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Adolescents Emotional State and Behavioral and Dietary Habit Changes during Isolation Due to the COVID-19 Pandemic

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ABSTRACT

Introduction: The coronavirus disease 2019 (COVID-19) was recognized as a pandemic by the World Health Organization on March 11, 2020. As an infectious disease with no specific treatment, several measures have been established to minimize the outbreak of this disease, including social isolation.

Objective: To evaluate the behavior of adolescents during the isolation period.

Methods: This is a cross-sectional descriptive study conducted at the Adolescent Health Studies Center. Data were obtained from a questionnaire prepared on Google Forms, sent by a multiplatform instant messaging application, and analyzed using the Stata 14 software.

Results: A total of 208 adolescents with a mean age of 15.3 years (SD ± 1.8) answered the questionnaire, 57.7% were female. About 93.3% of adolescents said they were in isolation with a changed routine, 67.3% increased their food consumption, 86.5% were inactive, and 58.7% reported screen time over 8 h/d. There was an association between anxiety and increased food consumption (odds ratio: 3.9; CI 95% 2–7.5; $p=0.00$), sleeping difficulty (odds ratio: 3.6; CI 95% 1.9–6.8; $p=0.00$), and conflicting family relationship (odds ratio: 5.7; CI 95% 1.6–7.8; $p=0.01$).

Conclusion: The study revealed that social isolation due to an infectious disease was associated with several effects on the behavior and eating behavior of adolescents, which need to be acknowledged to encourage them to lead a healthy lifestyle after the COVID-19 confinement.

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KEYWORDS

SARS-CoV-2; adolescents; feeding behavior; depression; social isolation

Introduction

In December 2019, humanity faced a new challenge in the form of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which caused the coronavirus disease 2019 (COVID-19) (1). This disease was declared a pandemic by the World Health Organization on March 11, 2020, requiring several measures to reduce virus transmissions, such as social isolation and closing schools, universities, clubs, squares, parks, gyms, restaurants, bars, and stores in general (2).

People from all age groups can be infected with SARS-CoV-2. However, epidemiological considerations suggest a higher incidence and severity in older men, smokers, and patients with comorbidities such as heart disease, chronic obstructive pulmonary disease, diabetes mellitus, and others (3, 4). In children and adolescents, 55% of cases are asymptomatic or mild, 40% are moderate, 5% are severe, and <1% are extremely severe (5).

According to the WHO (6), so far, there is no specific antiviral treatment. The mitigation measures and preventive actions adopted by the authorities in controlling COVID-19 are relevant strategies in combating the spread of this virus (2).

To reduce the transmissibility of COVID-19, social isolation was recommended as one of the main control measures. Consequently, the family dynamics and behavior of children and adolescents have undergone several changes and adaptations. The parents had their routine modified by the home office and overload of housework; some experienced declining family income and even unemployment. Adolescents experienced the limitation in their coming and going, the separation from friends and peers, interrupted their usual and school activities and started to spend more time with their family (7).

However, social isolation affects the adolescents' entire psychosocial development process. It can also result in mental health problems due to emotional suffering, an emotional state of fear, anxiety, irritability, sadness, and stress, and withdrawal behaviors (8). Further, these emotional state are often associated with increased interpersonal conflicts resulting from closer family life and lack of privacy. Studies carried out among the adolescent population during this pandemic revealed that social isolation led to behavioral changes in adolescents, such as increased use of screens, reduced physical activity, inadequate diet, weight gain, in addition to emotional changes (9–11).

The Adolescent Health Studies Center (NESA) is responsible for comprehensive adolescent health care at the State University of Rio de Janeiro (UERJ) and brings together different levels of care (Primary, Secondary, and Tertiary), providing comprehensive health care and assistance, teaching, and research functions. Due to its broad experience in adolescent care, NESA conducts research that supports the implementation of actions aimed at mitigating the impacts of COVID-19, in addition to assisting the creation of specific public policies for this age group. Therefore, this study aimed to assess the behavior of our adolescents in the outpatient clinic of NESA during the isolation period due to the COVID-19 pandemic.

Materials and methods

This cross-sectional descriptive study was conducted at NESA between June 1 and 30, 2020. Collected data were obtained through the administration of an anonymous online structured questionnaire, elaborated on Google Forms (Google LLC, Menlo Park, CA, USA). Adolescents were invited to participate in the survey by telephone and the questionnaire was distributed by a multiplatform instant messaging application (WhatsApp). The target population was 500 adolescents aged between 12 and 18 years, of both sexes, followed up at the NESA clinic.

The structured questionnaire consisted of four parts: (1) Sociodemographic characteristics, including sex, age, adolescent's education levels, family head educational background. (2) Disease chronic (presence and kind). (3) COVID-19 (diagnostic and evolution) and protective actions including mask-wearing, hand washing practice, and alcohol use. (4) Emotional state and adolescent's behavior during isolation, including the relationship with family; remote study; home office, financial difficulty, feeding behavior; physical activity; adolescents and their families drug use (tobacco, alcoholic beverages, and other drugs); sleep and screen time.

