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Artículo corto

Incidence of effects derived from sedentarism as a product of the Covid-19 pandemic. Case study in students from a calendar B school in north Bogotá.

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ABSTRACT

The COVID-19 pandemic has contributed to an increase in sedentarism during the lockdown period. Schools adopted a virtual model, which demanded students to sit for prolonged periods of time, accompanied by physical inactivity and unhealthy habits. These sedentary behaviors are known to be a risk factor for obesity, muscle atrophy, type 2 diabetes, and cardiovascular diseases among others. This study aimed to determine the incidence of effects derived from sedentarism as a product of the COVID-19 pandemic in students from a calendar B school in north Bogotá. To do this, the Adolescent Sedentary Activity Questionnaire (ASAQ) was adapted to this specific situation, with the population being male and female students from grades 9, 10, and 11. This survey assessed the physical activity of students and their eating habits, in addition to measuring their sedentary behaviors and the frequency of their effects on health in the students. The findings indicate an elevated amount of time dedicated to sedentary activities (and a high screen time), with a considerable percentage of students being physically inactive. The most common effects were shortness of breath, back, wrist, and joint pain, binge-eating, and weight gain. Remarkably, these health consequences were more pronounced in the female population, probably explained by the high amount of time they devoted to sedentary activities and shorter time dedicated to exercise compared to male students. This study provides a primary overview of a present problem, which needs to be addressed by institutions and students for future similar events and to propose health promotion programs.

Key words: Sedentarism, Physical Activity, Physical Inactivity, COVID-19 Pandemic, Lockdown

INTRODUCCIÓN

At the beginning of 2020, the COVID-19 started to spread all over the world from China. Later that year, on March 11, this virus was officially declared a global pandemic by The World Health Organization. This forced all the countries around the world to take extreme measures to stop the spread and avoid further deaths, including lockdowns, which obliged citizens to stay inside their houses. A rise in sedentary lifestyles was an inexorable consequence among them, due to the long periods of time people had to be sitting in front of electronic devices.

Sedentarism refers to actions and activities that carry a low energy expenditure, less than 1.5 METs (Arocha, 2019). Recent reports have shown the correlation between lockdown and a sedentary lifestyle, weight gain, and other diseases (Chambonniere et al., 2021; Micheletti et al., 2021; Jia et al., 2021; Martínez-de-Quel et al., 2021). Sedentary behaviors (SBs), principally prolonged sitting is a pleiotropic risk factor with energy expenditure, adipogenic signaling, immunomodulation, autonomic stability, and hormonal dysregulation, which increase the likelihood of chronic diseases like obesity, cardiovascular and respiratory diseases, and cancer (Chandrasekaran & Ganesan, 2020). Furthermore, a variety of reports have pointed out the relationship between a sedentary lifestyle and diseases including muscle atrophy (Narici et al., 2020), type 2 diabetes (Aune et al., 2015), hypertension (Guo et al., 2019), in addition to the increase of the risk of all-cause mortality (Ekelund et al., 2019). The effects of this lifestyle worsen even more when talking about people with comorbidities like CVDs (Van Bakel et al., 2020). Also, considering the increase in usage of technological devices such as the computer, studies have shown that there seems to be a relationship between the excessive use of mouse and keyboard, and carpal tunnel syndrome (Shiri & Falah-Hassani, 2015), and back problems with the prolonged sitting posture (Jung et al., 2020).

