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Psychosocial impairment of children and adolescents during COVID-19 lockdown in Ecuador: a cross-sectional study

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Title:

Psychosocial impairment of children and adolescents during COVID-19 lockdown in Ecuador: a cross-sectional study

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Objective Although children and adolescents are the groups less affected by the virus in terms of morbidity and mortality, the pandemic has strongly affected their mental health. This study aimed to determine children's and adolescents' psychological impairment during COVID-19 confinement in Ecuador.

Design A cross-sectional, internet-based questionnaire.

Participants Children and adolescents (4 to 16 years old),

Outcome measures Parents responded to Pediatric Symptom Checklist (PSC) to access psychosocial impairment.

Results A total of 1077 parents answered the questionnaire. The prevalence of psychosocial impairment was 20.8% and internalizing symptoms were the most prevalent (30.7%). The prevalence of psychological dysfunction was higher in children who had a bad family relationship during confinement (PR 2.23; 95% CI 1.22-4.07), children who never supported in housework (PR 2.63; 95% CI 1.13-6.14), and whose caregivers were worried about children's needs for emotional therapy (PR 2.86; 95% CI 1.97-4.15). Never playing video games (PR 0.34; 95% CI 0.17-0.69) or playing video games infrequently (PR 0.39; 95% CI 0.20-0.79) was a protective factor for children and adolescents' psychological impairment.

Conclusion Our study identifies that children and adolescents have experienced deteriorated mental health due to the pandemic. Family factors played an important role in the mental health of children during the lockdown. When a public crisis occurs, supportive mental health policies should be developed and implemented to promote children's psychological welfare.

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STRENGHS AND LIMITATIONS

- This study is one of the few to investigate psychosocial impairment of children and adolescents during COVID-19 lockdown in Ecuador and in developing countries.
- The Spanish version of the Pediatric Symptom Check List (PSC) has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Latino children.
- A convenience sample and as such may not be representative of all children and adolescents in Ecuador.

Introduction

The 2019 new coronavirus illness (COVID-19) outbreak has severely impacted most of the world's population. Ecuador reported its first case on February 29th, 2020, and the Ministry of Health declared a State of Emergency on March 11th, due to its rapid spread and mortality burden. Consequently, a national lockdown and quarantine period was imposed on March 16th to prevent the spread of the virus.¹ In this context, non-essential activities were suspended, including the closure of educational centers at all levels.² Ecuador was one of the countries in the region that kept schools closed for the longest time during the pandemic (> 40 weeks until January 2022).³

The quarantine has modified children's daily routines, healthy behaviors, physical activity, diet, and sleep habits.^{4,5} In addition, confinement has negatively influenced their academic performance, and social-emotional learning and has limited the social interaction necessary for their overall well-being and development.^{4,5} Although children and adolescents are the groups less affected by the virus in terms of morbidity and mortality⁶, the pandemic has strongly impacted

their mental health. The fear of infection, death of relatives, and family financial loss have all contributed to increasing the feeling of anxiety and stress among this vulnerable age group.^{4,5}

Previous systematic reviews and meta-analyses have looked at the impact of lockdown during the COVID-19 pandemic on the mental health of children and adolescents.⁷⁻¹¹ High levels of anxiety and depression, insomnia, emotional disorders, or post-traumatic stress disorders have been identified. To our knowledge, some studies have been carried out in Ecuador on the general population^{12,13} and adolescents^{1,14}; however, there are no available studies focused on the impact of confinement on children's mental health. Therefore, this study aims to investigate the psychosocial functioning of children and adolescents during the COVID-19 lockdown in Ecuador. A better understanding of how the government restrictions during the COVID-19 pandemic affected children's and adolescents' mental health can help to guide current and future 04.0 interventions.

Methods

An online cross-sectional survey of residents of Ecuador aged 18 or older who had at least one child between the ages of 4 and 16 years was conducted. The study was carried out in 2020 (July and August) while Ecuador was under a strict COVID-19 lockdown. The method used was snowball sampling starting with the authors' networks. Using the Google survey tool (Google Forms), a structured questionnaire was created, and the resulting link was distributed to the public on social media (i.e., Facebook, WhatsApp, Instagram, and Twitter). Participants were informed that the study was completely anonymous, and participation was voluntary. Participants had access to the questionnaire after confirming their willingness to participate and completing two screening tasks meant to verify their age and nationality.

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Measures

Psychosocial functioning of children and adolescents was assessed by employing the Pediatric Symptom Check List (PSC)¹⁵, which is made up of 35 items divided into three subscales that identify specific types of child psychosocial impairments: internalizing/anxiety/depression symptoms, externalizing/conduct symptoms, and attention symptoms.¹⁶ Each question has three alternative responses: never (scored 0); sometimes (scored 1) and frequently (scored 2). Item scores are summed, and the total score is recoded into a dichotomous variable indicating psychosocial impairment. For children aged 6 through 16 years, the cutoff score is 28 or higher. For 4- and 5-year-old children, the PSC cutoff is 24 or higher¹⁵. A positive score for each subscale was as follows: 5 or greater for the internalizing subscale and 7 or greater for the externalizing subscale and attention subscale. The Spanish version of PSC has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Latino children¹⁷⁻¹⁹ and is used in some Ecuadorian pediatric practice settings. The survey also collected demographic and socio-economic data, as well as family, household, and lockdown information.

Statistical analysis

Descriptive statistics were used to summarize PSC scores according to age and gender and to determine the prevalence of psychological impairment in the study population. We computed Prevalence Ratios (PR) for the association between the psychological impairment and independent variables using Generalized Linear Models with a binomial family and a log link with robust standard errors. All significant variables at p < 0.20 were included in the multivariable model to obtain adjusted PR with their 95% confidence intervals (95% CI). Finally, only significant

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RESULTS

Sample characteristics

In this survey, 1077 parents answered the questionnaire and were included in the study. Participants with missing data on any of the variables were excluded from the study (2%). As Table 1 shows, the study participants comprised 513 females (47.63%), 564 males (52.37%) and 68.99% were less than 11 years old. Most of the caregivers lived in urban areas (81.06%), had university studies (75.02%) and had a partner (74.28%). The children belonged primarily to nuclear families (74.09%). More than half of the families lived in a house (60.91%) and most of the families had three or fewer children in the household (94.06%). The percentage of families earning less than two minimum wages was 38.90%.

Table 2 shows the descriptive analysis of the PCS score by sex and age. The mean of the total score was 18.40 (SD: 10.57) and the highest media was for attention symptoms (3.60, SD 2.10). When the data were examined for female and male children separately, we found statistically significant differences in media values of PSC Internalizing symptoms (p<0.005). The highest mean of externalizing and attention scores were observed in children between 4 to 7 years old (3.64, SD: 2.83 and 3.84, SD: 2.15, respectively). On the other hand, the mean of internalizing score was higher in children between 8- to 10-year-old (2.58, SD: 2.09).

Psychosocial functioning of children and adolescents and associated factors

Psychosocial impairment was present in 20.8% of the children (21.8% in females and 19.9% in males) and the lowest proportion (18.9%) was observed in children between 11 to 16 years of age

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(Figure 1). However, no statistically significant differences were observed by sex and age. Internalizing symptoms were the most prevalent (30.73%), followed by externalizing symptoms (14.30%) and attention symptoms (9.56%).

Table 3 shows the bivariate association between independent variables and psychosocial impairment in children and adolescents. The prevalence of psychosocial impairment in children was higher in families who reported an awful family relationship during lockdown (PR 2.44; 95% CI 1.47-4.06), children that used electronic devices for 4 or more hours per day (PR; 1.68; 95% CI 1.09-2.58), and that never helped with housework (PR 3.11; 95% CI 1.43-6.73). Children who never, sometimes, or often played video games had a 55%, 4.8%, and 58% lower prevalence of psychosocial impairment than children who always played.

