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RESEARCH LETTER

Brazilian adolescents' lifestyle in the COVID-19 pandemic: a mixed-methods study

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The COVID-19 pandemic has forced the health authorities and governments worldwide to engage in a battle against the disease, adopting several mitigation strategies [1]. Since then, the world population has been affected by various changes in its routines. Restrictions imposed by the COVID-19 pandemic are believed to have had an impact on adolescents' lifestyle (LS) [2]. The LS is determined by discernible behavior patterns that can trigger effects on adolescents' health and is related to countless aspects that reflect attitudes, values and life opportunities [3]. Therefore, LS can be observed from the habits, behaviors and activities performed by people in their daily lives [4].

In particular, while being in a crucial period of their bio-psycho-socio-spiritual development, adolescents have experienced this disturbed period in a much more intense way [5]. Therefore, it is necessary to know the Brazilian adolescents' LS, to understand how the COVID-19 pandemic has exerted an impact on LS, and to try to mitigate the possible consequences on adolescents' health in the short, medium and long term. Thus, the purpose of this study was to analyze the adolescents' lifestyle in the context of the COVID-19 pandemic.

To achieve this objective, we developed a mixed-method study with a sequential and explanatory design given the complexity of the object of study. It was guided by the Mixed Methods Appraisal Tool [6]. In the first phase (quantitative), a cross-sectional and observational study was conducted; in the second phase (qualitative), the choice was to resort to an exploratory study with a qualitative approach to seek better explanations for the findings obtained in the quantitative phase [7]. A diagram representing the study is shown in Fig. 1. This research was approved by the Research Ethics Committee (No.4,661,013). Consent was obtained from participants and parents or guardians.

The research participants were adolescents aged between 15 and 18 years attending 21 public schools and four private schools that supported the research. In the quantitative phase, a stratified probability sampling design was chosen that considered the education network as strata (public vs. private). The sample size was calculated considering a 95% confidence level, 50% for the phenomenon, a population size of 21,164 and a 5% error. These resulted in an expected minimum sample of 377 individuals (287 from public schools and 90 from private schools educational institutions). However, a sample 27.1% higher than expected was obtained, being proportional to the size per stratum. In the qualitative phase, 16 adolescents investigated in the first phase selected intentionally were.

The students were invited to participate in the study through group messages on instant messaging apps administered by the schools or through email messages directed to the adolescents' parents or guardians. Data collection for the quantitative phase was conducted between April and June 2021.

Data collection took place via an electronic form (Google forms®), containing 25 questions from the Fantastic Lifestyle (FLS) questionnaire, which was adapted and validated for use in Brazil. The FLS contains nine domains and has the following classification: 0–34 (needs improvement); 35–54 (fair); 55–69 (good); 70–84 (very good); and 85–100 (excellent) [8]. Sequentially, qualitative data collection in July 2021 through five focus groups (FGs) was made. Recruitment was terminated due to reaching sufficient information power [11].

The FGs were conducted by a research nurse and two undergraduate nursing students. A video call meeting was held with each group via a messaging app, following key moments based on the previous research [12]. The meetings length varied between 51 and 106 minutes and

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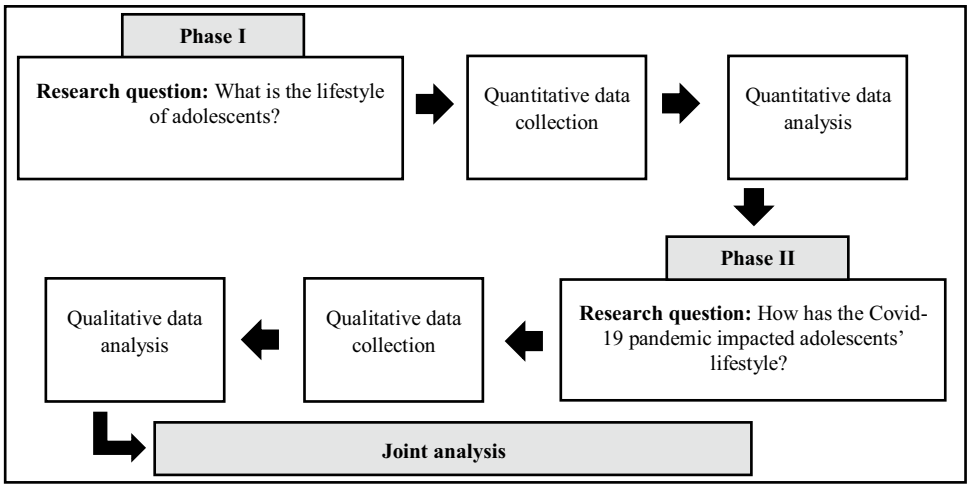

Fig. 1 Diagram representing the study design

were initiated with the following stimulus: "Tell me how your lifestyle has been during the COVID-19 pandemic". Afterward, other more specific questions regarding the FLS domains were asked with a provocative intention to allow for a debate.

