Postural Habits and Joint and Muscle Pain of Iranian School-Aged Students Undergoing Virtual Classes During the COVID-19 Pandemic: A Cross Sectional Study

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Abstract

Background

The current lifestyle, with its growing use of contemporary technologies, has resulted in changes in people's behavior, causing them to become increasingly sedentary and to develop unhealthy body habits. An essential variable determining an individual's physical and emotional well-being is posture. The purpose of this study was to investigate the postural habits and any related joint and muscle pain among school-aged students in Iran during the COVID-19 quarantine.

Methods

The present study used a cross-sectional methodology. An online survey was utilized to measure participants' postural habits and joint and muscle pain during the COVID-19 quarantine in Iran. Participants self-reported their postural habits and any joint and muscle pain during the COVID-19 epidemic. A chi-square test was used to determine the differences in the distribution of the participant responses ($P < 0.05$).

Results

The survey was completed by 43,660 school-aged students (15,532 boys and 28,128 girls; ages 8–17 years). The results indicated that 57% of the students reported that they did not maintain correct posture while taking virtual classes during the COVID-19 pandemic. The results revealed the following postural details, leaning forward (28%), leaning backward (11%) or curving (18%) during virtual classes. The majority of respondents (54%) reported feeling some joint or muscle pain while taking virtual classes during the COVID-19 pandemic. The greatest pain was reported in the neck (28%), upper back (14%) and lower back (13%).

Conclusion

These findings can help inform efforts to protect and promote children's health and posture during the COVID-19 pandemic. With the reopening of schools following the quarantine period, the findings from this study indicate that screening students for health risks such as body postural status will be necessary.

Introduction

Individual posture is an essential aspect influencing human physical and mental health throughout the life span (1). A range of factors influence human posture, including genetics, anatomical structural deficits, postural habits, and occupation (2). Posture is the position taken by the body with support during muscular activity or as a result of a coordinated action by a set of muscles working together to preserve

stability (2). The way people present themselves in a stance is referred to as static posture. The ability to maintain posture while completing functional tasks is referred to as dynamic posture (2). Any variation from ideal posture is referred to as postural deviation (3). When a person has good posture, the body's alignment is balanced, resulting in less stress on anatomical body parts (4). When a person's posture is poor, body alignment suffers, causing excessive strain on various body parts (4). These postural deviations and forms can be found in all categories of life, and statistics show that the prevalence of poor posture is increasing (3). Even at low levels of bad posture, the continuous stress generates anatomical modifications over time (1). The ability to work and perform correct movement patterns, pain free is impacted by these changes (4). Healthcare professionals frequently examine posture, both static and dynamic, in order to guide treatment (e.g., by providing a baseline assessment of movement quality and/or musculoskeletal dysfunction) (4).

Several governments closed schools as part of a physical separation and quarantine policy to minimize transmission and reduce the burden on health systems during the COVID-19 pandemic. (5). Nearly 60 million students have been deprived of traditional educational and health services as a result of these closures (6). As a result of quarantine measures, sedentary behavior has increased (7, 8). Sedentary people spend most of their days sitting or lying down, reading, talking, watching television, or taking virtual classes on their phone or computer (7). Individuals find it challenging to be physically active and maintain good posture as a result of the rising use of electronics and associated keyboard activity. According to studies, there is an increasing need to treat postural difficulties and musculoskeletal disorders caused by excessive use of technology (9).

Strong evidence exists to support the necessity to improve and monitor the quality of children's postural habits (10). When muscle length is altered as a result of misalignment (i.e., poor posture), tension development is reduced, and the muscle is unable to deliver enough force to provide effective and efficient movement (2). In children and adolescents, a systematic review found a link between sitting posture and upper quadrant musculoskeletal pain (11). In addition, there are many different habits used in the home, in addition to sitting posture, which could eventually affect the spine and contribute to bad posture (3). Students, for example, may assume a special position during virtual classes. The position assumed may place parts of the body at the very end of its range of motion and may cause some muscle imbalances and postural changes (3). Identifying if these modifiable household habits are linked to postural deviation could aid in the development of preventative methods (12). Early adulthood is crucial in the development of appropriate body behaviors and postural habits, which will help to reduce postural problems and repercussions later in life (10).

Postural deformities in growing children are common as a result of improper postural habits developed over time, and while most of these postural changes are gradual, irreversible deformities can be detected after a few years (13). The adoption of a preventive and educative program requires early recognition of postural alterations and musculoskeletal risk factors. Therefore, the purpose of this study was to investigate postural position and any related joint and muscle pain among school-aged students in Iran during the COVID-19 quarantine.