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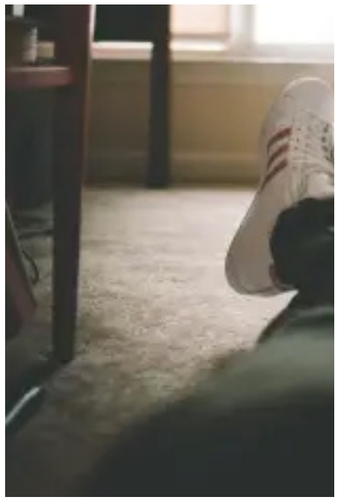
Specifically in Colombia, the emergency began on March 16, 2020. From this point on, people were ordered to stay at home, leading schools and workers to adopt a virtual model. Schools in Bogotá were forced to close, changing their teaching method to virtuality too. This implied 8 hours of constant study, plus the time the student invested in homework. This means that with no regular breaks and an extended sitting time, the effects of sedentary behaviors could be enhanced. The COVID-19 pandemic appears to be somewhat recent, but the incidence of lockdown-derived diseases has been examined several times. Longitudinal studies about this topic are scarce, but the effects of sedentary behaviors have been studied for many years, which helps to visualize better the effects of the lockdown.

Considering the stated above, it is vital to assess the habits of the students to identify possible sedentary behavior-related risks and implement necessary means to reduce the potential development of risk factors for chronic diseases. With the current work, it was intended to compile information about the lifestyle of the students to determine whether they display risk factors related to a sedentary lifestyle.The outcomes of this investigation could be used to promote consciousness about unhealthy habits among students and institutions and encourage them to adopt beneficial behaviors in their daily routines.



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METHODOLOGY AND METHODS

2.1 Population and sample size

The population consisted of 186 students from a calendar B school in north Bogotá, from grades 9, 10, and 11, with ages ranging from 15 to 18 years old. The sample size was calculated using the survey sample calculator Raosoft. Considering a margin of error of 3.8%, the sample size was 146 students.

“Recent reports have shown the correlation between lockdown and a sedentary lifestyle, weight gain, and other diseases.»

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2.2 Data collection

To collect data, the Adolescent Sedentary Activity Questionnaire (ASAQ) was used. This has been proven to have good to excellent reliability (Hardy et al., 2007. The ASAQ was adapted to the lockdown context and purpose of the study. The survey contained questions about sedentary activities (Screen- and study- based among others), physical activity (frequency and duration), eating habits, self-reported body weight gain, and the effects on health of sedentary behaviors. In the adaptation, the most relevant sedentary activities in the lockdown were selected, and the variables of physical activity, body weight gain, eating habits and the effects on health were added. The gathering of information was conducted by means of a digital survey in October 2021.I

2.3 Data analysis

The data was processed with the Excel program. For the sedentary behaviors and physical activity (duration), data is illustrated with the mean and standard deviation for each of the measured activities, including gender-individual results. For the effects on health, eating habits, body weight gain workout frequency, results were differentiated by gender.

RESULTS Y DISCUSION.

The number of surveyed students was 146. 50.68% of them were male students and 49.32 % were female students (Table 1).

Figure 1 displays an average of 6.06 ± 4.1 hours/day of sedentary behavior

Gender	n = 146	
	n	%
Male	74	50,68
Female	72	49,32

Table 1. Gender of the surveyed

according to the self-reports of the students. In addition, Table 2 shows more detailed results in terms of the domain of the sedentary activity and the gender. The sedentary activity students dedicated the most time on average was seating (9.97 h), while the least was doing homework without a computer (0.57 h). On 5 of the 8 activities, female students reported more time on average than male students, particularly on those in which students dedicated higher amounts of time such as computer usage for school, sitting, and cell phone usage.

