



Physical Activity Behaviors and Overweight Status among Iranian School-Aged Students during the COVID-19 Pandemic: A Big Data Analysis

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Abstract

Background: We aimed to investigate school-aged students' physical activity behaviors and overweight status during the COVID-19 quarantine.

Methods: In this cross-sectional study, an online questionnaire was utilized to measure participants' physical activity behavior and overweight status during the COVID-19 quarantine in Iran (May of 2021). Participants self-reported their physical activity levels, types, amounts and locations, as well as whether or not they became overweight. The chi-square test was used to determine the differences in the distribution of the participant responses. The statistical significance level was set at $P < 0.05$.

Results: The questionnaire was completed by 43,660 school-aged students (15,532 boys and 28,128 girls). The age, weight, and height ranges were 8–17 yr, 18–144 kg, and 75–198 cm respectively. Half of the students reported changes in their body weight and became overweight during the COVID-19 pandemic ($\chi^2 = 25514.4$; $P = 0.001$). Forty-one percent reported doing very little or no physical activity, 32% of students reported doing less than one hour of exercise per day ($\chi^2 = 8547.7$; $P = 0.001$). The majority of students (72%) reported participating in physical activity at home ($\chi^2 = 78851.2$; $P = 0.001$). Flexibility was the main kind of exercise performed, followed by walking or running, during the COVID-19 pandemic ($\chi^2 = 24328.9$; $P = 0.001$).

Conclusion: During the COVID-19 pandemic, half of the students became overweight, and the majority did not engage in regular physical activity. These findings can help guide efforts to protect and promote children's health during the COVID-19 outbreak, as well as influence policies to reduce the risk of future pandemics.

Keywords: COVID-19; Epidemiology; Physical activity; Home-based exercise; School closer

Introduction

The coronavirus infection 2019 (COVID-19) has spread globally in the last two years, and several

governments have decided to close schools as part of a physical distancing policy aimed at limiting



transmission and relieving pressure on health systems (1). As a result of these closures, about 60 million students have been deprived of essential educational and health services (2). Students were forced to stay in their homes during the quarantine period, which disturbed their daily routines and physical activity levels. Sedentary students spend most of their days sitting or lying down, reading, talking, watching television, or taking virtual classes on their phone or computer (3). The length of the enforcement of these regulations and policies has increased overall screen time among children and adolescents (4). Obesity, on the other hand, maybe connected to an increase in sedentary behavior and screen time, as well as a reduction in physical activity (3). Children and adolescents gain weight during the summer vacation, as previously observed, and childhood obesity rates may rise correspondingly to the number of months that schools are closed (5). The term "covibesity" was introduced to describe the increase in obesity rates caused by the pandemic's lockdown (6). According to US reports, if schools delay reopening, by Dec 2020, 1.27 million new cases of pediatric obesity would be reported (5).

Because lengthy home stays can exacerbate habits that contribute to inactivity and obesity, maintaining regular physical activity and continuously exercising in a safe home environment is a vital strategy for healthy living during the coronavirus crisis (6). Increased amounts and intensities of physical activity in children and adolescents are linked to a variety of positive health outcomes, according to significant research evidence (7). Appropriate quantities of physical activity help to develop healthy musculoskeletal tissues (muscles, bones, and joints), neuromuscular awareness (movement control and coordination), a healthy cardiovascular system (lungs and heart), and a healthy body weight (8, 9). Physical activity has also been linked to psychological benefits for young individuals, including reduced depressive symptoms and improved anxiety control, as well as social development by providing opportunities for social interaction, self-expression, self-confidence, and integration (10). Due to the health advantages of regular physical activity, WHO recommends that

people aged 5-17 engage in at least 60 min of moderate- to vigorous-intensity physical activity every day throughout the week (11). In addition, vigorous-intensity activities, including aerobic and activities that strengthen bone and muscle, should be included at least three days a week (11).

