28. Frequency and percentages were used to display categorical variables. A χ^2 Chi-square test was used to test for the presence of any associations between categorical variables, which was applied to test the association between the age group and the following (dietary habits, lifestyle aspects, and psychosocial assessment). Multivariate logistic regression was performed to predict the risk factors for depression, inattention, hyperactivity, and aggression using sociodemographic characteristics. The level of significance was set at P valueless than 0.05.

Results

A total of 1000 children and adolescents aged between 8 and 19 years were included in the study. There were 56.1% adolescents and 43.9% children. Most of the participants were female (74.2%) ($n=742$). About 57.3% of mothers had an academic education, while 43.6% of fathers had an academic education. Most of the fathers (75.1%) are employed, while 20.2% of them are unemployed and 4.7% are not alive. About 52.5% of the mothers are unemployed, while 46.6% are employed, and 0.9% are not alive. Most of the 530 families (53%) had a monthly income of more than 10 000 SR. The family's financial situation became worse for 308 (30.8%) of the participants during the curfew in comparison with the time before the curfew period. The sociodemographic profile of the participants and their parents is described in Table 1.

Table 1 Sociodemographic characteristics of one thousand Saudian children and adolescents

Demographical characteristics	N (%)
Sex of the child/adolescents	
Male	258 (25.8)
Female	742 (74.2)
Age group (in y)	
Child (8–12 years)	439 (43.90)
Adolescents (>12–19 years)	561 (56.10)
Education level of fathers	
High school or lower/diploma	428 (42.80)
Academic	436 (43.60)
Postgraduate	123 (12.30)
Other	13 (1.30)
Education level of mothers	
High school or lower/diploma	373 (37.30)
Academic	537 (53.70)
Postgraduate	64 (6.40)
Other	26 (2.60)
Occupation of fathers	
Does not work	202 (20.20)
Work	751 (75.10)
Not alive	47 (4.70)
Occupation of mothers	
Does not work	525 (52.50)
Work	466 (46.60)
Not alive	9 (0.90)
Monthly income of the family (Saudi riyals)	
No income	15 (1.50)
Less than 5000	149 (14.90)
From 5000 to 10 000	306 (30.60)
More than 10 000	530 (53.00)
Family's financial situation	
Not changed	622 (62.20)
Reduced	308 (30.80)
Increased	70 (7.00)

Table 2 demonstrates the comparison of dietary habits among children and adolescents before and during the curfew. Adolescents consumed more carbohydrates ($P = 0.001$), meats ($P = 0.019$), vegetables ($P = 0.001$), fruits ($P = 0.006$), legumes ($P = 0.004$), fast foods ($P = 0.001$), canned foods ($P = 0.001$), and water ($P = 0.001$) than children. On the other hand, children were found to consume more dairy products ($P = 0.001$), salty snacks ($P = 0.006$), and sweet foods ($P = 0.001$) than adolescents.

Table 3 illustrates the association between age groups and changes in lifestyle during the curfew. Sleeping hours in adolescents were significantly higher than those of children (60.1% vs. 46.7%) ($P < 0.001$). Reduced physical activity was observed in adolescents compared with children (61.1% vs. 46.7%) ($P < 0.001$). Weight loss was found to be higher in adolescents than in children (37.3% vs. 23.7%) ($P < 0.001$). About 70.8% of adolescents and

74.3% of children said they spent more time watching TV and using computers, tablets, and mobiles during the curfew than before.

Table 4 displays the association between psychiatric assessment and age groups. The frequency of depression, inattention, and hyperactivity was significantly higher in adolescents compared with children during the curfew ($P < 0.001$). In contrast, aggressive behavior was significantly higher in children ($P < 0.001$) than adolescents. The total PSC score was significantly higher in adolescents than children ($P < 0.001$).

Table 5 shows the multivariate logistic regression models for predicting depression, inattention, hyperactivity, and aggression using sociodemographic factors. Regarding depression, there was significant predictability across age groups ($P < 0.001$). Compared with children, adolescents had a greater chance of developing depression. Significant predictability regarding gender was also seen, with females exhibiting a decreased incidence of depression. As for inattention and hyperactivity, only the age group variable was shown to be a significant risk factor ($P < 0.001$), in which adolescents had a higher risk for inattention and hyperactivity. As for aggression, the variable of age group was also shown to be a significant risk factor, with adolescents having a lower risk for aggression (odds ratio = 0.61).

Discussion

Globally, the ongoing COVID-19 epidemic has had a significant negative influence on people's health. The pandemic may negatively affect mental health, dietary habits, and sleeping habits due to prolonged home confinement, financial worries, daily stressful events, violence, and overuse of social media during this critical period [27].