Then, the interviews were transcribed verbatim and, subsequently, organized by codes and submitted to Bardin's Content Analysis [13]. The quotations from the participants were presented containing the fictitious names chosen by them, their age and the score obtained in the FLS. After collecting and analyzing the quantitative and qualitative data, in clear and separate stages, their integration was carried out with the discussion of the findings, through the connection and joint assessment of the quantitative and qualitative results interpreted.

All statistical analyses were performed using the *R* software. A permutation test of independence was performed in the comparisons of scores for the type of school and for the gender, in each school because of the effect of gender–school interaction [9]. Cohen's d statistic was calculated for the effect size of the difference between means, wherein $0.2 \leq |d| < 0.5$ indicates small effect, $0.5 \leq |d| < 0.8$ indicates moderate effect and $|d| \geq 0.8$ indicates large effect. 95% bootstrap confidence intervals also were calculated [10]. 5% was adopted as the significance level. Cronbach's alpha values of FLS were calculated, which presented good internal consistency ($\alpha = 0.81$).

A total of 479 adolescents participated in the quantitative phase, of which 74.11% were female, with a mean age of 16.03 years (SD = 1.01) and with 81% that attended

Table 1 Adolescents' lifestyle by Fantastic Lifestyle (FLS) domains, general and according type of school ($n = 479$)

FLS domains (scores)	General	Type of school		*P* value*	Cohen's *d* (95% CI)
		Private	Public		
	Mean ± SD	Mean ± SD	Mean ± SD		
1. Family and friends (0–8)	4.76 ± 2.40	5.76 ± 2.01	4.53 ± 2.42	< 0.01	0.5 (0.32, 0.73)
2. Activity (0–8)	2.95 ± 2.57	3.20 ± 2.63	2.89 ± 2.56	0.30	0.1 (− 0.11, 0.35)
3. Nutrition (0–12)	5.82 ± 2.97	7.07 ± 3.15	5.53 ± 2.86	< 0.01	0.5 (0.24, 0.76)
4. Tobacco and toxics (0–16)	14.24 ± 2.08	14.53 ± 1.73	14.18 ± 2.15	0.15	0.2 (− 0.03, 0.35)
5. Alcohol (0–12)	11.30 ± 1.64	11.38 ± 1.26	11.28 ± 1.72	0.58	0.1 (− 0.13, 0.24)
6. Sleep, seatbelt, stress and safe sex (0–20)	12.99 ± 3.77	14.25 ± 3.02	12.70 ± 3.87	< 0.01	0.4 (0.21, 0.61)
7. Type of behavior (0–8)	4.28 ± 2.15	4.48 ± 2.01	4.23 ± 2.18	0.31	0.1 (− 0.09;0.35)
8. Insight (0–12)	5.99 ± 3.37	6.63 ± 3.12	5.84 ± 3.41	0.04	0.2 (0, 0.45)
9. Career (0–4)	1.98 ± 1.37	2.10 ± 1.21	1.95 ± 1.41	0.36	0.1 (− 0.09, 0.33)
Total (0–100)	64.31 ± 13.03	69.4 ± 11.02	63.12 ± 13.19	< 0.01	0.5 (0.28, 0.69)

SD standard deviation, *CI* BCa bootstrap confidence interval *Permutation test of independence

public schools. Table 1 presents the analysis of the FLS domains, general and according to type of school. In general, the LS of the adolescents researched was considered good. We identified a moderate relationship between lifestyle and type of school ($P < 0.01$; $d = 0.5$). However, among the domains, only 1 and 3 showed a moderate relationship with the type of school ($P < 0.01$; $d = 0.5$ in both). Domains 6 and 8 showed a small relationship with the type of school.

The quantitative findings demonstrated that there was a moderate relationship between lifestyle and gender among adolescents attending public schools ($P < 0.01$; $d = 0.5$) (Table 2). However, among the FLS domains, only 3 and 8 showed a moderate relationship with gender ($P < 0.01$; $d = 0.5$ and 0.6, respectively). Domains 2, 6, 7 and 9 showed a small relationship with gender in public school students.