Physical inactivity has been highlighted as a major cause of worldwide mortality and contributing to the increase in overweight and obesity (8). Physical inactivity is a worldwide, multifaceted issue that affects people of all ages (13). During the COVID 19 pandemic, children (aged 5–12 yr old) and adolescents (aged 13–17 yr old) were estimated to have switched to remote learning as a result of school closures (12). School closures, in combination with other socio-behavioral adaptations (e.g., social distancing, quarantining, etc.), affect children and adolescents' daily activities (13). Preliminary research suggests that the social limitations needed to combat COVID-19 have resulted in increased sedentary behavior (14), altered sleep patterns (15), and fewer opportunities for children and adolescents to engage in physical activity, which is a major cause for concern (13). Such habits in children and adolescents will lead to long-term health problems. While there is a growing amount of research exploring the impact of COVID-19 on physical activity and sedentary behavior, no studies examining the levels of physical activity among Iranian school-aged students during the COVID-19 quarantine to our knowledge have been published.

Therefore, the purpose of this study was to investigate the physical activity behaviors and overweight status of school-aged students in Iran during the COVID-19 quarantine.

Methods

The study was a cross-sectional online questionnaire distributed in May of 2021 to investigate the physical activity behaviors of school-aged students undergoing virtual classes during the COVID-19 pandemic. Iranian school-aged students of both genders were invited to participate in the study.

The questionnaire was distributed anonymously and electronically via social media platforms.

This study received approval from the Iran Ministry of Education's Department of Physical Education And Health. All participants were informed about the study's goals and provided electronic consent. All participants were under the age of 18. A written informed consent form was attached to the screening questionnaire to obtain parental consent in advance of data collection.

The target population was recruited by a non-randomized convenient sampling method and was representative of students available on social media platforms. The sample size was not estimated before the study. The study also demonstrated the beneficial use of social media as a method of data collection. This manuscript was written following the STROBE Statement (Strengthening the Reporting of Observational Studies in Epidemiology) (16).

Questionnaire

The questionnaire was designed and created by the research team based on relevant study questions. The questionnaire's content and face validity were approved by 15 specialists and professors who were familiar with the research topic. Cronbach's alpha coefficient was also used to determine the tool's reliability, found to be 0.82. Demographics (age, gender, weight, height, and grade: elementary school, secondary school, high school), and 5 additional questions were covered in the questionnaire, these included:

1-Did you become overweight while participating in virtual lessons during the COVID-19 pandemic over the last two years? (Not at all, very little, relatively high, very much).

2-During the COVID-19 pandemic, did you participate in physical activity in general? (Not at all, very little, relatively high, very much).

3-On average, how many hours per day do you exercise? (Less than 1 hour, 1 to 2 hours, 2 to 3 hours, more than 3 hours, no exercise).

4-During the COVID-19 pandemic, where did you do the most physical activity? (Home, sports hall, outside the house, gym, no exercise).

5-During the COVID-19 pandemic, what kind of exercises did you do? (Flexibility exercises, weight training, walking or running, bicycling or skating, no exercise).

The participants received the questionnaire as Google forms via social media on the school's platform. For a week, they had access to the forms via the link provided. With a mix of open-ended and closed-ended questions, the questionnaire was semi-structured (including multiple choice and ranking questions). To guarantee optimum participation, reminders were sent out to potential participants. The information received from participants was then analyzed.

Statistics

The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA). and a *P*-value of <0.05 was considered statistically significant. Microsoft Excel was used for data entry, editing, and sorting. Continuous data were presented as means and standard deviation (SD), and categorical data as frequency and percentages. The Chi-square goodness of fit test was used to determine the differences in the distribution of the participant responses (i.e, categorical variables such as: not at all, very little, relatively high, very much). All the Google forms received were screened by the research team and inappropriate and incomplete responses were discarded from the analysis. The close-ended data was analyzed automatically using a Google spreadsheet and descriptive statistics using percentage and frequency distribution were developed.

Results

The questionnaire was completed by 43,660 students (15,532 boys (36%) and 28,128 girls (64%)), and included 15,372 (35%) students in elementary school, 16,820 (39%) students in secondary school, and 11,468 (26%) students in high school. The age, weight, and height ranges were 8-17 yr, 18-144 kg, and 75-198 cm respectively. The details

of school-aged students' responses to the questions are presented in Figs. 1-5.