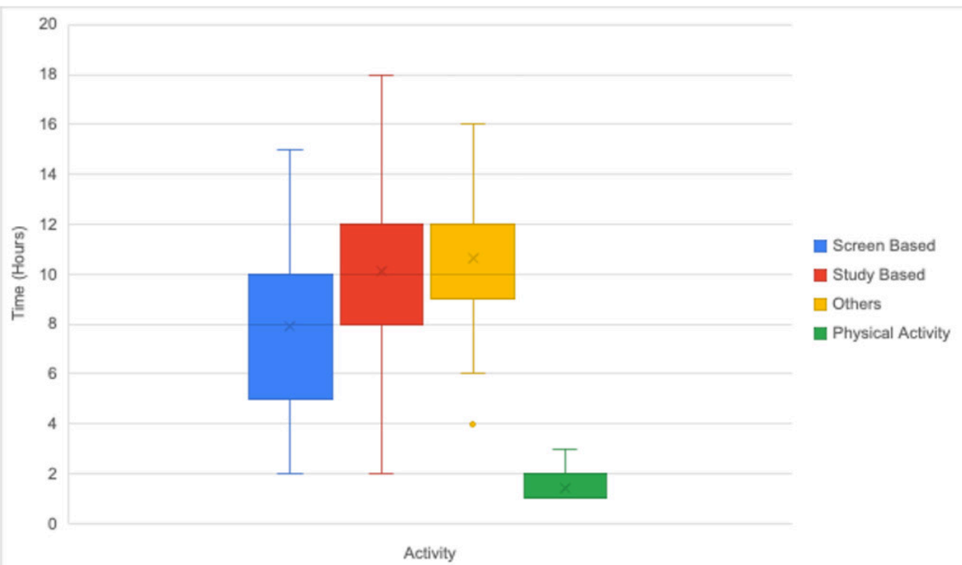

Figure 1. Self-reported average time dedicated to sedentary activities and physical activity

No	Items	n = 146					
		Both genders		Male		Female	
		Mean	SD	Mean	SD	Mean	SD
Screen-based activities							
1.	Computer use for leisure	2,03	1,28	2,16	1,19	1,90	1,35
2.	Cell phone use for leisure	4,84	2,63	4,46	2,75	5,24	2,47
3.	Television viewing	1,04	1,23	1,15	1,29	0,93	1,15
Study based activities							
4.	Computer use for school	9,56	2,33	9,05	2,27	10,08	2,29
5.	Doing homework without computer	0,57	1,02	0,54	0,89	0,60	1,13
Other sedentary activities							
6.	Sitting	9,97	2,49	9,78	2,58	10,17	2,39
7.	Non-academic reading	0,68	1,08	0,46	0,83	0,92	1,25
Physical activity							
8.	Workout	1,38	0,62	1,54	0,73	1,22	0,45

Figure 1. Self-reported average time dedicated to sedentary activities and physical activity

As for the workout frequency, most of the students reported to work out at least 2 times per week (Figure 2). Those who exercised 1 time per week or less were considered physically inactive. They represent 35% of the total sample (51 students). It can be observed that female students had less workout frequency than their male counterparts. While the most reported frequency for male students was 4-5 times per week, female students reported the most 2-3 times per week.

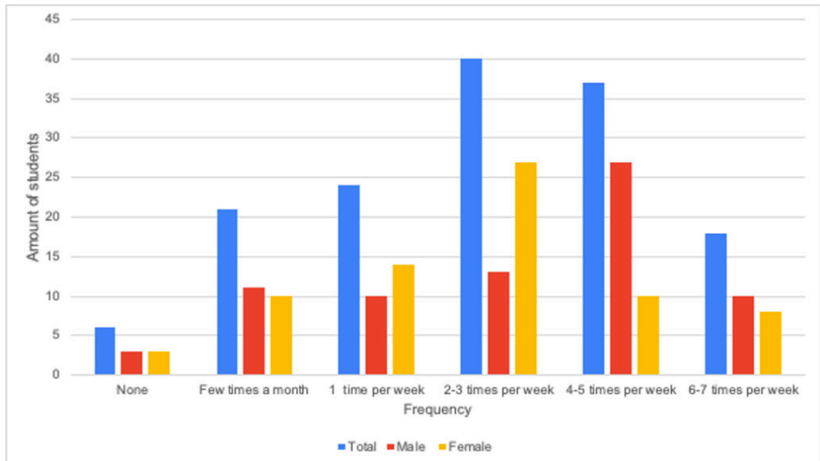

Figure 2. Self-reported workout frequency

Subsequently, students were asked to report if they ate in excess during this period (Figure 3). Most students admitted eating in excess, specifically female students.