According to our knowledge, this is the first study to assess the effects of the curfew on dietary, psychosocial, and lifestyle behaviors among children and adolescents in Saudi Arabia during the COVID-19 pandemic. The findings from our study are like those found in a study conducted in Romania, Palestine, Verona, Italy, the North Africa region, and Poland, which assessed factors contributing to weight gain among children and adolescents during the curfew. Furthermore, the study found an increase in the consumption of carbohydrates, salty snacks, energy drinks, and soft drinks, as well as a notable increase in fast-food consumption (45.5%) [26–28]. Many people favor eating sugary and salty foods for snacking due to

Table 2 Comparison of dietary habit changes among children and adolescents during the coronavirus disease 2019 curfew

Variables	Age group [n (%)]		P-value
	Children (N=439)	Adolescents (N=561)	
Changes in carbohydrate consumption			< 0.001*
Not changed	206 (46.9)	196 (34.9)	
Reduced	41 (9.3)	100 (17.8)	
Increased	192 (43.7)	265 (47.2)	
Changes in dairy product consumption			< 0.001*
Not changed	240 (54.7)	274 (48.8)	
Reduced	53 (12.1)	133 (23.7)	
Increased	146 (33.3)	154 (27.5)	
Changes in meats and alternative consumption			0.019*
Not changed	265 (60.4)	289 (51.5)	
Reduced	84 (19.1)	126 (22.5)	
Increased	90 (20.5)	146 (26)	
Changes in salty snack consumption			0.006*
Not changed	120 (27.3)	129 (23)	
Reduced	60 (13.7)	119 (21.2)	
Increased	259 (59)	313 (55.8)	
Changes in vegetable consumption			< 0.001*
Not changed	254 (57.9)	277 (49.4)	
Reduced	116 (26.4)	137 (24.4)	
Increased	69 (15.7)	147 (26.2)	
Changes in fruit consumption			0.006*
Not changed	253 (57.6)	270 (48.1)	
Reduced	91 (20.7)	126 (22.5)	
Increased	95 (21.6)	165 (29.4)	
Changes in legume consumption			0.004*
Not changed	286 (65.1)	317 (56.5)	
Reduced	94 (21.4)	127 (22.6)	
Increased	59 (13.4)	117 (20.9)	
Changes in energy drinks and soft drink consumption			0.123
Not changed	176 (40.1)	190 (33.9)	
Reduced	122 (27.8)	168 (29.9)	
Increased	141 (32.1)	203 (36.2)	
Changes in fast-food consumption			< 0.001*
Not changed	122 (27.8)	181 (32.3)	
Reduced	185 (42.1)	125 (22.3)	
Increased	132 (30.1)	255 (45.5)	
Changes in canned food consumption			< 0.001*
Not changed	239 (54.4)	132 (23.5)	
Reduced	123 (28)	244 (43.5)	
Increased	77 (17.5)	185 (33)	
Changes in sweet food consumption			< 0.001*
Not changed	139 (31.7)	245 (43.7)	
Reduced	100 (22.8)	171 (30.5)	
Increased	200 (45.6)	145 (25.8)	
Changes in water drinking			< 0.001*
Not changed	276 (62.9)	240 (42.8)	
Reduced	65 (14.8)	93 (16.6)	
Increased	98 (22.3)	228 (40.6)	

*Significant at *P* valueless than 0.05, using χ^2 , Chi-square test.

stress induced by the curfew, and this habit may increase the risk of developing obesity. In addition to that, screen time, sleeping hours, and physical activity among children and adolescents were all affected by the curfew [29].

The study revealed a substantial increase in the number of hours spent on screens and a decrease or lack of physical activity in comparison with before the curfew among children and adolescents. A study conducted in Canada explained the fact that children and

Table 3 Comparison of lifestyle changes among children and adolescents during the coronavirus disease 2019 curfew

Lifestyle aspect	Age groups [n (%)]		P value
	Children (N=439)	Adolescents (N=561)	
Change in the number of hours spent on screen			0.228
Not changed	77 (17.5)	100 (17.8)	
Reduced	36 (8.2)	64 (11.4)	
Increased	326 (74.3)	397 (70.8)	
Change in the number of sleeping hours			< 0.001*
Not changed	162 (36.9)	118 (21)	
Reduced	72 (16.4)	106 (18.9)	
Increased	205 (46.7)	337 (60.1)	
Change in physical activity			< 0.001*
Not changed	169 (38.5)	191 (34)	
Reduced	205 (46.7)	343 (61.1)	
Increased	65 (14.8)	27 (4.8)	
Change in body weight			< 0.001*
No	175 (39.9%)	127 (22.6%)	
Reduced	104 (23.7%)	209 (37.3%)	
Increased	160 (36.4%)	225 (40.1%)	

*Significant at *P* value less than 0.05, using χ^2 , Chi-square test.

adolescents attending school lessons, solving homework, and studying online on a smart phone or laptop have a lot of free time during the curfew period, which indicates spending more time on the screen [28].

