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Changes in Lifestyle Behaviors of Children and Adolescents during the COVID-19 Pandemic and the Impact on the Development of Non-Communicable Diseases: A Narrative Review

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Abstract

Background: Quarantine restrictions have changed the usual lifestyle habits of children and adolescents. In this review, we summarize how the COVID-19 outbreak changed lifestyle during childhood and discuss potential short- and long-term effects of NCD high-risk behaviors on health outcomes.

Methods: literature search was conducted in Medline database (PubMed), Scopus, Embase, Web of Science, and Google Scholar. All studies that assessed the relationship between COVID-19 outbreak and lifestyle changes were included.

Results: NCD risk factors such as unhealthy diet, physical inactivity, prolonged screen time and sedentary behavior, disrupted sleep schedules and sleep quality, as well as mental disorders during COVID19 in childhood, may increase the susceptibility to NCDs in adulthood. These changes in lifestyle behaviors have short and long-term cardio-metabolic and psychological health outcomes. Since it is not clear when COVID-19 is completely controlled, assessment of the interactions between COVID-19 and lifestyle activities in the pediatric age group is critical.

Conclusion: The pandemic of coronavirus disease 2019 (COVID-19) has greatly influenced all levels of health systems. During the COVID-19 pandemic, prevention and management of non-communicable diseases (NCDs) will need to be prioritized even further.

Keywords: COVID-19, Lockdown, Lifestyle Changes, Non-communicable Diseases, Children, Adolescents

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Introduction

The ongoing coronavirus disease 2019 (COVID-19) pandemic that has now spread to almost all countries is one of the most important health, economic, and social crises. The COVID-19 pandemic, physical and social distancing, and quarantine all lead to changes the lifestyle and may increase exposure risk factors for non-communicable diseases (NCDs), including inactivity, unhealthy nutrition, and mental health crises such as anxiety, depression, and chronic stress. An unhealthy lifestyle leads to weight gain and enhances the incidence of NCDs and related mortality (1).

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↑What is "already known" in this topic:
The adverse effects of COVID-19 are not limited to the related infectious disease. Because of quarantine restrictions, COVID19 can affect lifestyle of children and adolescent.

→What this article adds:
Unhealthy diet, physical inactivity, prolonged screen time and sedentary behavior, disrupted sleep schedules and sleep quality, as well as mental disorders during COVID19 in childhood, may increase the susceptibility to NCDs in adulthood.

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Children and adolescents are at risk for short-term and long-term NCDs, and preventive strategies should be investigated more in pediatric age groups. Promoting healthy behaviors and lowering NCD risk factors are critical strategies for containing the worsening surges of NCDs associated with the COVID-19 pandemic (2).

Healthy lifestyles increase the immune system, decrease the risk of respiratory infections and inflammation, and are effective in the prevention of NCDs, which indeed increase the risk of becoming severely ill from COVID-19. (3).

This review highlights the recent evidence on the short-term and long-term effects of lifestyle changes, including unhealthy diet, low physical activity and higher screen time, insufficient sleep, and mental disorders during the COVID-19 pandemic on NCDs in children and adolescents. We discussed lifestyle changes during social distancing and quarantine with a focus on current trends, important challenges, and future perspectives.

Review of the literature

The effect of COVID-19 on psychiatric distress in children and adolescents

Before the COVID-19 pandemic, the international prevalence of child and adolescent mental disorders was 13.4%, which is the shadow pandemic growing amidst the COVID-19 crisis (4). A large-scale study conducted on 8079 adolescents (12-18 years) reported that the prevalence of depressive and anxiety symptoms was 43.7% and 37.4%, respectively, during COVID-19 (5). A study in the United States reported that 40.1% of parents observed signs of distress in their children (6). Depression and anxiety are among the most common mental disorders, with significant dysfunction and the risk of suicide in children and adolescents. Children and adolescents are the most vulnerable to lifestyle changes. Hence, their mental health during and after the pandemic needs special consideration. As a result of COVID-19, children and adolescents experience unprecedented interruptions to their daily lives that may lead to mental illness, including anxiety, depression, and/or stress-related symptoms (7, 8)

At an individual level, children and adolescents have suddenly lost a lot of routine activities, including school, extracurricular activities, social interactions, and physical activity (9). These losses may exacerbate depressive symptoms, specific types of anxiety, social withdrawal, and hopelessness. Home confinement of children and adolescents is associated with their mental health. Parents should manage their education and activities and decrease the stresses on their children while the family is confronting economic, emotional, and social problems (8). The long-term outcomes of anxiety and mood disorders in children and adolescents need more investigation. Adolescents may experience disappointment while encountering stressful life events. Worsening school performance, increased agitation, aggression, and disappointing feeling may occur during quarantine (10).