Regarding to attitudes toward COVID-19, children who are afraid of COVID-19 had a 1.56 (95% CI 1.23-1.97) times higher prevalence of psychosocial impairment than children who are not afraid. The highest prevalence of psychosocial impairment occurred in children whose caregivers are worried about their mental health after de lockdown: a) may need psychological aid (PR 3.04; 95% CI 2.21-4.16), b) may need medication (PR 1.82; 95% CI 1.30-2.55), c) may need emotional therapy (PR 3.58; 95% CI 2.64-4.85) and d) may not be able to go back to normal life (PR 2.94; 95% CI 2.17-4.00).

After the multivariable analysis was performed (Table 4), psychosocial impairment was positively associated with good (PR 1.98; CI 95% 1.44-2.72), or awful (PR 2.23; 95% CI 1.22-4.07) family relationships during lockdown compared to those with excellent relationships. In addition, the prevalence of psychosocial impairment was 3 times higher in children who never (PR 2.63; 95% CI 1.13-6.14), sometimes (PR 2.76; 95% CI 1.44-4.29), or often (PR 2.68; 95% CI 1.39-5.17) helped with housework compared to those who always helped. The highest prevalence of

psychosocial impairment occurred in children whose caregivers are very worried (PR 2.86; 95% CI 1.97-4.15) and a bit worried (2.37; 95% CI 1.75-3.21) that their children may need emotional therapy after lockdown compared to those who are not worried at all. Finally, not having played video games (PR 0.34; 95% CI 0.17-0.69) or having played them infrequently (PR 0.39; 95% CI 0.20-0.79) was associated with a lower probability of psychosocial impairment in children and adolescents.

Discussion

The results obtained in this study show that 20.8% of the children suffered psychosocial impairment during the COVID-19 lockdown in Ecuador, and internalizing symptoms were the most prevalent. The prevalence of psychosocial dysfunction was higher in children who had a bad family relationship during confinement, children who never supported in housework, and whose caregivers were worried about children's needs for emotional therapy. Never playing video games or playing video games infrequently was a protective factor for children's and adolescents' psychological impairment.

Our study showed a higher prevalence of psychosocial impairment in children and adolescents compared to a study carried out in Mexico from February to May 2021 that showed a prevalence of 12% using the same evaluation instrument; attention symptoms were the most prevalent, followed by internalizing/anxiety-depression and externalizing/conduct symptoms.²⁰ The differences in prevalence could be partially related to the period of the pandemic being studied. A study performed in Ecuador showed moderate to severe emotional distress levels (anxiety-depressive symptoms and stress) in adolescents.¹ Specifically, 40.6% of the adolescents suffered from severe or very severe anxious symptoms, 36.4% from depressive symptoms, and 28.2% from stress six months after de beginning of the COVID-19 pandemic.¹ In addition, a study on

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Ecuadorian high school (14 to 18 years old) students showed a prevalence of 16% of mental health problems during COVID-19 quarantine.¹⁴ In studies pre-COVID-19, it was found that 6.2% of Ecuadorian college students met the criteria for diagnosis of a major depressive episode,²¹ this level of depression is substantially lower than the 30.7% rate of internalizing symptoms reported by our study, suggesting depression rates have increased as a consequence of COVID-19 lockdown. Finally, the most common mental health issues reported in a review of 35 survey studies with 65,508 participants, ranging from 4 to 19 years of age, were: Anxiety (28%), depression (23%), loneliness (5%), stress (5%), fear (5%), tension (3%), anger (3%), fatigue (3%), confusion (3%), and worry (3%) as a result of COVID-19 pandemic.⁷ In our study, internalizing/anxiety/depression symptoms were also the most prevalent.

Our results indicate that the prevalence of psychosocial deterioration was higher in children who did not have a good family relationship during confinement and in children who do not share family activities like help with housework. Previous studies showed that family characteristics, particularly parent-child interactions, were directly associated to children's mental health in situations when bad life events, such as hurricanes, earthquakes, migrations, and terrorist attacks, occurred..^{22,23}A study in Norwest China reported that frequent parent-child communication and better parent-child relationships improve children's psychological status associated to children's during home isolation.²⁴ A study conducted by Liu et al on 5000 Chinese children found that a poor parent-child relationship results in depression and anxiety in children during quarantine.²⁵ While confined together, families have more time to work through difficulties, which may result in better and more meaningful relationships. Contrarily, family conflicts might also occur easily when families are isolated in their homes for an extended period of time.²⁶ In those circumstances, the stressful confined environment may exacerbate preexisting issues or perhaps lead to the

development of new ones. A study in the United States reported a high level of closeness between parents and children during the pandemic, as well as increased conflicts, discipline, and harsh words.²⁷ Research in Australia found decreases in family positive expressiveness during the pandemic.²⁸ Families can reduce stress during the pandemic by keeping open lines of communication, participating in common activities, seeking out social support, and cultivating thankfulness.²⁹

According to the family factors, our study found a higher prevalence of psychosocial impairment in those children whose caregivers were concerned about children's mental health. In a Canadian study, parents with children <18 at home reported unique pressures, including worrying about their children's health, mental health, education and being stressed about looking after children while continuing to work.²⁶ In turn, higher parent stress has been associated with elevated child anxiety during the COVID-19 pandemic.³⁰ In addition, higher levels of parenting stress have been associated with increased use of harsh parenting practices.³¹ Therefore, interventions should also be focused on the mental health of parents since they impact the well-being of their children.

In our study, children who sometimes or never played video games (VGs) showed a reduced prevalence of psychological deterioration during COVID-19. Playing video games for prolonged periods of time is a major risk factor for the emergence of pathological behavioral signs.³² Some studies support suggestions that the COVID-19 pandemic will lead children and adolescents to be more engaged with playing video games because of their decreased access to social activities.^{33,34} A longitudinal study showed that the amount of videogames use and Internet Gaming Disorder severity increased significantly among adolescents during the COVID-19 pandemic.³⁴ Theoretically, during home confinement, kids and teens spent more time playing video games to prevent boredom and loneliness, which led to an increase in use and, ultimately, pathologic

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gaming. Effective monitoring techniques that can assist prevent the emergence of video game addiction should be rapidly adopted by parents of children and teenagers.

Our research has some limitations. First, the cross-sectional study design restricting the ability to demonstrate causality. Second, parents who were more concerned about their children's mental health were more motivated to participate, which could have influenced the symptoms that were reported. Third, the use of social networks may lead to a bias in selection and the lack of representation of vulnerable groups.

Conclusion

Prolonged school closures and confinement during the COVID-19 pandemic had a remarkable impact on children's and adolescents' mental well-being in Ecuador. There is a need to further explore the long-term consequences of lockdown on the mental health of these vulnerable groups and to develop structured strategies focus on parents-child relationships when facing adverse event such as pandemics. To better maximize these supports, future studies should investigate how services, such as virtual mental health supports, may be implemented.

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Contributors CVE, ALM, and FC contributed to conception and study design. CVE, ALM, and JDCG conducted the statistical analysis. CVE and ALM conducted interpretation of results, and drafting of the manuscript. The methodology and data collection were completed by ACC and AMN. All authors read and approved the final manuscript.