In our present study, sleeping hours in adolescents were significantly higher than those in children (60.1% vs. 46.7%) ($P < 0.001$). Moore *et al.* 2020 found that children slept for longer hours during the day (including naps) after the COVID-19 pandemic. Similarly, a study conducted on Italian children indicated that the participating children's sleep increased during the curfew by 6 h/day compared with the period before the curfew [14]. Another study conducted on Chinese children and adolescents reported that about 40% had trouble sleeping, staying asleep, or sleeping for a long period of time [30].

Considering the impact of COVID-19 and related consequences, this study revealed a higher rate of depression, the total PSC score, inattention, and hyperactivity in the adolescents' group as compared with children's group ($P < 0.001$) during the curfew. When comparing the results of this study to those of other studies conducted during the COVID-19 pandemic, depression was present in 51.7% of adolescents and 25.3% of children, which was lower than that of Lin *et al.*, 2020, who studied 5641 Chinese individuals of various age groups [21]. Moreover, when the findings were compared with a study conducted in Spain, during the first weeks of COVID-19 curfew, large numbers of young students experienced a moderate score of depression [31]. In our present study, aggressive behavior was significantly higher in children's group ($P = 0.001$) compared with the adolescents, which is consistent with an Egyptian

Table 4 Comparison of psychosocial assessment among children and adolescents during the coronavirus disease 2019 curfew

Psychosocial assessment	Age group [n (%)]		P value
	Children (N=439)	Adolescents (N=561)	
Depression			< 0.001*
Negative	328 (74.7)	271 (48.3)	
Positive	111 (25.3)	290 (51.7)	
Inattention and hyperactivity			< 0.001*
Negative	377 (85.9)	353 (62.9)	
Positive	62 (14.1)	208 (37.1)	
Aggression			0.001*
Negative	309 (70.4)	444 (79.1)	
Positive	130 (29.6)	117 (20.9)	
Total psychiatry assessment			< 0.001*
Normal	285 (52.9)	254 (47.1)	
Abnormal	154 (33.4)	307 (66.6)	

*Significant at *P* value less than 0.05, using χ^2 , Chi-square test.

Table 5 Multivariate logistic regression (predicting the risk factors for depression, inattention, and aggression using sociodemographic factors)

Factor	<i>P</i> value	Odds ratio		95% Confidence interval
Multivariate regression model predicting depression				
Age group (adolescent vs. child)	< 0.001*	3.70	2.73	5.01
Sex (female vs. male)	0.042*	0.71	0.51	0.99
Multivariate regression model predicting inattention and hyperactivity				
Age group (adolescent vs. child)	< 0.001*	3.24	2.30	4.58
Multivariate regression model predicting aggression				
Age group (adolescent vs. child)	0.003*	0.61	0.45	0.85

*Significant at *P* value less than 0.05.

study conducted by Alamrawy *et al.* [32], who reported that children have a higher rate of aggression than adolescents.

Culture plays a role in the differences in the frequency of disorders between different age groups. Sociodemographic factors may play a part in how stress is expressed [33,34]. In our study, a multivariate logistic regression model was used to predict depression. It was shown that the adolescent and male genders had significant predictability for depression during the curfew. This result was inconsistent with Fiorenzato *et al.* [35], who stated that depression during COVID-19 curfew is more prevalent in females than males. Furthermore, she stated that females experienced a greater change in appetite, eating behaviors, more pronounced hypochondria, and anxiety compared with males during the curfew, whereas changes in sleeping patterns were equally affected in both genders [35]. However, in Saudi Arabia, males are at a higher risk for depression during the curfew. This can be explained by the fact that males in Saudi Arabia had more freedom before the curfew, and they did not experience staying at home for a long time before or working from home.

Conclusion and future direction

Sudden lifestyle changes, dietary changes, and psychiatric morbidity are evident in adolescents and children during the COVID-19 pandemic. This study reveals a significant disruption in both dietary habits and psychosocial health that occurred in adolescents and children during the curfew period. The findings underscore the need to develop comprehensive strategies aimed at supporting the nutritional and mental health needs of this group during these unprecedented times. Implementing targeted interventions and strengthening flexible support systems becomes essential to mitigate the negative impacts experienced during periods of societal restrictions.

Recommendations

There is a significant need to raise awareness about healthy eating habits, the importance of home physical activity, and positive coping mechanisms to reduce the negative impact by promoting nutritional and physical activity programs in children's and adolescents' daily routines during the curfew. Finally, provisional and reliable nutrition information, as well as psychological support, is critical during the curfew period. Governments, health professionals, social media influencers, schools, and parents must all be aware of the COVID-19 curfew's implications.

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Conflicts of interest

There are no conflicts of interest.

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