Psychiatric disorders among adolescents without any appropriate psychological interventions often lead to mental problems in adulthood and increase the risk factors of age-related diseases, including cardiovascular diseases (11).

A study on 320 Turkish children and adolescents reported psychological and behavioral problems, including distraction, nervousness, and fear of asking about the pandemic (12). The anxiety scores in the COVID-19 pandemic are 4.39 times higher in adolescents who have previously been referred for psychiatric treatment. Having a COVID-positive patient in the family increases the state anxiety scores by 3.81 fold. Anxiety and depression can affect the immune system and increase the risk of infection (13).

Children and adolescents are in critical development periods and need special care to promote their mental health during quarantine. Some of them are more vulnerable than others. So, they should be identified and supported properly by various social connections, including healthcare professionals, families, and schools (13). Female and older adolescents showed a higher risk of depression and anxiety during COVID-19 (10). However, some studies did not show any effect of age or gender on child mental illness outcomes (4).

Findings showed that exposing children to excessive information about COVID-19 caused increased levels of stress and anxiety. Physical activity has a protective effect on mental problems, including depression and anxiety, during this pandemic. Furthermore, the pandemic may have a more substantial impact on the mental health of children and adolescents from lower socioeconomic conditions (14, 15).

Children and adolescents from lower socioeconomic status are more prone to mental problems. They had healthy meals, mental health support, and more physical exercise before the quarantine. Thus, school closures and quarantine prevent children from these services and activities and decrease their mental health and general well-being (4, 9)

According to findings, parents with higher distress and anxiety had more nervous children (3, 8). Media entertainment, reading, and physical activity reduce mental distress related to COVID-19 in children and adolescents. Further longitudinal studies are needed to identify the long-term impacts of the COVID-19 pandemic on the mental health of children and adolescents even after the pandemic (4).

The effect of COVID-19 and insufficient sleep on the development of NCDs

Isolation and home confinement have an impact on the sleep quality of children and adolescents. The levels of stress may increase because of family financial situations, health concerns, and uncertainty about the future during pandemics;all of them lead to sleep difficulties.

A study on Italian children (3-6 years) showed that sleep quality decreased during the early stages of the pandemic (3). However, this reduction plateaued after two weeks of follow-up. Sleep duration has increased by 0.65 hours per day during the pandemic compared to early 2019 among Italian children (1). A study on children (1-5 years) in Chile reported that sleep duration increased and sleep quality decreased during the pandemic. They showed that the play space was important for physical activity, decreased screen time, and also had an impact on sleep quality. Children with higher family incomes and less crowded homes showed fewer sleep problems (16).

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There are sleep problems in 40% of Chinese adolescents. The total Sleep Disorder Scale for Children score increased from 35.7 to 42.1 during the lockdown. Unscheduled sleep has increased during the COVID-19 pandemic among children and adolescents (17).

Results have shown that COVID-19 had an early effect on sleep quality in children and adolescents; However, long-term effects on health outcomes, especially NCDs, should be investigated more in future studies. Quarantine affects psychological well-being and increases the risk of mental health and sleep problems during and after the pandemic, especially in children and adolescents (18, 19).

High stress because of major changes in routine affects sleeping behaviors and leads to later sleep timing and later wake time. These are associated with poor health behaviors, lower physical activity, and excess weight in children and adolescents. Later sleep timing postpones the circadian timing and decreases opportunities for sunlight exposure or exercise in the morning. Sunlight exposure during daytime hours regulates the circadian system and physiological rhythms (20).

Children and adolescents spend more time with technology. Usage of mobile phones during the pre-sleep period enhances exposure to alerting 'blue light' and can disrupt melatonin release. Melatonin is anti-inflammatory and immune-enhancing and reduces the levels of cytokines, including IL-6 and TNF-a. Thus, disturbed melatonin production affects the immune system level that is crucial during pandemics (21).