Variable definitions

The independent variables included sociodemographic characteristics, these variables consisted of: sex (male, female), age (12–14, 15–18 years), adolescent's educational level (incomplete elementary, elementary, incomplete high and high), family head educational background (illiterate/incomplete elementary, elementary/incomplete high, high/incomplete higher and higher education). Presence of chronic disease (no, yes) and for those who answered "yes," we included a question about the kind of chronic disease: pulmonary disease (including asthma), cardiovascular disease, blood disorders, kidney disease, liver disease, endocrine disorders (e.g., diabetes mellitus) and obesity. COVID-19 diagnosis for adolescents and their guardian (no, yes). As for behavior, during the period of social isolation, the following items were studied: remote study - the adolescents have been asked if they have taken class remotely for the isolation period; eating behavior - The eating behavior block included

the question about changes in the eating, being considered as answer options: "Yes, eating more," "yes, loss of appetite," and "no changes." In case of eating more, the adolescent should indicate which food was being more consumed. "Another behavior evaluated in the same questionnaire was about having breakfast, with the following answer options: "no," "almost always," and "always." The answers "almost always" and "always" were grouped for the analysis, obtaining the variable "yes." Sleep - in this block, the adolescents should inform about sleeping difficulty (no, yes) and sleeping duration in hours (as there is still no consensus in the literature as to the ideal amount of sleep-in adolescence, the study used the recent proposal of the National Sleep Foundation (12), which recommended that adolescents sleep no less than 8 h); screen time - assessed by enquiring the number of hours in front of the computer, TV, and video game per day (more than 2 h a day was considered excessive screen time, as recommended by the American Academy of Pediatrics) (13); physical activity level - in this item, the adolescent were required to inform the frequency (days) and time (hours and minutes) that you practiced, in last week, any physical activities, and the product between time and frequency used to determine this level. Adolescents with less than 300 min of physical activity a week are considered inactive) (14); drug use of adolescents and their families (tobacco, alcoholic beverages, and other drugs), To characterize alcohol intake, adolescents were asked if drinking at least one glass (dose) of alcohol in the last 30 days, smoking use was defined as use on one or more days during the past 30 days. These variables followed the definitions adopted by the WHO (15) and the Center for Disease Control and Prevention (CDC) in the United States (16), respectively. Adolescents reported whether they used other drugs.

The dependent variable "emotional state" was classified according to emotional state, with were measured by asking which emotional state respondents were in during the pandemic. Response options were "calmness," "anxiety," "sadness," "fear," "depression" and "anger."

Statistical analysis

Values were expressed as mean and standard deviation. Categorical variables were presented in percentages. The chi-square and Fisher's exact tests were used to compare categorical variables. The association between dependent variables (emotional state) with studied variables was performed through bivariate logistic regression. Statistical analysis was performed using the Stata 14 software and considered $p < 0.05$ as a statistical value.

Ethical issues

The study was approved by the Research Ethics Committee (REC) of Pedro Ernesto University Hospital, State University of Rio de Janeiro, CAAE: 32171020.0.0000.5259. The data were collected after guardians and the adolescents signed the Informed Consent Form and the Consent Form, respectively.