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Patient consent for publication Not applicable

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Tables

Table 1. Bivariate analysis of the association between children's and caregiver's characteristics and	d a
psychological impairment in children and adolescents, Ecuador, 2020 (N=1077).	רע

Table 1. Bivariate analysis of the association psychological impairment in children and ad				s and
Variables	Total N (%)	Psychological impairment n (%)	PR (95% CI)	s and j va 0.1 0.2
Children's characteristics				
Area of residence				
Urban	873 (81.06)	190 (21.76)	1.0	
Rural	204 (18.94)	34 (16.67)	0.76 (0.54-1.06)	0.1
Gender			· · · · · ·	
Female	513 (47.63)	112 (21.83)	1.0	
Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.4
Age (years)	. ,	· /	. , ,	
4 to 7	445 (41.32)	99 (22.25)	1.0	
8 to 10	298 (27.67)	62 (20.81)	0.93 (0.71-1.24)	0.6
11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.2
Caregivers' characteristics				
Education level				
University or college	808 (75.02)	179 (22.15)	1.0	
Complete secondary	148 (13.74)	26 (17.57)	0.79 (0.54-1.15)	0.2
Complete primary or incomplete secondary	54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.2
Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0.2
Nationality				
Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	
Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.1
Marital status				
With partner	800 (74.28)	167 (20.88)	1.0	
No partner	277 (25.82)	57 (20.58)	0.98 (0.75-1.28)	0.9
Work type during lockdown				
Business at home	60 (5.57)	12 (20.00)	1.0	
Work out everyday	260 (24.14)	51 (19.62)	0.98 (0.55-1.77)	0.9
Mixed (teleworking and office)	267 (24.79)	61 (22.85)	1.14 (0.65-1.98)	0.6
Teleworking	241 (22.4)	52 (21.58)	1.08 (0.62-1.89)	0.7
Unemployed	249 (23.12)	48 (19.28)	0.96 (0.54-1.69)	0.8
Health worker				
No	701 (65.09)	132 (18.83)	1.0	
Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	0,0
Family and household Characteristics				0.8

2					Ę
3	Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	MJ Open: 0.549 <u>f</u> r
4	Others different from parents	264 (24.51)	51 (19.32)	0.91 (0.69-1.21)	$0.549^{\frac{9}{5}}$
5 6	Single parent	15 (1.39)	5 (33.33)	1.58 (0.76-3.28)	0.216
7	Housing type	15 (1.57)	5 (55.55)	1.56 (0.70-5.26)	0.216 bublished 0,825 as
8		$(\mathcal{F}(\mathcal{L}), \mathcal{L})$	125 (20 50)		olist
9	House	656 (60.91)	135 (20.58)		ned
10	Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	0,825జ్ల
11 12	Number of bedrooms				10.
12	> 3	251 (23.31)	48 (19.12)	1.0	113
14	3	543 (50.42)	118 (21.73)	1.14 (0.84-1.53)	0,404 8
15	1 - 2	283 (26.3)	58 (20.5)	1.07 (0.76-1.51)	$0,692\overline{g}^{-1}$
16	Inhabitants in the household				10.1136/pmjopen-2022-068761 on 20.77368761 on 20.8268761 on 20.826876876876876876876876876876876876876876
17	≤3	309 (28.69)	66 (21.36)	1.0	202
18 19	>3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	
20	Children in the household	/00 (/1.51)	150 (20.57)	0.90 (0.71 1.21)	0.7,5687
21		1012(04.06)	210(20.72)	1.0	761
22	≤ 3	1013 (94.06)	210 (20.73)		P P
23	>3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.826N
24	Family income (monthly minimum wage)				0.7423
25 26	≤1	197 (18.29)	71 (23.67)	1.0	÷20
27	1 to ≤ 2	222 (20.61)	35 (22.29)	0.94 (0.65-1.34)	
28	2 to < 3	201 (18.66)	34 (16.92)	0.71 (0.49-1.03)	0.074멍
29	3 to <4	157 (14.58)	43 (19.37)	0.81 (0.58-1.14)	0.244출
30	≥4	300 (27.86)	41 (20.81)	0.87 (0.62-1.23)	0.459
31 32	Pets in the household				ed fr
33	No	299 (27.76)	61 (20.4)	1.0	0.459 ed from
34	Yes	778 (72.24)	163 (20.95)	1.02 (0.78-1.33)	0 843
35	PR: Prevalence Rate, CI: Confidence Interval	110 (12.21)	105 (20.55)	1.02 (0.70 1.55)	0,843tb//bmjopen.bn
36	TR. Trevalence Rate, CI. Confidence interval				mjo
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		Externalizing	Internalizing	Attention
Variables	Total Score	symptoms	symptoms	symptoms
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total	18.40 (10.57)	3.42 (2.83)	2.26 (2.01)	3.60 (2.10)
Gender				
Boys	18.06 (10.40)	3.40 (2.82)	2.11 (1.91) ^a	3.62 (2.08)
Girls	18.77 (10.74)	3.44 (2.85)	2.44 (2.11)	3.58 (2.12)
Age (years)				
4-7	18.32 (10.30)	3.64 (2.83)*	1.95 (1.91) ^b	3.84 (2.15)b
8-10	19.33 (10.83)	3.47 (2.76)	2.58 (2.09)	3.81 (2.00)
11-16	17.67 (10.62)	3.08 (2.87)	2.39 (2.02)	3.10 (2.05)

Table 2. Mean scores of the Pediatric Symptom Checklist for all children and separated by age and sex. Ecuador. 2020 (N=1077).

60

Variables	Total N (%)	Psychological impairment n (%)	PR (95% CI)	<i>p</i> value
Characteristics of lockdown		(***)		
Family relationship				
Excellent	462 (42.8)	54 (11.69)	1.0	
Good	566 (52.55)	156 (27.56)	2.35 (1.77-3.13)	< 0.001
Bad or awful	49 (4.55)	14 (28.57)	2.44 (1.47-4.06)	0,001
Children's homework time				
Decreased	187 (17.36)	39 (20.86)	1.0	
Equal	271 (25.16)	41 (15.13)	0.72 (0.48-1.07)	0,113
Increased	619 (54.47)	144 (23.26)	1.11 (0.81-1.52)	0,495
Children's time with electronic devices				
≤1 hour	135 (12.53)	20 (14.81)	1.0	
2-3 hours	329 (30.55)	51 (15.5)	1.04 (0.64-1.68)	0,852
≥4 hours	613 (56.92)	153 (24.96)	1.68 (1.09-2.58)	0,017
During lockdown, has your child exercised?	· · · · ·	× ,		,
Always	51 (4.74)	8 (15.69)	1.0	
Often	192 (17.83)	26 (13.54)	0.86 (0.41-1.79)	0,693
Sometimes	708 (65.74)	157 (22.18)	1.41 (0.73-2.71)	0,298
Never	126 (11.7)	33 (26.19)	1.66 (0.82-3.36)	0,152
During lockdown, has your child played video ga		~ /		,
Always	21 (1.95)	9 (42.86)	1.0	
Often	202 (18.76)	37 (18.32)	0.42 (0.24-0.75)	0,004
Sometimes	412 (38.25)	92 (22.33)	0.52 (0.31-0.88)	0,015
Never	442 (41.04)	86 (19.46)	0.45 (0.26-0.77)	0,003
During lockdown, has your child played tradition	nal games?	× ,		
Always	40 (3.71)	3 (7.5)	1.0	
Often	214 (19.87)	37 (17.29)	2.3 (0.74-7.11)	0,147
Sometimes	570 (52.92)	126 (22.11)	2.94 (0.98-8.85)	0,054
Never	253 (23.49)	58 (22.92)	3.05 (1.01-9.29)	0,049
During lockdown, has your child played board g	ames?			
Always	31 (2.88)	3 (9.68)	1.0	
Often	261 (24.23)	40 (15.33)	1.58 (0.52-4.82)	0,418
Sometimes	545 (50.6)	125 (22.94)	2.37 (0.79-7.02)	0,12
Never	240 (22.28)	56 (22.28)	2.41 (0.8-7.24)	0,117
During lockdown, has your child watched movies	s or TV?			
Always	112 (10.4)	21 (18.75)	1.0	
Often	523 (48.56)	94 (17.97)	0.95 (0.62-1.47)	0,846
Sometimes	405 (37.6)	100 (24.69)	1.31 (0.86-2.01)	0,201
Never	37 (3.44)	9 (24.32)	1.29 (0.65-2.57)	0,458
		. ,		