According to the findings, the lockdown has adverse effects on health. Thus, parents should establish a structured routine with an earlier bedtime and wake time to protect against obesogenic behaviors and adverse health outcomes correlated with later sleep timing (22).

However, some children and adolescents experienced improved sleep during the COVID-19 crisis. They spend less time traveling to and from school or engaging in social and extracurricular activities. Because of school closures, students do not experience peer victimization or academic failure, which increases stress. It decreases rumination around bedtime, which can disturb the onset and quality of sleep. Further longitudinal studies seem to be required to determine the long-term effect of COVID-19 on the sleep of children and adolescents (23).

Discussion

The effect of COVID-19 and an unhealthy diet on the development of NCDs

According to the findings, a poorer diet has been reported in children during the COVID-19 lockdown. Quarantine has been linked to unhealthy diets and eating habits (24). A healthy diet has an important role in inflammation and immunity. Some food items, including simple sugars, trans fats, refined carbohydrates, processed meat, and junk food, may increase inflammation and obesity (25). An unhealthy diet is associated with excess energy intake and weight gain and increases the risk of developing obesity. Obesity is correlated with non-communicable diseases (NCDs). Childhood obesity is correlated with excess weight in adulthood. It is shown that obesity enhances the risk of complications from COVID-19 (26).

A study on 860 Spanish children and adolescents showed that the amount of fruit and vegetable intake decreased significantly during the COVID-19 pandemic, especially among children aged between 3 and 5 years. A possible reason for these results might be related to difficulties in balancing the telework of parents and taking care of their children (27).

A diet poor in fruit and vegetables leads to a lower intake of antioxidants and vitamins. Vitamins and antioxidants can improve the immune system against the Coronavirus (27). Antioxidants increase the response of lymphocytes to mitogens, the number of T-cell subsets, interleukin-2, and the activity of natural killer cells. Thus, having a balanced diet with a sufficient amount of antioxidants and vitamins is necessary during the COVID-19 outbreak. However, there are controversial findings about the usage of supplements (26, 28).

According to one study on Italian children and adolescents, consumption of red meat, potato chip, and sugary drink increased during the COVID-19 pandemic (3). The quarantine and lack of emotional support from friends and in-person contact with them, fears of infection, and inadequate information about the virus lead to stress-driven eating and drinking behaviors that are usually correlated with poor eating habits (28). It leads to the intake of regularly higher amounts of snacks, crackers, chips, sugary cereals, ramen noodles, hamburgers, processed ready-to-eat meals, soda cola, and chocolate; all of them increase body fat and obesity (29, 30).

Concerns about food shortages lead to the purchase of long-life foods, ultra-processed and calorie-dense comfort foods instead of fresh foods. Long-life foods usually have a high amount of salt, sugar, or trans-fat content. Thus, they lead to an unhealthy diet poor in antioxidants. Refined sugar with added fat increases energy density, and finally, obesity is correlated with cardiometabolic risk factors (26).

Having a healthy diet in a safe home environment is one of the important strategies for the prevention of excess weight during the COVID-19 pandemic. Having a healthy diet along with sufficient physical activity is more effective. Regular physical activities in obese children affect total daily energy expenditure (25).

Some activities have marked that eating, activity, and sleep behaviors change during the quarantine. Implementation of preventive programs during the COVID-19 pandemic, with uncertain duration, is necessary. Telemedicine lifestyle programs, including healthy lifestyle training, can be effective for the prevention of NCDs in the future (28, 31).

The effect of COVID-19, physical inactivity, and screen time on the development of NCDs

Healthy movement behaviors, including sufficient physical activity and limiting screen time, are associated with physical and mental health in the pediatric age group. Children and adolescents with sufficient physical activity have better cardio-metabolic, musculoskeletal, cognitive health, and immune function compared to those who are less active

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(27, 32).

Research findings have shown a serious downward trend in physical activity levels during the COVID-19 pandemic. A study on 1472 Canadian children and adolescents showed that only 3.6% of children aged 3-5 years and only 2.6% of adolescents aged 12–17 years had sufficient physical activity regularly, according to the recommended guideline during the COVID-19 pandemic (27). One study on South Koreans confirmed these findings and reported a significant decrease in physical activity in children (33). A recent investigation of 2427 Chinese children and adolescents reported that screen time increased by 30 hours per week, and it showed a 23.6% increase in total screen time more than 2 h/day during the COVID-19 pandemic (34).