Table 1. Characteristics of Participants According to Sex

Variable	Total (n = 208)	Male n = 88 (42.3%)	Female n = 120 (57.7%)	p value
Age group (years)				0.08
12 – 14	60 (28.8%)	31 (51.7%)	29 (48.3%)	
15 – 18	148 (71.2%)	57 (38.5%)	91 (61.5%)	
Educational levels				0.006
Incomplete elementary school	63 (30.3%)	34 (54%)	29 (46%)	
Elementary school	32 (15.4%)	6 (18.7%)	26 (81.3%)	
Incomplete high school	93 (44.7%)	42 (45.2%)	51 (54.8%)	
High school	20 (9.6%)	6 (30%)	14 (70%)	
Family head educational background				0.916
Illiterate / Incomplete elementary school	16 (7.7%)	6 (37.5%)	10 (62.5%)	
Elementary school / Incomplete high school	36 (17.3%)	29 (40.3%)	43 (59.7%)	
High school / Incomplete higher education	80 (38.5%)	36 (45%)	44 (55%)	
Higher education	40 (19.2%)	17 (19.2%)	23 (47.5%)	
Chronic disease				0.272
Yes	141 (67.8%)	56 (39.7%)	85 (60.3%)	
No	67 (32.2%)	32 (47.8%)	35 (52.2%)	
Adolescent social isolation				0.546
Yes	194 (93.3%)	81 (41.7%)	113 (58.3%)	
No	14 (6.7%)	7 (50%)	7 (50%)	
Remote study				0.241
Yes	163 (78.4%)	65 (39.9%)	98 (60.1%)	
No	41 (19.7%)	20 (48.8%)	21 (51.2%)	
No study	4 (1.9%)	3 (75%)	1 (25%)	
Eating behavior change				<0.001
Eating more	140 (67.3%)	50 (35.7%)	90 (64.3%)	
Appetite loss	14 (6.7%)	4 (28.6%)	10 (71.4%)	
No change	54 (26%)	34 (63%)	20 (37%)	
Breakfast				0.008
Yes	150 (72.1%)	72 (48%)	78 (52%)	
No	58 (27.9%)	16 (27.6%)	42 (72.4%)	
Difficulty sleeping				<0.001
Yes	97 (46.6%)	27 (27.8%)	70 (72.2%)	
No	111 (53.4%)	61 (54.9%)	50 (45.1%)	
Sleep duration (hours)				0.435
< 8	74 (35.6%)	27 (36.5%)	47 (63.5%)	
≥ 8 e ≤ 11	126 (60.6%)	57 (45.2%)	69 (54.8%)	
> 11	8 (3.8%)	4 (50%)	4 (50%)	
Screen time (hours)				0.024
≤ 2	15 (7.2%)	9 (60%)	6 (40%)	
> 2 e ≤ 5	40 (19.2%)	21 (52.5%)	19 (47.5%)	
> 5 e ≤ 8	31 (14.9%)	17 (54.8%)	14 (45.2%)	
> 8	122 (58.7%)	41 (36.6%)	81 (66.4%)	
Physical activity level				0.448
Inactive (<300 min)	180 (86.5%)	78 (43.3%)	102 (56.7%)	
Active (≥300 min)	28 (13.5%)	10 (35.7%)	18 (64.3%)	
Emotional state				
Calmness	45 (21.6%)	34 (75.6%)	11 (24.4%)	<0.001
Anxiety	137 (65.9%)	42 (30.7%)	95 (69.3%)	<0.001
Sadness	68 (32.7%)	11 (16.2%)	57 (83.8%)	<0.001
Fear	38 (18.3%)	11 (28.9%)	27 (71.1%)	0.065
Depression	57 (27.4%)	9 (15.8%)	48 (84.2%)	<0.001
Anger	62 (29.8%)	20 (32.3%)	42 (67.7%)	0.05
Family relationship				0.04
Better	27 (13%)	14 (51.8%)	13 (48.2%)	
Worse	7 (3.4%)	3 (42.9%)	4 (57.1%)	
No change	137 (65.9%)	63 (46%)	74 (54%)	
Conflictig	37 (17.8%)	8 (21.6%)	29 (78.4%)	
Use of drugs of adolescent				0.06
No	188 (90.4%)	75 (39.9%)	113 (60.1%)	
Alcohol	14 (6.7%)	8 (57.1%)	6 (42.9%)	
Smoking	4 (1.9%)	4 (100%)	0 (0%)	
Others	2 (1%)	1 (50%)	1 (50%)	
Financial difficulty				0.385
Yes	57 (27.4%)	27 (47.4%)	30 (52.6%)	
No	151 (72.6%)	61 (40.4%)	90 (59.6%)	

Results

We analyzed data from 208 adolescents that answered the questionnaire, 57.7% were female and between 15 and 18 years (71.2%). The mean age was 15.3 years (SD = 1.8). The skin color predominantly reported was brown and the

level of education of the head of the family with the highest prevalence was the complete high school/incomplete higher education (Table 1).

During pandemic period, the Brazilian government provided emergency assistance to low-income or jobless

families. About 63.4% of families of adolescents in our study received this assistance, 22.6% started to receive food donations and 4.8% had previously received food. However, of these, only 26.8% reported financial difficulties during the pandemic. An association was observed between financial difficulty and low level of education, illiterate to complete elementary school of the head of the family ($p < 0.01$).

Table 1 summarizes the characteristics of the participants according to gender. All adolescents in the sample stated the use of some COVID-19 protection measure, handwashing, and the use of mask and hand sanitizer being the most prevalent ($n = 173$; 83%) and with no statistical difference between sexes ($p = 0.391$). Despite this, 20 (9.6%) adolescents said they had contracted COVID-19 (male: $n = 9$; 10.2% vs. female: $n = 11$; 9.2%; $p = 0.798$), of which 13 also had a chronic disease; all of them had a positive outcome and recovered at home. Of the group who had COVID-19, 75% ($n = 15$; $p = 0.04$) stated that they and their families were not in isolation. As for the adolescents' family, 74 (35.6%) adolescents reported that at least one family member had COVID-19, with the following outcomes: 28.4% ($n = 59$) recovered at home, 2.9% ($n = 6$) in hospital, and 4.3% died ($n = 9$).

We observed that there was a statistically significant difference between sexes concerning eating behavior changes, difficulties in sleeping, longer screen time, conflicting family relationships, and emotional states such as anxiety, sadness, depression, and anger more frequently in women ($p \leq 0.05$). Remote studying was possible in 78.4% of adolescents and there was no statistically significant difference between the sexes ($p = 0.241$). Physical inactivity was reported in 86.5% of adolescents and 58.7% reported using cell phones, computers, and television for more than 8 h/d, more frequently in girls ($p < 0.05$). A Sleeping difficulty was present in 46.6% of adolescents, more significantly frequent in girls.