The chi-square goodness-of-fit test demonstrated significant differences between the participants' responses to the questions related to becoming overweight ($\chi^2=25514.4$; $P=0.001$), participating in physical activity ($\chi^2=8547.7$; $P=0.001$), hours of exercise per week ($\chi^2=9434.4$; $P=0.001$), location of physical activity ($\chi^2=78851.2$; $P=0.001$) and the kind of exercises used ($\chi^2=24328.9$; $P=0.001$).

The majority of participants (51%) reported not becoming overweight while taking virtual classes during the COVID-19 pandemic over the previous two yr. Half of the students reported very little (35%), some relatively high (10%) and large (4%) changes in their body weight resulting in becoming overweight during the COVID-19 pandemic (49%). In addition, includes information about becoming overweight for boys and girls, as well as details on becoming overweight for each grade (Fig.1).

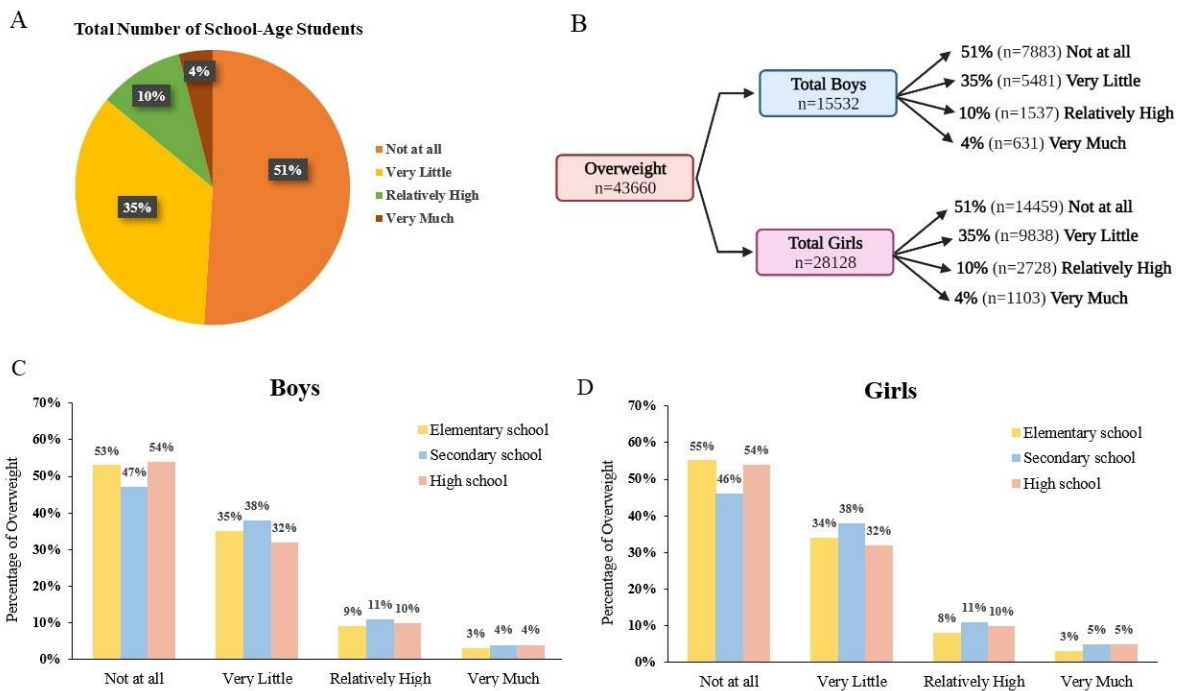


Fig. 1: Overweight status of school-aged students in total and for boys and girls separately as well as details in each grade while participating in virtual lessons during the COVID-19

In Fig. 2, the majority of respondents (53%) reported doing very little or no physical activity during the COVID-19 pandemic, whereas some reported doing reasonably high (30%) or extremely high (17%) physical activity. Fig. 2 also shows how much physical activity boys and girls completed, as well as how much they completed in each grade. Overall, 32% of students reported doing less than

one hour of exercise per day during the COVID-19 pandemic, 28% reported 1 to 2 h, 15% and 19% reported 2 to 3 h and 3 h, respectively, while 6% said they did not exercise at all. Moreover, includes information on the number of hours exercising for boys and girls, as well as details on the number of hours of exercises in each grade (Fig.3).