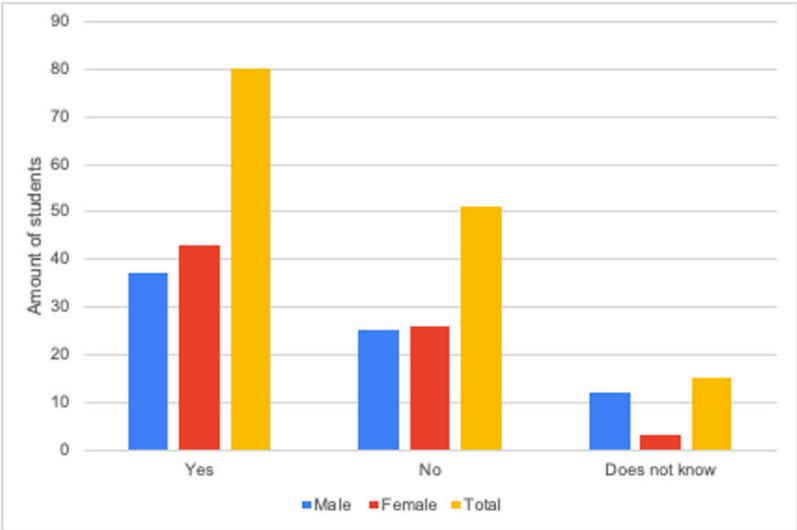

Figure 3. Eating in excess self-report

Furthermore, students also reported any change in their body weight (Figure 4). While 65 students did not perceive any change, 46 of them did gain body weight and 35 lost body weight. Additionally, more female students reported gaining and losing body weight than male students.

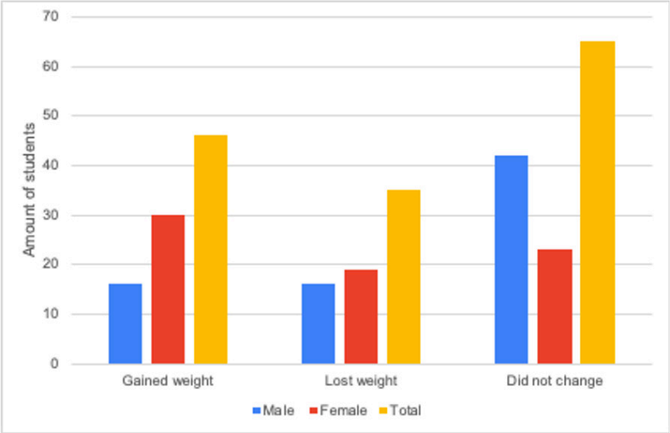

Figure 4. Change in body weight self-report

Lastly, students reported some of the most common symptoms of sedentarism they felt during lockdown (Figure 5). The most reported was back pain, followed by joint pain (excepting wrists), wrist pain, and shortness of breath. In all the effects female students reported more than male students.

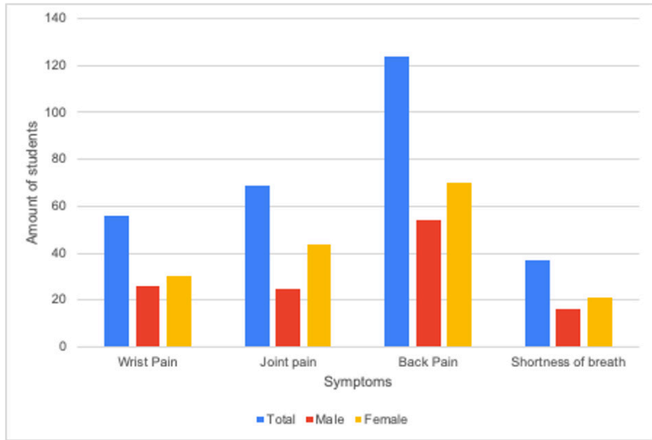

Figure 5. Frequency of effects on health self-report

The present study provides evidence that suggests a relation between the lockdown period and sedentarism, along with its health consequences on the students at the studied school. Furthermore, female students seem to have been more affected by lockdown than their counterparts.