Concerning eating behavior changes during confinement, most adolescents (67.3%) had a greater consumption of food, mainly bread/biscuits (47.1%); hamburger, pizza, and snacks (41.8%); soda, juice, and natural guarana (32.2%), being more frequent in females ($p < 0.05$). Most of the adolescents surveyed (72.1%) reported having breakfast every day, being significantly more frequent among boys ($p < 0.01$).

The frequency of drug use was also examined in this study. About 9.6% of adolescents used some type of drug, alcohol being the most frequent (6.7%). There was a significant association between alcohol use by the adolescent and his family ($p < 0.01$) (Table 1).

The results regarding the association of the different variables investigated with the emotional state of the adolescents are described in Table 2. There was no statistically significant difference concerning the level of education of the head of the family, remote study, drug use, financial difficulty, social isolation, and diagnosis of COVID-19 in adolescents.

Data analysis revealed that more than 90% of the adolescents and 64.4% of those responsible were in social isolation during the pandemic. Adolescents whose guardians were in isolation reported tranquility in this pandemic period

($p < 0.05$). The reasons for the adolescent and guardians not to respect the isolation were the maintenance of the job and not agreeing with this protective measure.

Sleeping difficulty was significant in those with anxiety and a conflicting family relationship ($p < 0.01$). We observed that adolescents who reported depressed mood have 11 times more sleeping difficulty ($p < 0.001$). Conflictive family relationships were more prevalent in females ($p < 0.05$). The results made it possible to identify a six times greater association between conflicting family relationships and emotional state of sadness and anxiety ($p < 0.05$) (Table 2).

Among adolescents with chronic disease (67%), there was a statistically significant association with the emotional state of depression, sadness, anxiety, and fear ($p < 0.05$). Respiratory pathologies (29,3%) and obesity (18,2%) were the most prevalent chronic diseases in our sample.

Discussion

The study demonstrated that the social isolation imposed by the pandemic changed the adolescents' lifestyle, their routines regarding food, physical activity, and sleep, and family relationships, raising doubts about the present and the future concerning this age group, which in itself face many uncertainties.

In their new routine, the adolescents began to experience measures of social isolation and home confinement, and the families were forced to use new models of coexistence. With no prediction about the duration of the pandemic, the children were confined to their homes, without access to group activities, team sports, or meetings with friends, and parents started to study daily with their children, work remotely, or were unable to work to take care of them. For those living in low-income families with a large number of members, these challenges were exacerbated and had serious implications during this period. The experience of greater coexistence among the members may have led to moments of greater stress, challenging their tolerance capacity and impacting family relationships (17). Effective strategies are necessary to strengthen the family environment to provide care and protection for the future of adolescents. In one study by Buzzi et al. (9), a survey was conducted among 2,064 adolescents and they reported that the COVID-19 pandemic affected emotions and lifestyle and influenced relationships with peers and parents. The level of conversations with parents about the pandemic during the interview period remained high for most participants and, for the authors, it was a sign of the large capacity of the adolescents to transform and overcome dramatic events.

In this study, although most adolescents reported no changes in their relationship with family members during the period of confinement, the family relationship was conflicting or even worsened, in female adolescents. In contrast, difficult times may have allowed opportunities for creative moments and stronger bonding, as can be seen in 27% of the interviewed adolescents who reported that their family relationship improved.