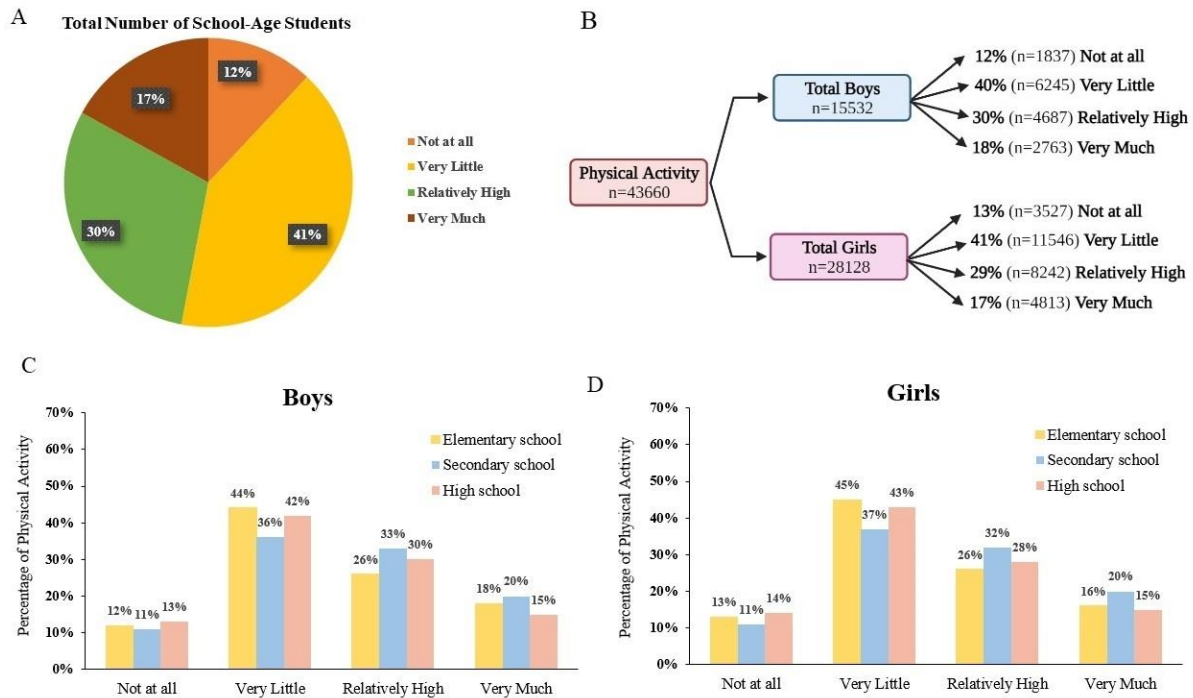
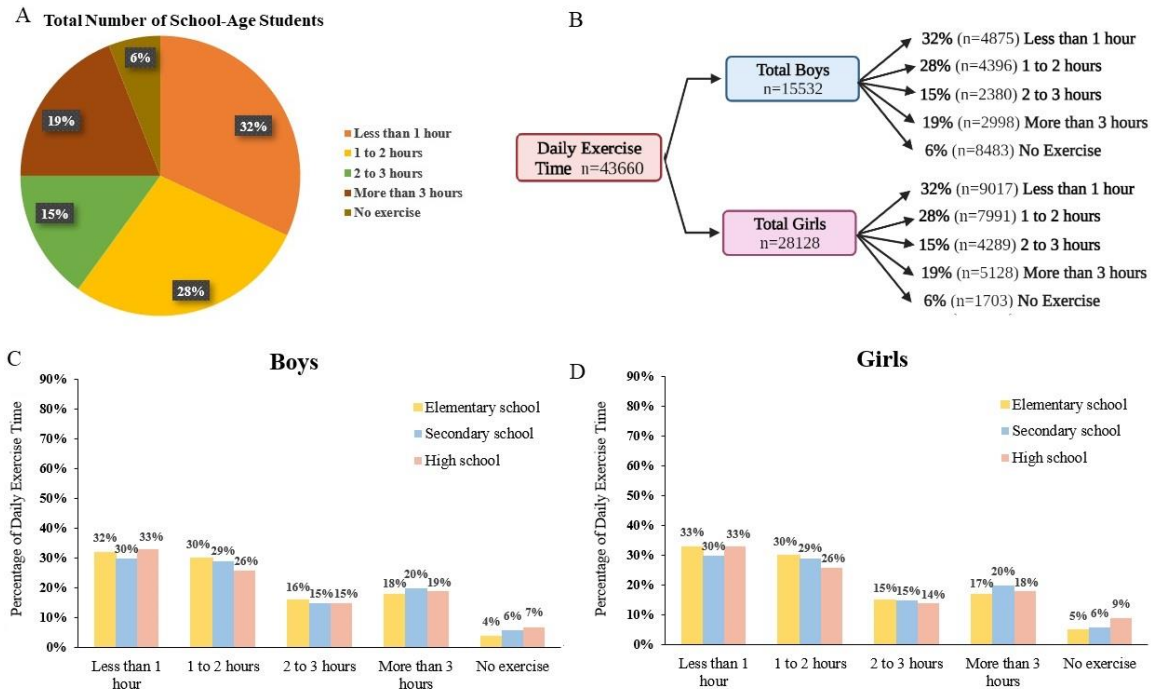