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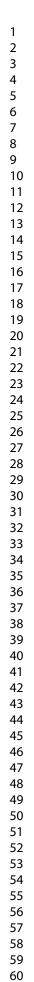
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2						BMJ Open: first published
3 4	During lockdown, has your child helped with the h				-	Oper
5	Always	127 (11.79)	10 (7.87)	1.0	0.004	n: fir
6	Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004	st p
7	Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	< 0.001	ubli
8 9	Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004	she
10	Attitudes regarding COVID-19					
11	Someone had or died from COVID-19			1.0		s 10
12	No friend or family member	215 (19.96)	40 (18.60)	1.0	0.440	.11
13	A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443	36/t
14 15	A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274	<u>mi</u>
16	As an adult, are you afraid of COVID-19?		2(12(4))	1.0	-	as 10.1136/bmjopen-2022-068761
17	Definitely not	22 (2.04)	3 (13.64)	1.0	0.010	ר-2C
18	No, as long as I am at home everything will be fine	135 (12.53)	21 (15.56)	1.14 (0.37-3.51)	0,818)22-
19	Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502	890
20 21	I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245	3761
21	Is your child afraid of COVID-19?		142 (10.10)	1.0		n
23	No	790 (73.35)	143 (18.10)	1.0		
24	Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	< 0.001	22 June
25	Are you worried that your child may need psycholo	-		1.0		
26	I am not worried at all	514 (47.73)	59 (11.48)	1.0	-0.001	023
27 28	I am a bit worried	391 (36.3)	105 (26.85)	2.33 (1.74-3.12)	< 0.001	D
29	I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	< 0.001	NMU
30	Are you worried that your child may need medicat	•	-			load
31	I am not worried at all	811 (75.3)	140 (17.26)	1.0	-0.001	ded
32	I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	< 0.001	fror
33 34	I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	< 0.001	л Т
35	Are you worried that your child may need emotion	al therapy after	lockdown?		-	2023. Downloaded from http://bmjop
36	I am not worried at all	625 (58.03)	73 (11.68)	1.0		bm
37	I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)		
38	I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	< 0.001	n.b
39 40	Are you worried that your child may not be able to	o go back to norr	nal life?			<u>ă</u> .
40 41	I am not worried at all	519 (48.19)	64 (12.33)	1.0		Öm
42	I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	< 0.001	or
43	I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	< 0.001	Ap
44	PR: Prevalence Rate, CI: Confidence Interval					iii
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Variables	PR (95% CI)	<i>p</i> valu
Family relationship during lockdown		
Excellent	1.0	
Good	1.98 (1.44-2.72)	< 0.00
Bad or awful	2.23 (1.22-4.07)	0.00
During lockdown, has your child played vie	e e	
Always	1.0	
Often	0.36 (0.17-0.76)	0.00
Sometimes	0.39 (0.20-0.79)	0.00
Never	0.34 (0.17-0.69)	0.00
During lockdown, has your child helped wi	ith housework?	
Always	1.0	
Often	2.68 (1.39-5.17)	0.00
Sometimes	2.76 (1.44-4.29)	0.00
Never	2.63 (1.13-6.14)	0.02
Are you worried that your child may need	emotional therapy after lockd	own?
I am not worried at all	1.0	
I am a bit worried	2.37 (1.75-3.21)	<0.00
I am very worried	2.86 (1.97-4.15)	< 0.00
PR: Prevalence Rate, CI: Confidence Interva	1	

Page 24 of 25

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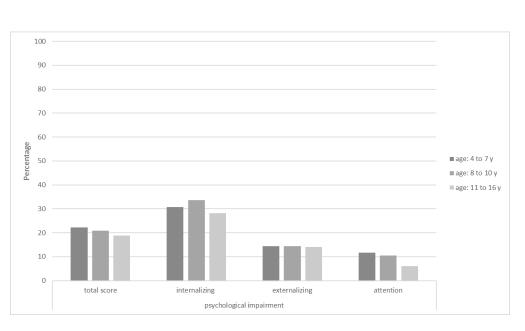


Figure 1. Prevalence of psychological impairment by age groups during COVID-19 lockdown in Ecuador.

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Page 25 of 25

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Section/Topic	ltem #	Recommendation 9	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Page 1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was to \vec{b}	Page 1
Introduction		023.	
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 2
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 2 and 3
Methods			
Study design	4	Present key elements of study design early in the paper	Page 3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, folew-up, and data collection	Page 3
Participants	6	(<i>a</i>) Give the eligibility criteria, and the sources and methods of selection of participants	Page 3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Gree diagnostic criteria, if applicable	Page 3 and 4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 3 and 4
Bias	9	Describe any efforts to address potential sources of bias	Page 3 and 4
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which group ings were chosen and why	Page 3 and 4
Statistical methods	12	why <u>ص</u> (<i>a</i>) Describe all statistical methods, including those used to control for confounding	Page 4
		(b) Describe any methods used to examine subgroups and interactions	NA
		(b) Describe any methods used to examine subgroups and interactions org (c) Explain how missing data were addressed org	Page 4
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examin🛱 for eligibility,	Page 4
		confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 4 and 5
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	Page 5
Main results	16	(<i>a</i>) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 5 and 6
		(b) Report category boundaries when continuous variables were categorized	Page 5 and 6
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses 🚆	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 6 and 7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page 6, 7, 8 and 9
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in c bound by the studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine grg/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Psychosocial dysfunction of children and adolescents during COVID-19 lockdown in Ecuador: a cross-sectional study

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Keywords:	COVID-19, EPIDEMIOLOGY, MENTAL HEALTH, Community child health < PAEDIATRICS

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Title:

Psychosocial dysfunction of children and adolescents during COVID-19 lockdown in Ecuador: a cross-sectional study

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Objective Although the risk of morbidity and mortality of children and adolescents was lower during the COVID-19 pandemic, it appears that their mental health was strongly impacted. The goal of this study is to document psychological dysfunction among children and adolescents who underwent confinement due to COVID-19 in Ecuador.

Design A cross-sectional, internet-based questionnaire.

Setting Ecuador

Participants A total of 1077 caregivers of children and adolescents (4 to 16 years old),

Outcome measures Caregivers responded to Pediatric Symptom Checklist (PSC-35) to assess psychosocial dysfunction.

Results The prevalence of psychosocial dysfunction was 20.8% and internalizing symptoms were the most prevalent (30.7%). The prevalence of psychosocial dysfunction was higher in children who had a bad family relationship during confinement (PR 2.23; 95% CI 1.22-4.07), children who never helped with housework (PR 2.63; 95% CI 1.13-6.14), and whose caregivers were worried about children's needs for emotional therapy (PR 2.86; 95% CI 1.97-4.15). Never playing video games (PR 0.34; 95% CI 0.17-0.69) or playing video games infrequently (PR 0.39; 95% CI 0.20-0.79) was a protective factor for the psychosocial problems of children and adolescents.

Conclusion Our study demonstrates that children and adolescents have experienced a deterioration of mental health due to the pandemic. Family factors played an important role in the mental health of children during the lockdown. When a public crisis occurs, supportive mental health policies should be developed and implemented to promote children's psychological welfare.

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STRENGTHS AND LIMITATIONS

- This study is one of the few to investigate the psychosocial dysfunction of children and adolescents during the COVID-19 lockdown in Ecuador and in developing countries.
- The Spanish version of the Pediatric Symptom Check List (PSC) has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children.
- This was a convenience sample and as such may not be representative of all children and adolescents in Ecuador.