Most of the students exercised on a regular frequency, nevertheless, 35% reported being physically inactive (Figure 2). The World Health Organization (2020) recommends children between 5 and 17 years to exercise at least 3 times per week for 60 minutes. This may demonstrate a significant, albeit smaller than expected, prevalence of physical inactivity (PI) related to lockdown. These results are consistent with other similar studies conducted in other countries, where they found a similar trend in the decrease of PI during the lockdown. (Androutsos et al., 2021; Jia et al., 2021; Medrano et al., 2020; Stockwell et al., 2021). Gender-wise, female students on average engaged less in physical activity in terms of frequency (2-3 times per week) and duration (1.22 hours on average) than male students (3-4 times per week and 1.54 hours on average), as seen in Table 2 and Figure 2. This contradicts what was found by Elnaggar et al.(2020), who reported that male students reduced their physical activity (PA) after the imposition of lockdown in Saudi Arabia. Nevertheless, this could be

related to socioeconomic, regional, and cultural differences between studies, variables not considered in this investigation.

Another finding was that overall, students had an unhealthy amount of SBs during this period (6.06 ± 4.1 hours/day). Students seated on average for 9.97 hours, including both academic and non-academic activities (Table 2), exceeding the healthy threshold of 6-8 hours (Patterson et al., 2018). For almost every student, the use of a computer was indispensable for their academic activities, thus the few students who did homework without a computer (Table 2). Consequently, the screen time in this period was significantly high, on average 8 hours just for leisure (Figure 1). Other studies conducted over the same period of time, also found a significant increase of 2-3 hours in the screen time of students around the world (Androutsos et al., 2021; Jia et al., 2021; Medrano et al., 2020; Stockwell et al., 2021). It is important to highlight that all the evaluated sedentary activities had a significant duration among students (Table 2), nonetheless, the ones that students dedicated more time to, were computer usage in general (11.6 hours), sitting (9.97 hours), and cell phone usage (4.84 hours), while the least common were watching television (1.04 hours), non-academic reading (0.68 hours) and doing homework without computer (0.57 hours). This may suggest that the time that was not dedicated to PA or to sleep was for numerous students a sedentary activity in front of a screen. In addition, female students reported more time in sedentary activities, specifically in the one students dedicated most of their time (Table 2).

Eating habits and the change in body weight were partially consequent with the PA and SB reported by students. Regardless of the eating frequency, results indicate that more than half of the students ate more than they would normally eat (Figure 3). Flaudias et al. (2020) found that the stress related to lockdown and social distancing was associated with binge-eating, which is consistent with the findings in this research. In an unanticipated way, this was more common in females than in males (Figures 3). Consequently, 31% (46 students) of the students gained weight (Figure 4), supported by the findings of other studies (Androutsos et al., 2021; Jia et al., 2021; Martínez-de-Quel et al., 2021) who reported that there was a general body weight gain in students from different parts of the world. Regarding females, a study by Sánchez et al. (2021) suggests being female is a risk factor for body weight gain in the COVID-19 lockdown, possibly attributed to their smaller bodies, thus needing fewer calories. This could explain why females tended to report body weight gain more than male students (Figure 4). It appears to be a case of the change in eating habits during the lockdown. While it is true that in quarantine positive practices were found in cooking-related variables, such as healthy home cooking, Murphy et al. (2020) points out that there was an increased intake of saturated fats during this period. This may explain how the calorie intake was not thoroughly balanced by the burning of calories for some individuals, specifically for females, who did less physical activity and had more SBs (Table 2). Moreover, another study by Ruiz-Roso et al. (2020), that investigated the dietary trends of adolescents in Spain, Italy, Brazil, Colombia, and Chile, states that although families had better cooking and eating habits, the study group revealed an elevated consumption of sweet food, possibly associated with boredom and stress. As for the students who did not change body weight, principally male students, we speculate that this might be due to a neutral energy balance (Callahan, 2020), as a result of the amount of time male students dedicated to PA (3-4 times per week and 1.54 hours in average).