Methods

The study was a cross-sectional online survey distributed in May 2021 to investigate the postural habits 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 survey was distributed anonymously and electronically via social media platforms. This study received ethical approval from the Iranian Ministry of Education's department of physical education and health. All participants were informed about the study's goals and provided electronic consent for inclusion. 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 prior to the study. The study also demonstrated the beneficial use of social media as a method of data collection. This manuscript was written in accordance with STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology) (14).

Survey

The survey was designed and created by the research team based on relevant study questions. Demographics (age, gender, weight, height, and grade), and 7 additional questions were included in the survey (Appendix A).

The participants received the survey as Google forms via social media on the school's platform. For one week, they had access to the information provided by the survey via the link provided. With a mix of open-ended and closed-ended questions, the survey was semi-structured (including multiple choice and ranking questions). To guarantee optimum participation, reminders were sent out to potential participants. Once the information was returned from participants, appropriate statistical analysis procedures were used to analyze the data.

Statistics

The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM Inc., Chicago, IL, USA) and a p-value of ≤ 0.05 was considered statistically significant. Microsoft Excel was used for data entry, editing, and sorting. Continuous data was presented as mean 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. Close-ended data were analyzed automatically using a Google spread-sheet, and descriptive statistics using percentage and frequency distribution were developed.

Results

The survey 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 years, 18–144 kg, and 75–198 cm respectively.

The chi-square goodness-of-fit test demonstrated significant differences between the participants' responses to the questions related to body posture ($\chi^2=40250.7$; $p=0.001$), different sitting positions ($\chi^2=8142.7$; $p=0.001$), place of sitting during virtual classes ($\chi^2=2234.4$; $p=0.001$), different lying positions ($\chi^2=2523.1$; $p=0.001$), place of lying during virtual classes ($\chi^2=3225.2$; $p=0.001$), joint or muscle pain during virtual classes ($\chi^2=52832.2$; $p=0.001$) and joint or muscle pain in various part of the body ($\chi^2=41643.9$; $p=0.001$). The details of school-aged students' responses to the questions are presented in figures 1 and 2.

As shown in Figure 1, the majority of participants (77%) reported having a sitting posture while taking virtual classes during the COVID-19 pandemic, while a few respondents reported taking lying (22%) or standing (1%) postures. For sitting posture, 57% of the students reported that they did not maintain correct posture while taking virtual classes during the COVID-19 pandemic and they either leaned forward (28%), backward (11%) or curved their backs (18%) during virtual classes. Regarding students who reported maintaining lying positions during virtual classes, half of them reported lying on their stomach while 31% and 20% reported lying on their back and side during virtual classes respectively. The majority of places where students sat during virtual classes included sitting on the floor (58%) and the majority of places where students assumed a lying position were on the floor.

In Figure 2, the majority of respondents (54%) reported feeling some joint or muscle pain while taking virtual classes during the COVID-19 pandemic. The greatest pain areas were reported in the neck (28%), upper back (14%) and lower back (13%) respectively.

Discussion

The aim of this study was to examine posture positions and associated joint and muscle pain among school-aged students during the COVID-19 pandemic. The overall results showed significant differences between kinds of body posture, different sitting positions, place of sitting, different lying positions, place of lying, feeling joint or muscle pain, and joint or muscle pain in various parts of the body while taking virtual classes during the COVID-19 pandemic. To our knowledge, this is the first study to assess the impact of the COVID-19 pandemic and associated public health restrictions on posture behaviors and joint and muscle pain among school-aged students in Iran.

Over the previous decade, postural abnormalities linked to changes in young people's habits have increased (3). Bad posture is a modern-day health issue that affects large amounts of people and has implications for ill health (10). People's behavior has changed as a result of lifestyles, which has resulted