Fig. 2: Participate in physical activity in general during the COVID-19 pandemic of school-aged students in total and for boys and girls separately as well as details in each grade



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Fig. 3: Hours per day that school-aged students have done physical activity during the COVID-19 pandemic in total and for boys and girls separately as well as details in each grade

The majority of students (72%) reported engaging in physical activity at home during the COVID-19 pandemic, whereas 28% reported engaging in physical activity outside the house, including the gym (4%) and sports halls (5%), while 6% said

they did not exercise at all. Moreover, further details provide regarding the locations of boys' and girls' exercises, as well as the specifics about the various locations for exercises in each grade (Fig.4).

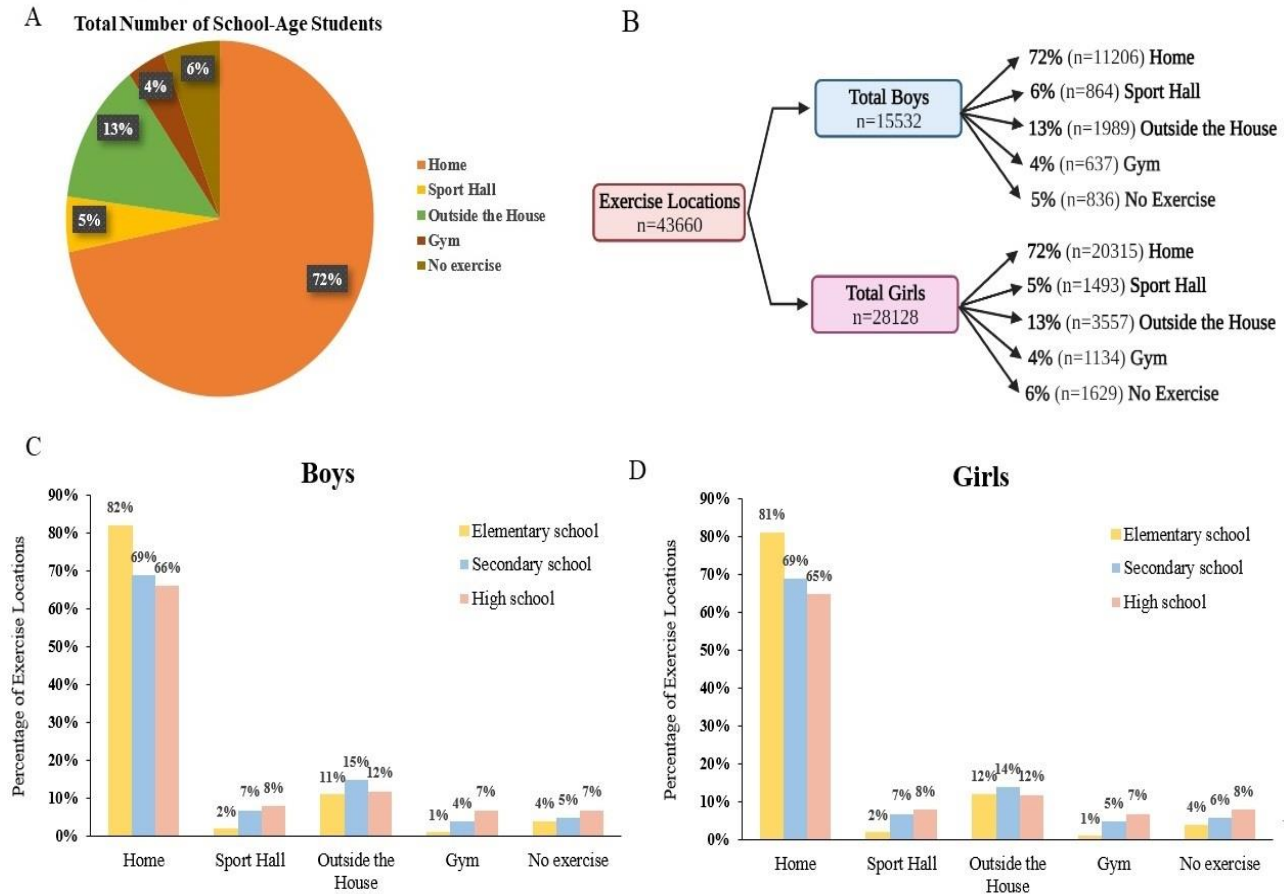


Fig. 4: The place of exercise that school-aged students did physical activity during the COVID-19 pandemic in total and for boys and girls separately as well as details in each grade

Fig. 5 shows that the majority of respondents (45%) reported doing flexibility exercises, as well as walking or running (27%), bicycling or skating (16%), and a small number of students reported participation in weight training (6%), while 6% said they didn't exercise at all during the COVID-

19 pandemic. Fig. 5 also offers further information about the different types of exercises for boys and girls, as well as specifics about the different types of exercises in each grade. Fig. 6 shows the inter-relationships between school closures, health, wellness, and obesity.