Introduction

The 2019 new coronavirus illness (COVID-19) outbreak has severely affected most of the world's population. Ecuador reported its first case on February 29th, 2020, and the Ministry of Health declared a State of Emergency on March 11th, due to its rapid spread and mortality burden. Consequently, a national lockdown and quarantine period was imposed on March 16th to prevent the spread of the virus.¹ In this context, non-essential activities were suspended, including the closure of educational centers at all levels.² Ecuador was one of the countries in the region that kept schools closed for the longest time during the pandemic (> 40 weeks until January 2022).³

The quarantine modified the children's daily routines, healthy behaviors, physical activity, diet, and sleep habits.^{4,5} Confinement negatively influenced their academic performance, socialemotional learning, and the social interaction necessary for their overall well-being and development.^{4,5} Although children and adolescents are the groups less affected by the virus in

terms of morbidity and mortality⁶, the pandemic has strongly impacted their mental health. The fear of infection, death of relatives, and family financial loss have all contributed to increasing the feeling of anxiety and stress among this vulnerable age group.^{4,5}

Previous systematic reviews and meta-analyses have looked at the impact of lockdown during the COVID-19 pandemic on the mental health of children and adolescents.⁷⁻¹¹ High levels of anxiety and depression, insomnia, emotional disorders, or post-traumatic stress disorders have been identified. To our knowledge, some studies have been carried out in Ecuador on the general population^{12,13} and adolescents^{1,14}; however, there are no available studies focused on the impact of confinement on children's mental health. Therefore, this study aims to investigate the psychosocial functioning of children and adolescents during the COVID-19 lockdown in Ecuador. A better understanding of how the government restrictions during the COVID-19 pandemic affected children's and adolescents' mental health can help to guide current and future interventions.

Methods

An online cross-sectional survey of residents of Ecuador aged 18 or older who had at least one child between the ages of 4 and 16 years was conducted. The study was carried out in 2020 (July and August) while Ecuador was under a strict COVID-19 lockdown. The method used was snowball sampling starting with the authors' networks. Using the Google survey tool (Google Forms), a structured questionnaire was created, and the resulting link was distributed to the public on social media (i.e., Facebook, WhatsApp, Instagram, and Twitter). Participants were informed that the study was completely anonymous, and participation was voluntary. Participants had access to the questionnaire after confirming their willingness to participate and completing two screening tasks to verify their age and place of residence.

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Patient and public involvement statement

This study was designed and conducted without patient and public involvement. Our results will be disseminated to the public through publication in this journal.

Measures

The psychosocial functioning of children and adolescents was assessed by employing the Pediatric Symptom Check List (PSC)¹⁵, which is made up of 35 items divided into three subscales that identify specific types of child psychosocial problems: internalizing/anxiety/depression symptoms, externalizing/conduct symptoms, and attention symptoms.¹⁶ Each question has three alternative responses: never (scored 0); sometimes (scored 1) and frequently (scored 2). Item scores are summed, and the total score is recoded into a dichotomous variable. For children aged 6 through 16 years, the cutoff score is 28 or higher. For 4- and 5-year-old children, the PSC cutoff is 24 or higher.¹⁵ A positive score for each subscale was as follows: 5 or greater for the internalizing subscale and 7 or greater for the externalizing subscale and attention subscale. The Spanish version of PSC-35¹⁶ has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children¹⁷⁻²⁰. The survey also collected demographic and socio-economic data, as well as family, household, and lockdown information.

Statistical analysis

Descriptive statistics were used to summarize PSC scores according to age and gender and to determine the prevalence of psychological dysfunction in the study population. We computed Prevalence Ratios (PR) for the association between the psychological problems and independent variables using Generalized Linear Models with a binomial family and a log link with robust

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standard errors. All significant variables at p < 0.20 were included in the multivariable model to obtain adjusted PR with their 95% confidence intervals (95% CI). Finally, only significant variables (p < 0.05) were maintained for the final model. Analysis was conducted using Stata version 15.0.

RESULTS

Sample characteristics

In this survey, 1124 caregivers answered the questionnaire and 1077 were included in the study. We excluded 27 children and adolescents who were receiving treatment for any mental problem before the pandemic. In addition, participants with missing data on any of the variables were excluded from the study (2%). As Table 1 shows, the study participants comprised 513 females (47.63%), 564 males (52.37%) and 68.99% were less than 11 years old. Most of the caregivers lived in urban areas (81.06%), had university studies (75.02%), and had a partner (74.28%). The children belonged primarily to nuclear families (74.09%). More than half of the families lived in a house (60.91%) and most of the families had three or fewer children in the household (94.06%). The percentage of families earning less than two minimum wages was 38.90%.

Table 1. Bivariate analysis of the association between children's and caregiver's characteristics and psychological dysfunction in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychological dysfunction n (%)	PR (95% CI)	p valu
Children's characteristics				
Area of residence				
Urban	873 (81.06)	190 (21.76)	1.0	
Rural	204 (18.94)	34 (16.67)	0.76 (0.54-1.06)	0.11
Gender				
Female	513 (47.63)	112 (21.83)	1.0	
Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.42

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Age (years)				Ope
4 to 7	445 (41.32)	99 (22.25)	1.0	n: fi
8 to 10	298 (27.67)	62 (20.81)	0.93 (0.71-1.24)	$0.641^{\frac{1}{10}}$
11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.252 <u>5</u>
Caregivers' characteristics				0.252 bished as 10. 0.312 0.312 0.900 0.900
Gender				das
Female	825 (76.60)	178 (21.58)	1.0	: 10
Male	252 (23.40)	46 (18.25)	0.85 (0.61-1.17)	0.312
Age (years)				6/br
20-29	237 (22.00)	54 (22.78)	1.0	njop
30-39	350 (32.50)	78 (22.29)	0.98 (0.69-1.38)	0.900 ⁸
40-49	375 (34.82)	72 (19.20)	0.84 (0.59-1.20)	0.342
≥50	115 (10.68)	20 (17.39)	0.76 (0.46-1.27)	0.302g
Education level	. ,	. /		3876
University or college	808 (75.02)	179 (22.15)	1.0	0.30208761 0.2222
Complete secondary	148 (13.74)	26 (17.57)	0.79 (0.54-1.15)	0.222 N
Complete primary or incomplete secon	dary 54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.2275
Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0.291 _N
Nationality			· · · · ·	023.
Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	
Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.184 <u></u>
Marital status				0.184boaded from http://bmig 0.916c
With partner	800 (74.28)	167 (20.88)	1.0	ed fr
No partner	277 (25.82)	57 (20.58)	0.98 (0.75-1.28)	0.916 ³
Work type during lockdown		()	· · · · · ·	http
Business at home	60 (5.57)	12 (20.00)	1.0	://bi
Work out every day	260 (24.14)	51 (19.62)	0.98 (0.55-1.77)	0.946
Mixed (teleworking and office)	267 (24.79)	61 (22.85)	1.14 (0.65-1.98)	0.637
Teleworking	241 (22.4)	52 (21.58)	1.08 (0.62-1.89)	0.791
Unemployed	249 (23.12)	48 (19.28)	0.96 (0.54-1.69)	0.899
Health worker				
No	701 (65.09)	132 (18.83)	1.0	ר Ap
Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	on April 27
Family and household Characteristics		(=,)		, , 2
Family structure	-			, 2024 by guest 0.549st
Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	· by
Others different from parents	264 (24.51)	51 (19.32)	0.91 (0.69-1.21)	0.5496
Single parent	15 (1.39)	5 (33.33)	1.58 (0.76-3.28)	0.216 م <u>ب</u>
Housing type	15 (1.57)	0 (00.00)	1.55 (0.76 5.20)	o.210 rote
House	656 (60.91)	135 (20.58)		otected
Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	0.825
Number of bedrooms	T21 (37.07)	07 (21.17)	1.02(0.01-1.50)	0,020
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				0,
> 3	251 (23.31)	48 (19.12)	1.0	
3	543 (50.42)	118 (21.73)	1.14 (0.84-1.53)	0,
1 - 2	283 (26.3)	58 (20.5)	1.07 (0.76-1.51)	0, 0.
Inhabitants in the household				
<u>≤</u> 3	309 (28.69)	66 (21.36)	1.0	
> 3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	0.
Children in the household				
\leq 3	1013 (94.06)	210 (20.73)	1.0	0.
> 3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.
Family income (monthly minimum wage)				
≤ 1	197 (18.29)	71 (23.67)	1.0	
1 to < 2	222 (20.61)	35 (22.29)	0.94 (0.65-1.34)	0.
2 to < 3	201 (18.66)	34 (16.92)	0.71 (0.49-1.03)	0.
3 to <4	157 (14.58)	43 (19.37)	0.81 (0.58-1.14)	0.
≥4	300 (27.86)	41 (20.81)	0.87 (0.62-1.23)	0.
Pets in the household				
No	299 (27.76)	61 (20.4)	1.0	
Yes	778 (72.24)	163 (20.95)	1.02 (0.78-1.33)	0.