Table 2. Association between Emotional State and Variables of the Research

Variable	Calmness			Anxiety			Sadness			Fear			Depression			Anger		
	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor
Sex																		
Male	34 (38.6)	6.2 (2.9-13.3)	<0.001	42 (47.7)	0.2 (0.1-0.4)	<0.001	11 (12.5)	0.5 (0.2-1.1)	0.07	9 (10.2)	0.2 (0.1-0.4)	<0.001	20 (22.7)	0.5 (0.3-1)	0.05	42 (35)	1	
Female	11 (9.2)	1		95 (79.2)	1		57 (47.5)	1		48 (40)	1		42 (35)	1				
Age group (year)																		
12 – 14	12 (20)	1		40 (66.7)	1		12 (20)	1		8 (13.3)	1		16 (26.7)	1				
15 – 18	33 (22.3)	1.1 (0.5-2.4)	0.716	97 (65.5)	0.9 (0.5-1.8)	0.877	56 (37.8)	2.4 (1.2-4.9)	0.02	29 (19.6)	1.4 (0.6-3.1)	0.439	49 (33.1)	3.2 (1.4-7.3)	0.01	46 (31.1)	1.2 (0.6-2.4)	0.529
Education levels																		
Incomplete elementary school	11 (17.5)	1		40 (63.5)	1		18 (28.6)	1		14 (22.2)	1		15 (23.8)	1				
Elementary school	8 (25)	1.6 (0.6-4.4)	0.387	19 (59.4)	0.8 (0.4-2.0)	0.696	8 (25)	0.8 (0.3-2.2)	0.712	2 (6.2)	0.3 (0.1-1.1)	0.07	11 (34.4)	2.2 (0.8-5.8)	0.103	12 (37.5)	1.9 (0.8-4.8)	0.165
Incomplete high school	23 (24.8)	1.5 (0.7-3.5)	0.283	62 (66.7)	1.1 (0.6-2.2)	0.683	33 (35.5)	1.4 (0.7-2.7)	0.367	22 (23.7)	1.1 (0.5-2.3)	0.835	24 (25.8)	1.5 (0.7-3.2)	0.327	29 (31.2)	1.4 (0.7-3)	0.317
High school	3 (15)	0.8 (0.2-3.3)	0.798	16 (80)	2.3 (0.7-7.7)	0.177	9 (45)	2 (0.7-5.8)	0.176	0	0		10 (50)	4.2 (1.4-8.5)	0.01	6 (30)	1.4 (0.5-4.2)	0.589
Family head educational background																		
Illiterate / Incomplete elementary school	3 (18.7)	1		10 (62.5)	1		5 (31.2)	1		7 (43.7)	1		5 (31.2)	1		6 (37.5)	1	
Elementary school / Incomplete high school	20 (27.8)	1.7 (0.4-6.5)	0.461	46 (63.9)	1.1 (0.4-3.2)	0.917	21 (29.2)	0.9 (0.3-2.9)	0.869	7 (9.7)	0.1 (0-0.5)	0.782	16 (22.2)	0.6 (0.2-2.1)	0.446	17 (23.6)	0.5 (0.2-1.6)	0.258
High school / Incomplete higher education	10 (12.5)	0.6 (0.2-2.5)	0.508	59 (73.7)	1.7 (0.5-5.2)	0.364	31 (38.7)	1.4 (0.5-4.4)	0.573	20 (25)	0.4 (0.1-1.3)	0.135	24 (30)	0.9 (0.3-3)	0.921	32 (40)	1.1 (0.4-3.3)	0.852
Chronic disease																		
Yes	12 (30)	1.8 (0.4-7.7)	0.395	22 (55)	0.7 (0.3-2.4)	0.609	11 (27.5)	0.8 (0.2-2.9)	0.779	4 (10)	0.1 (0-0.6)	0.224	12 (30)	0.9 (0.3-3.3)	0.927	7 (17.5)	0.4 (0.1-1.3)	0.117
No	25 (17.7)	0.5 (0.3-0.9)	0.04	102 (72.3)	2.4 (1.3-4.4)	0.01	55 (39)	2.7 (1.3-5.3)	0.01	31 (22)	2.4 (1-5.8)	0.04	47 (33.3)	2.8 (1.3-6.1)	0.01	48 (34)	1.9 (1-3.9)	0.05