The results imply that physiological health effects were widely prevalent throughout the sample. In order of prevalence, back pain came first, followed by joint pain (excepting the wrists), wrist pain, and finally shortness of breath (Figure 5). Back pain was the most reported physiological effect (Figure 5), which could be explained by the prolonged sitting times, and high amounts of PI and SB (Jung et al., 2020; Lemes et al., 2021) students were exposed to while attending their classes using the computer. Furthermore, the findings of joint pain are directly in line with another study that suggests that PI and sedentarism can cause damage to the neuromuscular junctions, consequently causing pain (Narici et al., 2020). As for wrist pain, the results indicate a less yet important prevalence (Figure 5), possibly explained by a study that points out a relationship between excessive use of the mouse and keyboard and carpal tunnel syndrome (Shiri & Falah-Hassani, 2015). Finally, for shortness of breath, 25% (37 students) of the students reported feeling it (Figure 5). This is consistent with what has been found in previous investigations (Ried-Larsen et al., 2017), which imply that the loss of cardiorespiratory fitness is related to PI. In all 4, the female students seem to be more susceptible to suffer from them (Figure 5). This may be demonstrated by the little time they engaged in PA(compared to male students) and the elevated amount of time they devoted to SBs (computer usage, specifically referring to wrist pain).

Although there are several studies that corroborate the usefulness of the instrument used in this study (Hardy et al., 2007; Guimarães et al) there are limitations that impact the reliability of the data presented. Firstly, the Hawthorne effect produces a change in the behavior in response to the awareness of being observed (Wullems et al., 2016), and indeed, it is known that people self-report more time of physical activity compared to objective device measures, and in addition, under-report time spent in sedentary activities (Prince, 2020). Secondly, the survey was conducted a year after the quarantine ended, therefore this instrument appeals to people's memory. For this reason, it is not possible to prove if this information is totally accurate, thus the conclusions and inferences can only be given as probable. In spite of the limitations of the instrument, these results allow to some degree to generate a background about the possible impact of the pandemic on students from the studied school. These findings may help to raise awareness in the student community about their health habits and the consequences of sedentarism. Moreover, this report could also promote actions by the school to increase physical activity among students. Further research is needed to establish a concrete relationship between sedentarism and its effects on health with the lockdown. This could be done through the analysis of specific medical records, cases of students, and comparisons with pre-and post-pandemic data. Furthermore, more age ranges would allow to determine if the effects of sedentarism derived from the pandemic are age-dependent. It is also recommendable to increase the sample size to have a general overview of the incidence in a more general population.

CONCLUSION

The COVID-19 pandemic has contributed to an increase in sedentary behaviors among school students. This study shows that students exceeded the healthy limits of sedentarism, with a considerable amount of them being physically inactive. Furthermore, eating in excess and weight gain had remarkable importance in the results. Consequently, an elevated number of students reported feeling back, joint, and wrist pain, accompanied by shortness of breath, all of these being symptoms of sedentarism and aggravated by physical inactivity. Results suggest that female students were more affected by these, caused by their elevated sedentarism, physical inactivity, and binge-eating.

These results serve as a basis for future research to validate the relationship between lockdown and its impact on health. It is important to point out that the current results correspond to a specific population, and to have a wider objective view of the actual impact of the lockdown, future studies involving different populations exposed to different conditions should be conducted. In addition, the habits in a post-pandemic condition must be included to compare results and evaluate more accurately the effects of virtual schooling on the health of students.

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