PR: Prevalence Rate, CI: Confidence Interval

Table 2 shows the descriptive analysis of the PCS score by sex and age. The mean of the total score was 18.40 (SD: 10.57) and the highest mean was for attention symptoms (3.60, SD 2.10). When the data were examined for female and male children separately, we found statistically significant differences in mean values of PSC internalizing symptoms (p<0.005). The highest mean of externalizing and attention scores were observed in children between 4 to 7 years old (3.64, SD: 2.83 and 3.84, SD: 2.15, respectively). On the other hand, the mean of the internalizing score was higher in children between 8- to 10-year-old (2.58, SD: 2.09).

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Variables	Total Score	Externalizing symptoms	Internalizing symptoms	Attention symptoms
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total	18.40 (10.57)	3.42 (2.83)	2.26 (2.01)	3.60 (2.10)
Gender				
Boys	18.06 (10.40)	3.40 (2.82)	2.11 (1.91) ^a	3.62 (2.08)
Girls	18.77 (10.74)	3.44 (2.85)	2.44 (2.11)	3.58 (2.12)
Age (years)				
4-7	18.32 (10.30)	3.64 (2.83) ^b	1.95 (1.91) ^b	3.84 (2.15) ^b
8-10	19.33 (10.83)	3.47 (2.76)	2.58 (2.09)	3.81 (2.00)
11-16	17.67 (10.62)	3.08 (2.87)	2.39 (2.02)	3.10 (2.05)
SD: standard devi	ation	· · · · · ·		· · · ·

Table 2. Mean scores of the Pediatric Symptom Checklist for all children separated by age
and sex, Ecuador, 2020 (N=1077).

SD: standard deviation

^at test p<0,005; ^bANOVA, p<0,005

Psychosocial functioning of children and adolescents and associated factors

Psychosocial dysfunction was present in 20.8% of the children (21.8% in females and 19.9% in males) and the lowest proportion (18.9%) was observed in children between 11 to 16 years of age (Figure 1). However, no statistically significant differences were observed by sex and age. Internalizing symptoms were the most prevalent (30.73%), followed by externalizing symptoms (14.30%) and attention symptoms (9.56%).

Table 3 shows the bivariate association between independent variables and psychosocial dysfunction. The prevalence of psychosocial dysfunction in children and adolescents was higher in families who reported a bad family relationship during lockdown (PR 2.44; 95% CI 1.47-4.06), children that used electronic devices for 4 or more hours per day (PR; 1.68; 95% CI 1.09-2.58), and that never helped with housework (PR 3.11; 95% CI 1.43-6.73). Children who never,

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Variables Characteristics of lockdown Family relationship	Total	Psychosocial		р
	N (%)	dysfunction n (%)	PR (95% CI)	value
	1((/0)	n (70)		
Excellent	462 (42.8)	54 (11.69)	1.0	
Good	566 (52.55)	156 (27.56)	2.35 (1.77-3.13)	< 0.00
Bad	49 (4.55)	14 (28.57)	2.44 (1.47-4.06)	0,001
Children's homework time			(- ,
Decreased	187 (17.36)	39 (20.86)	1.0	
Equal	271 (25.16)	41 (15.13)	0.72 (0.48-1.07)	0,113
Increased	619 (54.47)	144 (23.26)	1.11 (0.81-1.52)	0,495
Children's time with electronic devices		(()	- ,
≤1 hour	135 (12.53)	20 (14.81)	1.0	
2-3 hours	329 (30.55)	51 (15.5)	1.04 (0.64-1.68)	0,852
≥4 hours	613 (56.92)	153 (24.96)	1.68 (1.09-2.58)	0,017
During the lockdown, has your child exercised?	010 (00.92)	100 (21.90)	1.00 (1.0) 2.00)	0,017
Always	51 (4.74)	8 (15.69)	1.0	
Often	192 (17.83)	26 (13.54)	0.86 (0.41-1.79)	0,693
Sometimes	708 (65.74)	157 (22.18)	1.41 (0.73-2.71)	0,298
Never	126 (11.7)	33 (26.19)	1.66 (0.82-3.36)	0,152
During the lockdown, has your child played video		00 (2011))	1.00 (0.02 0.00)	•,10=
Always	21 (1.95)	9 (42.86)	1.0	
Often	202 (18.76)	37 (18.32)	0.42 (0.24-0.75)	0,004
Sometimes	412 (38.25)	92 (22.33)	0.52 (0.31-0.88)	0,015
Never	442 (41.04)	86 (19.46)	0.45 (0.26-0.77)	0,003
During the lockdown, has your child played tradi	· · · ·	00 (19.10)	0.15 (0.20 0.77)	0,005
Always	40 (3.71)	3 (7.5)	1.0	
Often	214 (19.87)	37 (17.29)		0,147
Sometimes	570 (52.92)	126 (22.11)		0,054
Never	253 (23.49)	58 (22.92)	3.05 (1.01-9.29)	0,049
During the lockdown, has your child played board		56 (22.72)	5.05 (1.01).2))	0,047
Always	31 (2.88)	3 (9.68)	1.0	
Often	261 (24.23)	40 (15.33)		0,418
Sometimes	545 (50.6)	125 (22.94)		0,12
Never	240 (22.28)	56 (22.28)	2.41 (0.8-7.24)	0,12
During the lockdown, has your child watched mo		50 (22.20)	2.41 (0.0-7.24)	0,117
sometimes, or often played video games		6 and 58% los	ver prevalence of	
sometimes, or orten played video games	паса <i>3370</i> , т .07	o, and 5070 10		
psychosocial dysfunction than children who	always played.			