Adolescent social isolation																		
Yes	42 (21.7)	1.0 (0.3-3.8)	0.985	130 (67)	2 (0.7-6)	0.202	64 (33)	1.2 (0.4-4.1)	0.734	33 (17)	0.4 (0.1-1.2)	0.09	53 (27.3)	0.9 (0.3-3.1)	0.919	60 (30.9)	2.7 (0.6-12.3)	0.205
No	3 (21.4)	1		7 (50)	1		4 (28.6)	1		5 (35.7)	1		4 (28.6)	1		2 (14.3)	1	
Adolescent's guardian social isolation																		
Yes	16 (33.3)	2.2 (1.1-4.6)	0.02	24 (50)	0.4 (0.2-0.8)	0.01	14 (29.2)	0.8 (0.4-1.6)	0.553	7 (14.6)	0.7 (0.3-1.7)	0.453	10 (20.8)	0.6 (0.3-1.4)	0.247	10 (20.8)	0.5 (0.3-1.2)	0.125
No	29 (18.1)	1		113 (70.6)	1		54 (33.7)	1		31 (19.4)	1		47 (29.4)	1		52 (32.5)	1	
Remote study																		
Yes	36 (22.1)	1 (0.4-2.3)	0.985	108 (66.3)	0.9 (0.4-1.9)	0.805	52 (31.9)	0.8 (0.4-1.7)	0.569	26 (15.9)	0.7 (0.3-1.6)	0.364	42 (25.8)	0.7 (0.3-1.4)	0.284	50 (30.7)	1.1 (0.5-2.3)	0.861
No	9 (21.9)	1		28 (68.3)	1		15 (36.6)	1		9 (21.9)	1		14 (34.1)	1		12 (29.3)	1	
Eating behavior change																		
Eating more	22 (15.7)	0.3 (0.1-0.5)	<0.001	102 (72.9)	3.9 (2-7.5)	<0.001	53 (37.9)	2.7 (1.2-5.8)	0.01	30 (21.4)	2.7 (0.1-7.3)	0.06	42 (30)	2.1 (0.9-4.8)	0.06	47 (33.6)	2.9 (1.3-5.7)	0.01
Appetite loss	1 (7.1)	0.1 (0.1-0.9)	0.04	13 (92.9)	1.8 (1.2-2.3)	0.06	5 (35.7)	2.4 (0.7-8.9)	0.175	3 (21.4)	2.7 (0.1-12.9)	0.221	6 (42.9)	3.8 (1-13.5)	0.04	7 (50)	5.8 (1.6-20.9)	0.01
No change	22 (40.7)	1		22 (40.7)	1		10 (18.5)	1		5 (9.3)	1		9 (16.7)	1		8 (14.81)	1	
Sleeping difficulty																		
Yes	8 (8.2)	0.2 (0.1-0.4)	<0.001	78 (80.4)	3.6 (1.9-6.8)	<0.001	51 (52.6)	6.1 (3.2-11.8)	<0.001	24 (24.7)	2.3 (1.1-4.7)	0.03	48 (49.5)	11.1 (5-24.4)	<0.001	39 (40.2)	2.6 (1.4-4.7)	<0.001
No	37 (33.3)	1		59 (53.1)	1		17 (15.3)	1		14 (12.6)	1		9 (8.1)	1		23 (20.7)	1	
Sleeping duration (hour)																		
< 8	8 (10.8)	1		56 (75.7)	1		41 (55.4)	1		15 (20.3)	1		38 (51.3)	1		30 (40.5)	1	
≥ 8 e ≤ 11	36 (28.6)	3.3 (1.4-7.6)	0.005	74 (58.7)	0.5 (0.2-0.9)	0.02	26 (20.6)	0.2 (0.1-0.4)	<0.001	23 (18.2)	0.9 (0.4-1.8)	0.726	19 (15.1)	0.2 (0.1-0.3)	<0.001	30 (23.8)	0.5 (0.2-0.9)	0.01
> 11	1 (12.5)	1.2 (0.1-10.8)	0.885	7 (87.5)	2.3 (0.3-19.5)	0.462	1 (12.5)	0.1 (0-0.9)	0.05	0	0		0	0		2 (25)	0.5 (0.1-2.6)	0.4
Screen time (hour)																		
≤ 2	3 (20)	1		9 (60)	1		6 (40)	1		6 (40)	1		5 (33.3)	1		7 (46.7)	1	