In the pandemic context, some adolescents reported better relationships with their family because they had more time to talk and develop shared activities. On the other hand, there were reports about difficulties in family relationships, as this scenario generated "more stress" and family misunderstandings: "*It was normal before the pandemic, until then. Now more stress, you know? More quarrels too. […]"* (Isis, 15 years old, FLS = 46). The impact of the pandemic was also noticed in the adolescents' circles of friends. With the disease control measures, especially closure of schools, many of them needed to physically stay away from their friends: "*Really, it was a huge blow, I lost a lot of friends […]"* (Aria, 16 years old, FLS = 63).

The adolescents also experienced changes in their practice of physical activities during the pandemic. Many of them used to take advantage of the school's structure to do so, especially during the physical education discipline. Therefore, there was predominance of a more sedentary LS since the beginning of the pandemic, and adolescents increasingly connected to their smartphones: "*[…] with the pandemic I got discouraged, even because of that thing of the cell phone […]. I lose time and don't even do what I did before, because before I used to do a lot of exercise"* (Mary, 17 years old, FLS = 64). While the girls considered themselves sedentary, some boys were more concerned about their physical and mental health during the COVID-19 pandemic, which prompted them to seek a more active LS: "*[…] I saw that I was having health problems also staying at home, then I started to go running, kind of to improve my self-esteem and everything else"* (Gabriel, 17 years old, FLS = 75).

Most of the adolescents reported deterioration in the quality of their eating habits and related it to the sensation

Table 2 Adolescents' lifestyle by Fantastic Lifestyle (FLS)domains according to gender by type of school ($n = 479$)

FLS domains (scores)	Types of school							
	Private				Public			
	Gender		*P* value*	Cohen's *d* (95% CI)	Gender		*P* value*	Cohen's *d* (95% CI)
	Male ($n = 28$)	Female ($n = 63$)			Male ($n = 96$)	Female ($n = 292$)		
	Mean ± SD	Mean ± SD			Mean ± SD	Mean ± SD		
1. Family and friends (0–8)	5.86 ± 1.84	5.71 ± 2.1	0.75	0.1 (− 0.34, 0.49)	4.29 ± 2.42	4.6 ± 2.42	0.27	− 0.1 (− 0.36, 0.09)
2. Activity (0–8)	3.96 ± 2.95	2.86 ± 2.42	0.06	0.4 (− 0.09, 0.87)	3.68 ± 2.93	2.63 ± 2.37	< 0.01	0.4 (0.16, 0.68)
3. Nutrition (0–12)	6.96 ± 3.18	7.11 ± 3.16	0.84	0.0 (− 0.49, 0.43)	6.49 ± 2.76	5.22 ± 2.82	< 0.01	0.5 (0.21, 0.67)
4. Tobacco and toxics (0–16)	14.89 ± 1.13	14.37 ± 1.92	0.18	0.3 (− 0.08, 0.62)	14.19 ± 2.63	14.17 ± 1.97	0.96	0.0 (− 0.25, 0.26)
5. Alcohol (0–12)	11.64 ± 0.87	11.27 ± 1.39	0.19	0.3 (− 0.12, 0.6)	11.26 ± 2.13	11.28 ± 1.57	0.91	0.0 (− 0.3, 0.26)
6. Sleep, seatbelt, stress and safe sex (0–20)	14.79 ± 3.56	14.02 ± 2.74	0.26	0.3 (− 0.26, 0.76)	13.72 ± 3.75	12.36 ± 3.85	< 0.01	0.4 (0.12, 0.59)
7. Type of behavior (0–8)	4.86 ± 2.19	4.32 ± 1.92	0.24	0.3 (− 0.22, 0.76)	4.67 ± 2.14	4.09 ± 2.18	0.02	0.3 (0.03, 0.49)
8. Insight (0–12)	7.18 ± 2.98	6.38 ± 3.16	0.26	0.3 (− 0.2, 0.67)	7.23 ± 3.58	5.38 ± 3.23	< 0.01	0.6 (0.3, 0.82)
9. Career (0–4)	2.29 ± 1.21	2.02 ± 1.21	0.33	0.2 (− 0.19, 0.7)	2.3 ± 1.44	1.84 ± 1.38	< 0.01	0.3 (0.08, 0.59)
Total (0–100)	72.43 ± 12.04	68.05 ± 10.36	0.08	0.4 (− 0.07, 0.88)	67.82 ± 13.46	61.57 ± 12.75	< 0.01	0.5 (0.23, 0.73)

SD standard deviation, *CI* BCabootstrap confidence interval *Permutation test of independence

of anxiety caused by the pandemic. Spending more time at their homes made them change their eating routine times and consume more industrialized and ultra-processed food products: *"I think that I ate pretty badly after the pandemic"* (Luiza, 16 years old, FLS = 51). In relation to sleep, the adolescents say that in this period, they started to go to bed at later times, inverting their circadian rhythm, and for this reason, they slept during the day to recover from sleep deprivation: "*In the morning I feel sleepy, I feel very sleepy, but at dawn I'm not sleepy at all, you know?, exchanging day for night"* (Emily, 17 years old, FLS = 38). Dissatisfaction with emergency remote teaching (ERT) is a consensus among the interviewees, the adjectives "very bad", "bad" and "awful" were frequent in their statements: *"[…] in my opinion, the school was very bad! […] I'm not at all happy! It's very bad!"* (Luiza, 16 years old, FLS = 51).