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2					0,846 0,201 0,458 0,004 <0.001 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004 0,001 0,004
3	Always	112 (10.4)	21 (18.75)	1.0	(
4	Often	523 (48.56)	94 (17.97)	0.95 (0.62-1.47)	0,846
5 6	Sometimes	405 (37.6)	100 (24.69)	1.31 (0.86-2.01)	0,201
о 7	Never	37 (3.44)	9 (24.32)	1.29 (0.65-2.57)	0,458
8	During the lockdown, has your child helped with th) (21.32)	1.29 (0.00 2.07)	0,100
9	Always	127 (11.79)	10 (7.87)	1.0	
10	Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004
11 12	Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	< 0.001
12	Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004
14	Attitudes regarding COVID-19	()	()	(.,
15	Someone had or died from COVID-19				
16	No friend or family member	215 (19.96)	40 (18.60)	1.0	Č
17 18	A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443
18	A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274
20	As an adult, are you afraid of COVID-19?				
21	Definitely not	22 (2.04)	3 (13.64)	1.0	-
22	No, as long as I am at home everything will be fine	135 (12.53)	21 (15.56)	1.14 (0.37-3.51)	0,818
23	Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502
24 25	I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245
26	Is your child afraid of COVID-19?	()		· · · · ·	
27	No	790 (73.35)	143 (18.10)	1.0	
28	Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	< 0.001
29	Are you worried that your child may need psychological		· · · · ·	· · · · · ·	
30 31	I am not worried at all	514 (47.73)	59 (11.48)	1.0	2
32	I am a bit worried	391 (36.3)	105 (26.85)	2.33 (1.74-3.12)	< 0.001
33	I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	< 0.001
34	Are you worried that your child may need medicat	ion for any men	tal problem aft		<0.001 <0.001 <0.001 <0.001 <0.001
35 36	I am not worried at all	811 (75.3)	140 (17.26)	1.0	
30 37	I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	< 0.001
38	I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	< 0.001
39	Are you worried that your child may need emotion	al therany after	the lockdown?		c c
40	I am not worried at all	625 (58.03)	73 (11.68)	1.0	<0.001 <0.001
41	I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)	< 0.001
42 43	I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	<0.001
44	Are you worried that your child may not be able to			5.50 (2.04 4.05)	V.001
45	I am not worried at all	519 (48.19)	64 (12.33)	1.0	!
46	I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	
47	I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	<0.001
48 ₋ 49	PR: Prevalence Rate, CI: Confidence Interval	105 (15.52)	00 (50.50)	2.91 (2.17 1.00)	<u>, 0.001</u>
50	TR. Trevalence Rate, CI. Confidence interval				0
51					-
52					
53 54	Regarding attitudes toward COVID-19, childr	en who are afraid	d of COVID-19	had a 1.56 (95% CI	<0.001 <0.001
54 55					2
56	1.23-1.97) times higher prevalence of psychol	social dysfunctio	n than children	who are not afraid.	
57					
58					9
59 60	For peer review only - http://bmjor	oen.bmi.com/site/al	bout/quidelines.xh	tml	
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The highest prevalence of psychosocial problems occurred in children whose caregivers were worried about the need for: a) psychological aid (PR 3.04; 95% CI 2.21-4.16), b) medication (PR 1.82; 95% CI 1.30-2.55), c) emotional therapy (PR 3.58; 95% CI 2.64-4.85), and/or d) inability to return to normal life (PR 2.94; 95% CI 2.17-4.00).

After the multivariable analysis was performed (Table 4), psychosocial dysfunction was positively associated with good (PR 1.98; CI 95% 1.44-2.72), or bad (PR 2.23; 95% CI 1.22-4.07) family relationships during lockdown compared to those with excellent relationships. In addition, the prevalence of psychosocial dysfunction was 3 times higher in children who never (PR 2.63; 95% CI 1.13-6.14), sometimes (PR 2.76; 95% CI 1.44-4.29), or often (PR 2.68; 95% CI 1.39-5.17) helped with housework compared to those who always helped. The highest prevalence of psychosocial problems occurred in children whose caregivers are very worried (PR 2.86; 95% CI 1.97-4.15) and a bit worried (2.37; 95% CI 1.75-3.21) that their children may need emotional therapy after lockdown compared to those who are not worried at all. Finally, not having played video games (PR 0.34; 95% CI 0.17-0.69) or having played them infrequently (PR 0.39; 95% CI 0.20-0.79) was associated with a lower probability of psychosocial problems in children and adolescents.

Table 4. Multivariate regression of the association between independentvariables and psychosocial dysfunction in children and adolescents, Ecuador,2020 (N=1077).

Variables	PR (95% CI)	<i>p</i> value
Family relationships during lockdown		
Excellent	1.0	
Good	1.98 (1.44-2.72)	< 0.001
Bad	2.23 (1.22-4.07)	0.009
During the lockdown, has your child playe	ed video games?	
Always	1.0	
Often	0.36 (0.17-0.76)	0.007

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Sometimes	0.39 (0.20-0.79)	0.008
Never	0.34 (0.17-0.69)	0.003
During the lockdown, has your child helpe	d with housework?	
Always	1.0	
Often	2.68 (1.39-5.17)	0.003
Sometimes	2.76 (1.44-4.29)	0.002
Never	2.63 (1.13-6.14)	0.025
Are you worried that your child may need lockdown?	emotional therapy after the	
I am not worried at all	1.0	
I am a bit worried	2.37 (1.75-3.21)	< 0.00
I am very worried	2.86 (1.97-4.15)	< 0.00

Discussion

The results obtained in this study show that 20.8% of the children suffered psychosocial dysfunction during the COVID-19 lockdown in Ecuador, and internalizing symptoms were the most prevalent. The prevalence of psychosocial dysfunction was higher in children who had a bad family relationship during confinement, children who never helped with housework, and whose caregivers were worried about the need for emotional therapy for their children. Never playing video games or playing video games infrequently was a protective factor for the psychosocial problems of children and adolescents.

Our study showed a higher prevalence of psychosocial dysfunction in children and adolescents compared to a study carried out in Mexico from February to May 2021 that showed a prevalence of 12% using the same evaluation instrument; attention symptoms were the most prevalent, followed by internalizing/anxiety-depression and externalizing/conduct symptoms.²¹ The differences in prevalence could be partially related to the period of the pandemic being studied. A study performed in Ecuador showed moderate to severe emotional distress levels (anxiety-

depressive symptoms and stress) in adolescents.¹ Specifically, 40.6% of the adolescents suffered from severe or very severe symptoms of anxiety, 36.4% from depressive symptoms, and 28.2% from stress six months after the beginning of the COVID-19 pandemic.¹ In addition, a study on Ecuadorian high school (14 to 18 years old) students showed a prevalence of 16% of mental health problems during the COVID-19 quarantine.¹⁴ In studies pre-COVID-19, it was found that 6.2% of Ecuadorian college students met the criteria for diagnosis of a major depressive episode,²² this level of depression is substantially lower than the 30.7% rate of internalizing symptoms reported by our study, suggesting depression rates have increased as a consequence of COVID-19 lockdown. Finally, the most common mental health issues reported in a review of 35 survey studies with 65,508 participants, ranging from 4 to 19 years of age, were: Anxiety (28%), depression (23%), loneliness (5%), stress (5%), fear (5%), tension (3%), anger (3%), fatigue (3%), confusion (3%). worry (3%) as a result of COVID-19 pandemic.⁷ In and our study. internalizing/anxiety/depression symptoms were also the most prevalent.

Our results indicate that the prevalence of psychosocial problems was higher in children who did not have a good family relationship during confinement and in children who did not share family activities like housework. Previous studies showed that family characteristics, particularly parentchild interactions, were directly associated with children's mental health in situations when bad life events, such as hurricanes, earthquakes, migrations, and terrorist attacks, occurred.^{23,24}A study in Norwest China reported that frequent parent-child communication and better parent-child relationships improve children's psychological status associated to children's during home isolation.²⁵ A study conducted by Liu *et. al.* on 5000 Chinese children found that a poor parentchild relationship resulted in depression and anxiety in children during quarantine.²⁶ While confined together, families have more time to work through difficulties, which may result in better

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and more meaningful relationships. Contrarily, family conflicts might also easily occur when families are isolated in their homes for an extended period.²⁷ In those circumstances, the stressful confined environment may exacerbate preexisting issues or perhaps lead to the development of new ones. A study in the United States reported a high level of closeness between parents and children during the pandemic, as well as increased conflicts, discipline, and harsh words.²⁸ Research in Australia found decreases in family positive expressiveness during the pandemic.²⁹ Families can reduce stress during the pandemic by keeping open lines of communication, participating in common activities, seeking out social support, and cultivating thankfulness.³⁰

According to the family factors, our study found a higher prevalence of psychosocial problems in those children whose caregivers were concerned about children's mental health. In a Canadian study, parents with children <18 at home reported unique pressures, including worrying about their children's health, mental health, and education and being stressed about looking after children while continuing to work.²⁷ Higher parent stress has been associated with elevated child anxiety during the COVID-19 pandemic.³¹ In addition, higher levels of parenting stress have been associated with increased use of harsh parenting practices.³² Therefore, interventions should also be focused on the mental health of parents since they affect the well-being of their children.