(continued)

Table 2. Continued.

Variable	Calmness			Anxiety			Sadness			Fear			Depression			Anger		
	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor	n (%)	Odds ratio (IC 95%)	p valor
> 2 e ≤ 5	13 (32.5)	1.9 (0.5-8)	0.368	20 (50)	0.7 (0.2-2.2)	0.509	11 (27.5)	0.6 (0.2-1.9)	0.374	7 (17.5)	0.4 (0.1-1.6)	0.213	10 (25)	0.4 (0.1-1.3)	0.128	62 (29.8)	0.4 (0.1-1.3)	0.128
> 5 e ≤ 8	5 (16.1)	0.8 (0.1-3.7)	0.746	21 (67.7)	1.4 (0.4-5)	0.606	7 (22.6)	0.4 (0.1-1.6)	0.224	1 (3.2)	0.1 (0-0.5)	0.01	6 (19.3)	0.3 (0.1-1.1)	0.06	6 (19.3)	0.3 (0.1-1.1)	0.06
> 8	24 (19.7)	1.0 (0.2-3.7)	0.976	87 (71.3)	1.7 (0.5-5)	0.37	44 (36)	0.8 (0.3-2.5)	0.765	20 (16.4)	0.3 (0.1-0.9)	0.04	39 (32)	0.5 (0.2-1.6)	0.261	39 (32)	0.5 (0.2-1.6)	0.261
Physical activity level																		
< 300 min	40 (22.2)	1	0.603	117 (65)	1	0.506	61 (33.9)	1	0.354	9 (32.1)	2.5 (1-5.9)	0.05	47 (26.1)	1	58 (32.2)	1	1	0.063
≥ 300 min	5 (17.9)	0.76 (0.3-2.1)	0.603	20 (71.4)	1.3 (0.6-3.2)	0.506	7 (25)	0.7 (0.3-1.6)	0.354	9 (32.1)	2.5 (1-5.9)	0.05	10 (35.7)	1.6 (0.7-3.6)	2.92	4 (14.3)	0.3 (0.1-1.1)	0.063
Family relationship																		
Better	7 (25.9)	1	0.908	16 (59.3)	1	0.217	6 (22.2)	1	0.01	5 (18.5)	1	9 (33.3)	1	6 (22.2)	1	6 (22.2)	1	—
Worse	0	0	0.908	6 (85.7)	4.1 (0.4-9.2)	0.217	6 (85.7)	2.1 (1.1-3.5)	0.01	3 (42.9)	3.3 (0.6-19.7)	0.19	6 (85.7)	2.2 (1.2-3.6)	0.03	7 (100)	0	—
No change	37 (27)	1.1 (0.4-2.7)	0.908	82 (59.8)	1.0 (0.4-2.4)	0.954	28 (20.4)	0.9 (0.3-2.2)	0.834	23 (16.8)	0.9 (0.3-2.6)	0.827	20 (14.6)	0.3 (0.1-0.8)	0.124	27 (19.7)	0.8 (0.3-2.3)	0.766
Conflicting	1 (2.7)	0.1 (0-0.7)	0.022	33 (89.2)	5.7 (1.6-9.6)	0.01	28 (75.7)	6.5 (3.4-7.1)	<0.001	7 (18.9)	1 (0.3-3.7)	0.968	22 (59.5)	2.9 (1.1-8.2)	0.04	22 (59.5)	5.1 (1.7-8.7)	0.004
Use of drugs																		
of adolescent																		
No	41 (21.8)	1	0.973	126 (67)	1	0.735	62 (33)	1	0.453	2 (14.3)	0.8 (0.2-3.8)	0.792	3 (21.4)	0.7 (0.2-2.5)	0.561	60 (31.9)	1	0.08
Alcohol	3 (21.4)	0.9 (0.3-3.7)	0.973	10 (71.4)	1.2 (0.4-4.1)	0.735	6 (42.9)	1.5 (0.5-4.6)	0.453	2 (14.3)	0.8 (0.2-3.8)	0.792	3 (21.4)	0.7 (0.2-2.5)	0.561	1 (7.1)	0.2 (0.2-1.3)	0.08
Smoking	0	0	—	0	0	—	0	0	—	4 (100)	0	—	0	0	—	1 (25)	0.7 (0.1-6.9)	0.77
Others	1 (50)	3.6 (0.2-5.8)	0.37	1 (50)	0.5 (0.1-7.9)	0.618	0	0	—	0	0	—	0	0	—	0	0	—
Financial difficulty																		
Yes	8 (14.5)	0.5 (0.2-1.2)	0.141	39 (70.9)	1.4 (0.7-2.7)	0.359	17 (30.9)	0.9 (0.5-1.7)	0.742	13 (23.6)	1.6 (0.7-3.4)	0.232	14 (25.4)	0.9 (0.4-1.8)	0.706	15 (27.3)	0.8 (0.4-1.7)	0.632
No	37 (24.2)	1	0.141	98 (64)	1	0.359	51 (33.3)	1	0.742	25 (16.3)	1	43 (28.1)	1	47 (30.7)	1	47 (30.7)	1	0.632
COVID19 diagnosis (adolescent)																		
Yes	2 (10)	0.4 (0.1-1.7)	0.2	16 (80)	2.2 (0.7-6.9)	0.17	7 (35)	1.1 (0.4-2.9)	0.817	4 (20)	1.1 (0.4-3.6)	0.833	6 (30)	1.6 (0.4-3.2)	0.784	4 (20)	0.6 (0.2-1.7)	0.319
No	43 (22.9)	1	0.2	121 (64.4)	1	0.17	61 (32.4)	1	0.817	34 (18.1)	1	51 (27.1)	1	58 (30.9)	1	58 (30.9)	1	0.319
COVID19 diagnosis (guardian)																		
Yes	9 (12.2)	0.4 (0.2-0.8)	0.02	57 (77)	2.3 (1.2-4.3)	0.01	29 (39.2)	1.6 (0.9-2.9)	0.139	13 (17.6)	0.9 (0.4-1.9)	0.846	24 (32.4)	1.5 (0.8-2.7)	0.228	2 (29.7)	0.9 (0.5-1.8)	0.985
No	36 (26.9)	1	0.02	80 (59.7)	1	0.01	39 (29.1)	1	0.139	25 (18.7)	1	33 (24.6)	1	40 (29.9)	1	40 (29.9)	1	0.985

Social distance measures mostly bring people close to family members, but they can also cause or exacerbate tensions. Stress is a well-established risk factor for alcohol abuse. This study identified the use of drugs in almost 10% of adolescents, with alcohol being the most consumed. This fact is worrying since both alcohol consumption and smoking can potentially increase the vulnerability to SARS-CoV-2 infection and worsen the clinical course of COVID-19. Chronic alcohol exposure has a complex and adverse effect on host response, including innate and adaptive immunity mechanisms (18). Therefore, it highlights the need to provide assistance and support for this group for coping and solving daily life problems and difficulties, especially in this new scenario.

NESA, as a reference in the care of adolescents with chronic diseases and, recognized that chronic disease is already a factor of vulnerability, and observed that this condition added to the emotional state of anxiety due to fear of contamination, or even death.

The population's uncertainties regarding the virus transmission revealed an emotional state of insecurity and fear. The control measures were insufficient, and there was a lack of therapeutic mechanisms that had a direct impact on the population's mental health (19). To date, studies on the mental health of adolescents with chronic illnesses during the implementation of quarantine policies are scarce. Ozamiz-Etxebarria et al. (20) evaluated the mental health of 976 people aged 18–78 years and reported that younger patients with chronic illnesses had higher levels of stress, anxiety, and depression compared to healthy or older patients, corroborating this present study, which showed that adolescents with chronic illnesses reported anxiety, sadness, fear, depression, and anger more frequently than healthy adolescents. This signals the need for additional supportive care and the development and implementation of support and intervention programs for this group during pandemics.