This study identified that the adolescents' LS in the pandemic context was classified as "good", according to score classification [10]. The quantitative findings demonstrate that there was a moderate relationship between lifestyle and type of school. The difference between the genders was evidenced only among adolescents attending public schools. The adolescents' reports in the qualitative phase point out that the pandemic scenario imposed considerable changes in their habits and behaviors.

The quantitative results showed that the Family and Friends domain score was lower among students from public schools, with moderate relation. It is known that public school students are the ones with greater socioeconomic vulnerability and that this interferes with relationships. In line with this, the qualitative findings show the presence of more family stress and greater affective detachment from peers during the pandemic. It is emphasized the protective importance of proximity to the family and peers in reducing the intensity of the stress experienced during the pandemic [14].

Although with small relationship in the quantitative phase, it was observed that among public school students, girls had lower scores than boys in the domain activity. Furthermore, the most sedentary lifestyle was evident in the reports of the girls interviewed, which revealed discouragement to participate in sports during the pandemic. Another study developed in Spain identified that the confinement substantially reduced the levels of physical activity and consumption of fruits and vegetables, in addition to increasing exposure to screens [15].

The results of the quantitative phase also showed that the worst eating styles were among public school students, especially among girls. In the qualitative phase, the participants revealed that the pandemic influenced their diet. The changes in eating behavior during the pandemic were driven by contextual factors, such as lockdown conditions, and personal factors, such as anxiety related to COVID-19, loss of income, household composition and gender [16]. Therefore, our results help to identify that the students of public schools were more vulnerable to nutritional changes during the pandemic, especially the girls, and that potential avenues could be explored to minimize the negative effects of the pandemic on food intake.

However, with a small relationship in the quantitative phase, the score related to the sleep domain was lower among public school students, especially in females, and the qualitative findings show deterioration in the sleep pattern of this population with the arrival of the pandemic. This is a reflection of the abrupt change in daily school life and the disturbance of daily habits, which normally serve as regulators of the sleep–wake rhythms [17]. Sleep plays an important role in the regulation of the brain functions and in the physiology of the body. Thus, adequate time and regularity are necessary for healthy sleeping habits [18] and should be encouraged.

With regard to career, the quantitative results pointed to the low overall score and qualitative findings clarify it better. Girls attending public schools were more dissatisfied with their careers, compared with boys attending the same schools. Other researchers also provided evidence that the changes from face-to-face teaching to ERT exerted a direct impact on the adolescents' satisfaction with their studies [19]. The Brazilian educational systems had difficulties dealing with this crisis. However, it is essential to act in defense of quality education, providing the elaboration of all the necessary aspects for efficient learning in the face of new contexts presented [20].

Just as this study showed a gender difference between the lifestyle of public school students; another study in high school students from South Korea revealed that the girls showed unhealthier lifestyle-related behaviors and greater vulnerability to poor mental health, including lower sleep satisfaction, stress, depression, and suicidal thoughts [21]. These results suggest that education and health institutions should consider the needs of each gender separately. A gender-specific approach to maintaining healthy lifestyles and good health status among senior high school students is highly recommended [21].

This study is limited to a local survey, in a capital city of the Brazilian Midwest region, developed through the collection of virtual data. Self-reporting questionnaires are susceptible to social desirability bias, therefore, future longitudinal studies should explore the findings of the current research in more detail and using diversified measurement methods to further increase reliability of the results.

In conclusion, it was possible to verify that the Covid-19 pandemic impacted the lifestyle of the participants. In addition, lifestyle was more harmful among adolescents who studied in public schools, mainly those of the female gender.

This identified lifestyle can evolve to levels of excellence from health-care measures especially aimed at actions that enhance healthier and more balanced lifestyles during and after the pandemic period through good health education practices, considering the difference between genders.

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Data availability All data will be made available upon request.

Declarations

Ethical approval The research was approved by the Research Ethics Committee (No. 4,661,013).

Conflict of interest No financial or non-financial benefits have been received or will be received from any party related directly or indirectly to the subject of this article. The authors declare no financial or non-financial conflicts of interest related to this study. The authors were not involved in the journal's review of, or decisions related to, this manuscript.

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