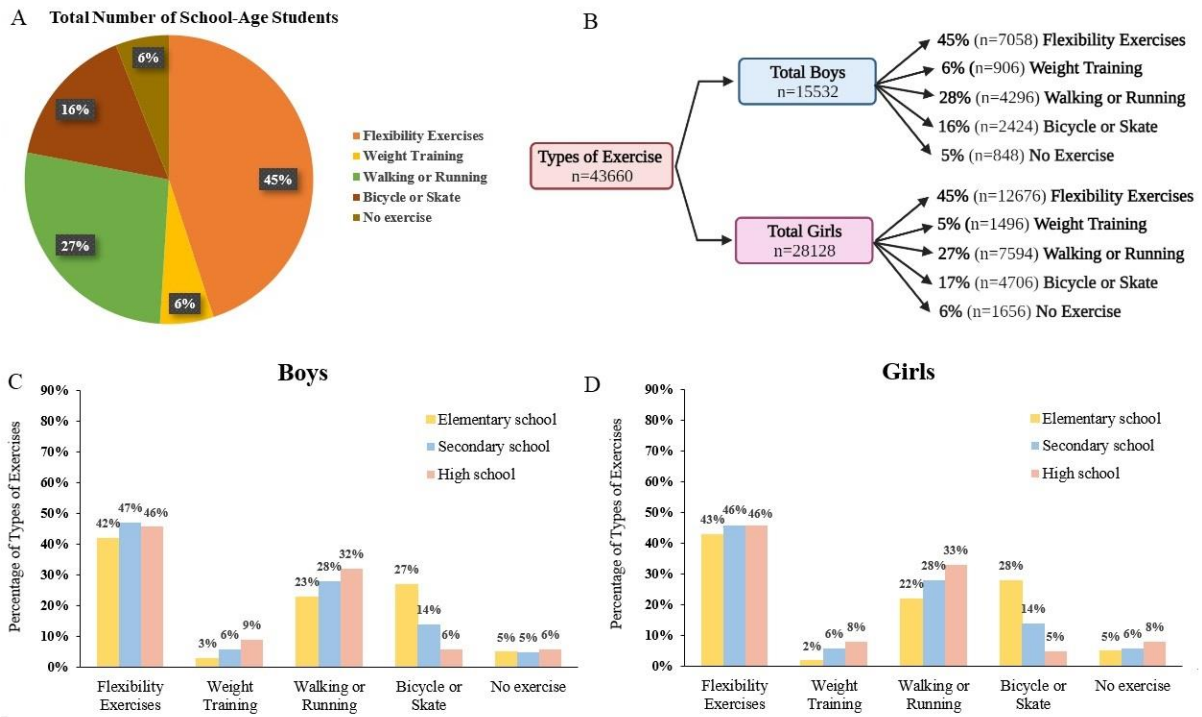


Fig. 5: The kind of exercises that school-aged students have done during the COVID-19 pandemic in total and for boys and girls