As for food, most adolescents surveyed changed their eating behavior during the isolation. This fact can be due to difficulties in acquiring fresh food during confinement, and the financial difficulties identified among adolescents in this study associated with the emotional state evidenced in the pandemic.

There was an association between financial difficulties and the education level of the head of the family used as a proxy for socioeconomic level, and therefore, it was concluded that poorer families are the most affected. Corroborating other studies (10, 21), COVID-19 made social inequalities visible and broader.

Isolation influenced both the quantity and quality of the adolescents' diet, as they increased their intake, especially of foods rich in simple carbohydrates. This is extremely worrying since the consumption of these foods increases the risk of obesity, type 2 diabetes mellitus, cardiovascular disease, among other harmful effects to health (22, 23).

In contrast, the results of this study also confirm that confinement could lead to irregular eating behavior and frequent snack consumption in adolescents due to boredom

and stress, corroborating other studies (24, 25). There was increased consumption of hamburgers, pizza, snacks, and sugary drinks, and the increased food intake was associated with the emotional states of anxiety, sadness, and anger, characterizing the stress generated by the pandemic. This is because stress induces hyperphagia or binge eating, both eventually resulting in a significant weight change.

Stress can also lead to overeating, especially due to the consumption of "comfort foods" rich in sugar. These foods can reduce stress, as they stimulate the production of serotonin, which has a positive effect on the mood (26). In addition to the increased risks of developing obesity and cardiovascular diseases, excess sugar intake is related to a chronic state of inflammation, which is a triggering factor that increases the risk of serious COVID-19 complications (27).

The literature also indicates (28) a close link between increased food intake and affective and relationship issues, in which food has a reparative function and an affective object symbolism. Therefore, family relationships and eating behavior results reveal that the less functional the family relationship, the greater the appetite for food.

As for physical activity, one of the consequences observed in this study during the pandemic period was the increase in inactivity among adolescents, since 86.5% were practicing less than 300 min of moderate physical activity a week, probably due to space restrictions for such practice; since the closing of schools, the practice of physical activity was restricted to the household, a factor that greatly delimited their execution (29, 30). Considering the different socioeconomic situations in the society, in which the poorer and more vulnerable families have to share a restricted space with several family members, the practice of exercises becomes even more unlikely.

Concomitantly, 58.7% of adolescents reported more than 8 h of screen time (television, cell phones, tablets, and electronic games) a day, and International Societies and the Brazilian Society of Pediatrics recommend a screen time less than 2 h a day for adolescents (31), excluding time for remote study activities (11). Thus, this results in an increased risk of obesity and its complications (7, 32). Also, 46.6% of adolescents had sleeping difficulty, of which 78% also reported anxiety. This could be because smartphones and video games are stimulating, as they demand total attention. Additionally, exposure to light can interfere with sleep in several ways by increasing alertness and decreasing sleepiness before bedtime, changing the circadian rhythm, delaying sleep onset, and reducing the duration of REM sleep.

Thus, sleep restrictions can affect neurocognitive functions, impair attention, increase intellectual difficulties (33), and affect the person emotionally, increasing the risk of depressive symptoms and low self-esteem (34). The existence of a relationship between shorter sleep duration and sleep patterns, such as sleeping and waking up late, with obesity and poor diet quality in adolescents has already been reported (35, 36).

As for the closed schools during the pandemic, without face-to-face classes, most adolescents had access to a new learning tool and experienced the challenges of online and remote education. However, not all students had access to this education platform. An American study conducted in Georgia evaluated the capacity at which the country and the population continued the remote education process. A platform for this study was implemented in a private school with 920 elementary and high school students. The results confirm that the fast transition to online education was successful and that the experience acquired can be used in the future (37). Considering this pandemic and the social inequality, public educational actions need to be implemented so that education is accessible to all. The prospect of losing an entire semester or even more can have negative future consequences on learning and education, in addition to psychological pain and suffering (38).

The study limitations were due to the information collected through responses to the questionnaire, considering indirect measure because are dependent of conditions inherent to the subjects, as memory, ability to understand what was asked, in addition to being mediated by interviewees interests. Thus, the questions were made to be as objective and simple as possible to avoid systematic errors.

Conclusion

This study demonstrated that social isolation due to an infectious disease is associated with several psychological effects, as well as changes in eating behaviors and physical inactivity, favoring an obesogenic environment. This is concerning since most adolescents in this study already had some form of chronic disease. Based on these results, NESA will be able to implement actions to mitigate the psychosocial and nutritional impacts of the COVID-19 pandemic. Thus, knowing the eating habits and behavior of adolescents is extremely important to encourage a healthy lifestyle after COVID-19 confinement, in addition to assisting public health authorities to reshape future policies for adolescents in case of new pandemics necessitating an isolation policy.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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