Because of the quarantine, television viewing and usage of computers, tablets, and mobile phones are increasing. Screen time increased by more than 4 hours per day in children and adolescents (3).

There is a strong association between physical activity and NCDs in children and adolescents (25). Sedentary behavior and physical inactivity increase cardio-metabolic disease, obesity, and diabetes in children and adolescents (35). According to guidelines, 60 min of moderate-vigorous physical activity and ≤2 hour screen time per day for 5-17 year-olds and 75 min with vigorous aerobic exercise intensity or 150 min with moderate aerobic intensity per week for more than 17 years old are recommended during the COVID-19 pandemic (1, 36, 37).

Findings showed that children from poorer families and lower-educated parents had higher physical activity than those in more wealthy or educated families during the pandemic. Lack of enough space for physical activity at home is another problem of inactivity. Children and adolescents that live in rural areas and houses have a strong attachment to physical activity than those living in urban areas and apartments (16). However, some studies showed that children from higher socioeconomic backgrounds had higher levels of physical activity (38, 39).

Lack of outdoor activities is the cause of adverse effects on mental health, vitamin D deficiency, and myopia (33). Studies have shown that increasing the levels of physical activity can decrease the risk of respiratory infections in pediatric age groups (40, 41). Physical activity is associated with lower hypertension and higher bone mineral density (29).

The health status of pediatric age groups is more compromised during COVID-19. There is a strong correlation between health status and movement behaviors in children (42). Practical interventions are needed to increase physical activity in children and adolescents for the prevention of potential future health consequences (43).

An active video game can increase physical activity and energy expenditure during quarantine. Active video games are safe and fun for children who spend more time playing electronic screen games for entertainment (44).

The effect of COVID-19 on the health care system

COVID-19 leads to some problems in the healthcare system, including physical and mental exhaustion of the healthcare workforce and the increasing backlog of healthcare procedures. Increasing the incidence of COVID-19 and hospitalized patients lead to hiring a backup workforce, paying overtime to staff, and educating staff. With the increasing incidence of COVID-19, healthcare workers who typically dealt with NCDs were reassigned to support the COVID-19 patients (45).

The World Health Organization (WHO) assessed 155 countries and reported that prevention and treatment services for NCDs have been severely disrupted since the COVID-19 pandemic began. The inability or fear of high-risk patients to consult a doctor is disrupting NCDs management and delaying some critical care procedures. Thus, patients with serious health conditions, including cancer, diabetes, and cardiovascular diseases, are often not able to receive the services and medicines that they require (46).

Evidence has shown that consultations have been reduced among general practitioners and specialists since the beginning of the COVID-19 outbreak. Some health care centers have postponed unnecessary and non-urgent operations to free up essential hospital staff and hospital beds. Hospitals throughout the country became financially strained because of increasing costs related to COVID-19 and the lost revenue from the cancellation of outpatient office visits and elective procedures and surgeries. These effects are more destructive in middle and low-income countries. They have been forced to devote already sparse resources to fighting the pandemic, and without support, these countries are at risk of devastating consequences (47).

In addition to its effect on the health system, COVID-19 also has an influence on research in our country. A lot of budgets have been spent on COVID-19-related topics. So, several studies with topics other than COVID-19 including the Childhood & Adolescence Surveillance and Prevention of Adult Non-communicable disease (CASPIAN Study) and STEPs surveys in Iran that assessed the risk factors of NCDs, have encountered problems. These changes decrease studies on NCDs and consequently delay the current path of scientific progress.

Conclusion

COVID-19 has adverse effects on lifestyle behaviors and physical and psychological health in children and adolescents. Prevention and control of NCDs' risk factors are crucial for decreasing the negative effects of this pandemic on individual and public health aspects. Safe, accessible, enjoyable, and creative, healthy lifestyle strategies should be developed and implemented by families, caregivers, governments, healthcare providers, media, and trainers. These strategies can be effective in increasing a healthy diet and promoting physical activity habits, as well as in decreasing screen time and sedentary behavior, and promoting sleep time and quality for health promotion of children and adolescents during the COVID-19 pandemic.

Ethical approval

This study was approved by the Ethics Committee of Alborz University of Medical Sciences.

Conflict of Interests

The authors declare that they have no competing interests.

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