in individuals becoming more sedentary and developing bad physical habits, including bad posture during work and leisure activities (10). Technological development has provided individuals with increased comfort and luxury, but has also led to a physical activity decline that includes increased sedentary behavior and related postural issues (12). 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 spread and consequences of COVID (15). As a result of segregation and isolation, about 60 million students have been deprived of traditional educational and health services and were forced to stay in their homes during the quarantine period. This has disturbed their daily routines and minimized their engagement in physical activities (6). Our results illustrate that the majority of participants (77%) reported sitting postures while taking virtual classes during the COVID-19 pandemic, with some reporting lying (22%) or standing (1%) postures. In the sitting posture, 57% of the students reported incorrect posture while taking virtual classes during the COVID-19 pandemic. They reported leaning forward (28%), leaning backward (11%) or curving (18%) during virtual classes. The majority of places where students sit during virtual classes were on the floor (58%) and the majority of places where students lie were also on the floor. Students who reported lying positions during virtual classes, half reported lying on their stomach while 31% and 20% reported lying on their back and side respectively. Posture acts as a reference frame for the generation of accurate movement patterns because it ensures that balance is maintained during the start, continuation, and completion of any action (1). There is a link between poor posture and musculoskeletal disorders in people of all ages, and various variables can contribute to these changes, such as adjustments and adaptations to body changes, psychosocial pressures, and ergonomic issues, among others (12). As a result, school-aged students must be screened by the school when starting in-person classes and those who have postural abnormalities must receive medical or corrective exercise interventions and information. More research is needed to assess and compare the postural deviation of school-aged children before and after the pandemic.

Individuals who maintain long postures or execute repetitive actions develop tissue adaptations (tissue impairments) (4). Short, stiff, lengthy, overworked, or weak muscles cause imprecise movement patterns, which can lead to tissue injury (2). Long periods of sitting, for example, have been linked to the development of back pain. According to the findings of this study, the majority of respondents (54%) reported feeling some joint or muscle pain while taking virtual classes during the COVID-19 pandemic. The most pain was reported in the neck (28%), upper back (14%) and lower back (13%) (Fig. 2). According to research on the effects of sustained stress, posture positions should not be maintained for longer than one hour. McGill and colleagues observed that 20 minutes in a sustained flexion position might cause creep in the soft tissues, requiring more than 40 minutes to fully recover (4). The study also demonstrated how bad posture affects muscles, joints, and connective tissue over time. Sitting with the head forward for an extended period of time while reading a book will elongate the ligaments and muscles in the posterior neck and upper back, making it more difficult to regain appropriate posture.

Poor posture can also weaken the scapular muscles and put persistent stress on the rotator cuff, leading to glenohumeral impingement, particularly when using overhead motions. Future research should focus on interventions to inform people about the effect of postural habits on their health. Individuals also need

to be reminded of the necessity of engaging in regular physical activity, and there is strong evidence that physical activity improves a variety of health outcomes, including posture (16, 17). The term "COFIT-19" was developed to underline the importance of being physically active during the COVID-19 pandemic (18). Because of the changes in the structure and delivery of education and employment during the COVID-19 pandemic, these changes may become more permanent following the pandemic. As a result, more research into the health benefits of home-based exercise and the effects of daily routines on posture needs to be conducted. Interventions to improve participation in home-based activities and reduce associated health risks need consideration.

This study has some limitations. These include no assessment of postural deviations in-person, and the inability to assess the amount of time spent in different postural positions. 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.

Conclusion

During the COVID-19 pandemic, half of the students studied reported that they did not use the correct posture while engaging in virtual classes during the COVID-19 pandemic. The majority of respondents reported feeling some joint or muscle pain, especially in their neck, upper back and lower back during virtual classes.

These findings may help guide efforts to protect and promote children's health during the COVID-19 pandemic. With the reopening of schools after the quarantine and isolation period, it appears that screening students for health risks such as postural status will be necessary.

Declarations

Ethics approval and consent to participate

This study received ethical approval from the Iranian Ministry of Education's department of physical education and health. All participants were informed about the study's goals and provided electronic consent for inclusion. 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. All participants will be informed of their right to confidentiality and the right to leave the trial at any point without loss of those benefits to which they were entitled. This manuscript was written in accordance with STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology).

Consent for publication

Not applicable.

Availability of data and materials

The dataset analyzed for this study is available from the corresponding author on reasonable request.

Competing interests

All authors declare that they have no competing interests.

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No funding was obtained for this study.

Authors' contributions

The conception of the work, design of the work, acquisition of data, analysis, and interpretation of data were done by SB and JB. Data curation, drafting the article, revising it critically for intellectual content, validation and final approval of the version to be published were done by SB and JB. All authors read and approved the final manuscript.

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Figures

Figure 1

Postural habits among school-aged students during the COVID-19 quarantine.

Figure 2

Related joint and muscle pain among school-aged students during the COVID-19 quarantine.

Figure 3

Interrelationships between school closures, postural habits, and related joint and muscle pain among school-aged students during the COVID-19 quarantine.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AppendixA.docx](#)