separately as well as details in each grade

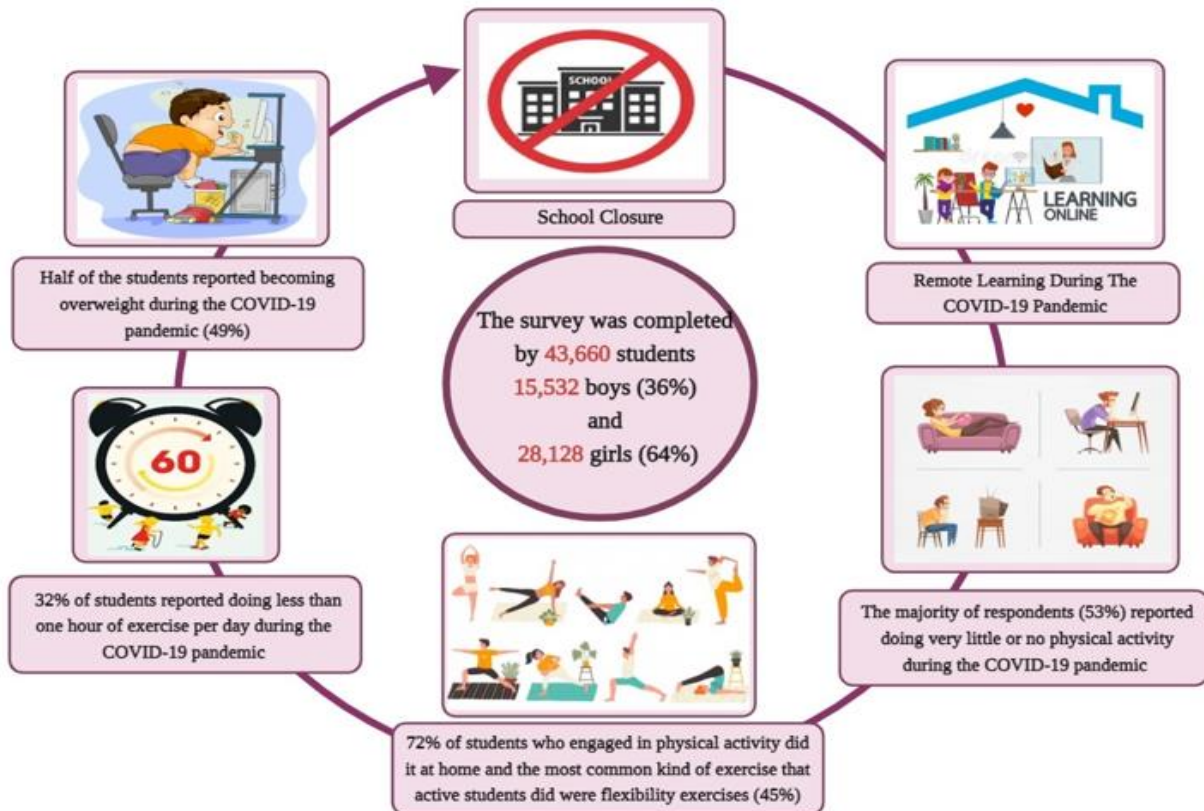


Fig. 6: Interrelationships between school closures, health, wellness, and obesity

Discussion

This study aimed to examine the physical activity behaviors and overweight status among school-aged students during the COVID-19 pandemic. The overall results showed significant differences between the participants' responses to the questions about becoming overweight, participating in physical activity, hours of exercise per week, the location of physical activity and the kind of exercises performed. To our knowledge, this is the first study to assess the impact of the COVID-19 pandemic and associated public health restrictions on physical activity behaviors and overweight status among school-aged students in Iran.

Our results illustrate that the majority of participants (51%) reported not becoming overweight over the previous two years while taking virtual classes during the COVID-19 pandemic, but half of the students reported very little (35%), to relatively high (10%) and very much (4%) changes in their body weight and became overweight during the COVID-19 pandemic (Fig. 1). Since the COVID-19 pandemic was declared by the WHO, the disease's rapid global spread has forced almost 2.6 billion individuals into quarantine to minimize the consequences of COVID (17). About 60 million students have been cut off from essential educational and health services and were forced to stay in their homes during the quarantine period, which disturbed their daily routines and physical activities (2). The term "covibesity" was introduced to describe the increase in obesity rates caused by the pandemic's lockdown (6). Fast weight gain, or covibesity, has resulted as because of the spontaneous nature of such a lockdown (6). During lockdown, forced inactivity has been linked with changes in eating habits and an increase in stress (6). Since half of school-aged students reported becoming overweight during the COVID-19 pandemic over the last two years, our findings confirm covibesity. Rapid weight gain in children is connected to obesity later in life, as well as an increased risk of cardiovascular disease and all-cause mortality (18). Strategies to prevent the

development of obesity may therefore benefit from interventions that are implemented in early life. The Iranian government has decided to gradually reopen schools following vaccinations (19). As a result, school-aged students must be screened by the school when starting in-person classes and those who have become overweight or obese must receive medical or fitness training interventions and information. More research is needed to assess and compare the overweight and obesity of school-aged children before and after the pandemic.

According to the findings of this study, the majority of school-aged students (41%) reported undertaking very little or no physical activity during the COVID-19 pandemic and 32% of students reported doing less than an hour of exercise each day. Nearly half of the students became overweight while taking virtual classes during the COVID-19 pandemic. Some studies have confirmed that individual interest in exercising increased, and they cared about their health (20, 21). However, we need to consider that about half of the community, as confirmed in this study, were still not physically active. Many experts have emphasized the necessity of improving healthy living habits, while others have stated that we are currently facing not one, but two pandemics at the same time (i.e., COVID-19, physical inactivity) (22). As a result, widespread messaging emphasizing the importance of adult physical activity is critical. The term "COFIT-19" was developed to underline the importance of being physically active during the COVID-19 pandemic (23). Even before COVID-19, medical professionals were aware of the public health risks associated with a lack of physical activity, including an increase in hypertension, type 2 diabetes, and obesity (24). Future research should investigate the beneficial health effects of various types of exercise performed at home on children and the adolescent community.

Limitations of this study include no assessment of physical activity intensity, and the inability to assess the amount of pre-COVID-19 physical activity behaviors and overweight status to explore

changes in physical activity and overweight levels. Because of study design, and memory recall, it would have been difficult to examine nutritional status and dietary habits of the subjects, and this may have impacted the findings presented here. The current study used an online self-report methodology, which may have included biases (e.g., social desirability and memory recall). Furthermore, because the study was cross-sectional, we could not establish causality between any of the variables evaluated. Finally, we used specific general questions designed by the researchers rather than a standard questionnaire to assess participants' physical activity behaviors and overweight status.

Conclusion

During the COVID-19 pandemic, half of the students studied became overweight, and the majority did not engage in regular physical activity. These findings can help guide efforts to protect and promote children's health during the COVID-19 outbreak, as well as influence policies to reduce the risk of future pandemics. With the reopening of schools after the quarantine period, it appears that screening students for health risks such as physical inactivity and overweight status will be necessary.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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