In our study, children who sometimes or never played video games (VGs) showed a reduced prevalence of psychological deterioration during COVID-19. Playing video games for prolonged periods is a major risk factor for the emergence of pathological behavioral signs.³³ Some studies support suggestions that the COVID-19 pandemic will lead children and adolescents to be more engaged in playing video games because of their decreased access to social activities.^{34,35} A longitudinal study showed that video games use and Internet Gaming Disorder severity increased significantly among adolescents during the COVID-19 pandemic.³⁵ Theoretically, during home

confinement, kids and teens spent more time playing video games to prevent boredom and loneliness, which led to an increase in use and, ultimately, pathologic gaming. Effective monitoring techniques that can assist prevent the emergence of video game addiction should be rapidly adopted by parents of children and teenagers.

Our research has some limitations. The cross-sectional study design restricts the ability to demonstrate causality. The study represents a short time-lapse of exploration during the strict COVID-19 lockdown in Ecuador; therefore, the results could have been influenced by situational factors. Another potential limitation is that our data include only a proxy report of the child/adolescent's psychosocial problems because the PSC was completed by the caregivers. In addition, parents who were more concerned about their children's mental health were more motivated to participate, which could have influenced the symptoms that were reported. Finally, the use of social networks may lead to a bias in selection and the lack of representation of vulnerable groups.

Conclusion

Prolonged school closures and confinement during the COVID-19 pandemic had a remarkable impact on children's and adolescents' mental well-being in Ecuador. There is a need to further explore the long-term consequences of lockdown on the mental health of these vulnerable groups and to develop structured strategies that focus on parent-child relationships when facing adverse events such as pandemics. To better maximize these supports, future studies should investigate how services, such as virtual mental health supports, may be implemented.

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Competing interests None declared.

Patient consent for publication Not applicable

Ethics approval The study was approved by the Ethics Board at the Medicine Faculty, Pontificia Universidad Católica del Ecuador (SB-CEISH-POS-458). Participants were informed that the study was completely anonymous and participation voluntary. Online informed consent was provided by the respondents before they completed the questionnaire.

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Data availability statement Data are available upon reasonable request through the corresponding author.

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Figure Legends

Figure 1. Prevalence of psychosocial dysfunction by age groups during COVID-19 lockdown in

Ecuador, 2020.

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internalizing score

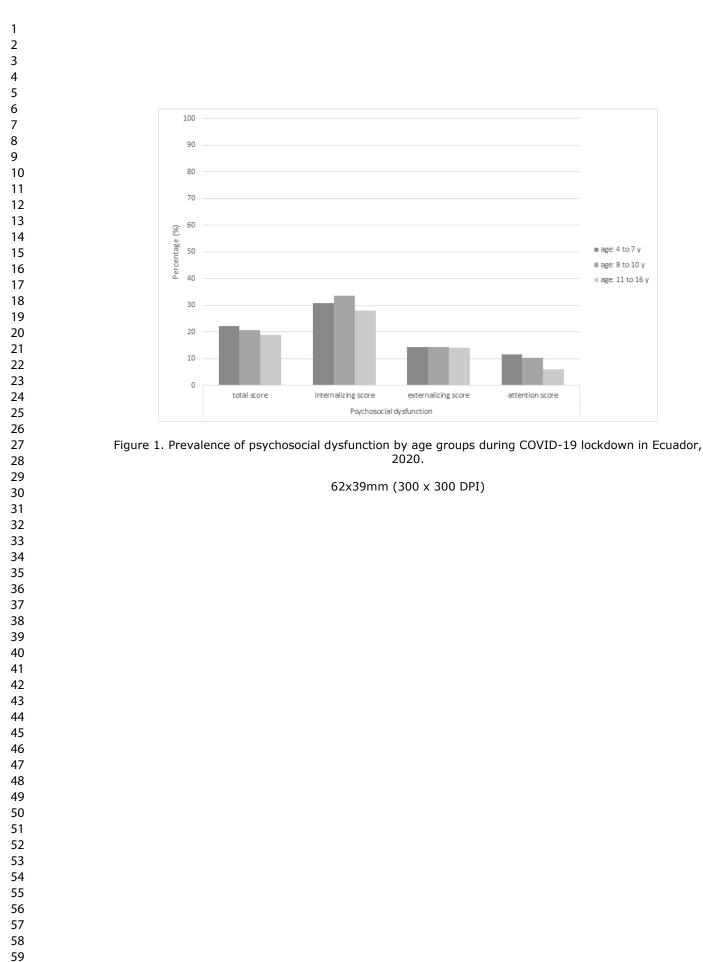
Psychosocial dysfunction

2020.

62x39mm (300 x 300 DPI)

externalizing score

attention score



60

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■ age: 4 to 7 y

■ age: 8 to 10 v

■ age: 11 to 16 y

		BMJ Open	Page 2
	STR	OBE 2007 (v4) Statement—Checklist of items that should be included in reports of <i>cross-sectional studies</i>	
Section/Topic	ltem #	Recommendation S	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract $\frac{N}{c}$	2 (line 8), 3 (line 17)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was bound	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	5 (line 22-24)
Methods	1		
Study design	4	Present key elements of study design early in the paper	5 (line 37-56)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, folew-up, and data collection	5 (line 37-56)
Participants	6	(<i>a</i>) Give the eligibility criteria, and the sources and methods of selection of participants	5 (line 37-56)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Gree diagnostic criteria, if applicable	6 (line 16-42)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6 (line 16-42)
Bias	9	Describe any efforts to address potential sources of bias	5,6
Study size	10	Explain how the study size was arrived at	7 (lines 19-26)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which group ings were chosen and why	6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6,7
			NA
		(b) Describe any methods used to examine subgroups and interactions 0 (c) Explain how missing data were addressed 0	7 (line 24-26)
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses ^O	NA
Results		Yrig	

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility,	7 (lines 19-26)
		confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	7 (lines 19-26)
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on	7 (lines 26-38)
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9 (lines 31-45) and
		N N N N N N N N N N N N N N N N N N N	10 (lines 31-40)
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence	10,11,12,13,14
		interval). Make clear which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	10,11,12,13,14
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses 😸	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	14 (lines 26-40)
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17 (lines 13-31)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14,15,16
Generalisability	21	Discuss the generalisability (external validity) of the study results	17 (line 29-32)
Other information		7, 20	
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18 (line 21-23)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in controls in case-control studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.spobe-statement.org.

Psychosocial dysfunction of children and adolescents during the COVID-19 lockdown in Ecuador: a cross-sectional study

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Title:

Psychosocial dysfunction of children and adolescents during the COVID-19 lockdown in Ecuador: a cross-sectional study

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Abstract

Objective Although the risk of morbidity and mortality of children and adolescents was lower during the COVID-19 pandemic, it appears that their mental health was strongly impacted. The goal of this study is to document psychological dysfunction among children and adolescents who underwent confinement due to COVID-19 in Ecuador.

Design A cross-sectional, internet-based questionnaire

Setting Ecuador

Participants A total of 1077 caregivers of children and adolescents (4 to 16 years old)

Outcome measures Caregivers responded to Pediatric Symptom Checklist (PSC-35) to assess psychosocial dysfunction.

Results The prevalence of psychosocial dysfunction was 20.8%, with internalizing symptoms being the most common (30.7%). The prevalence of psychosocial dysfunction was higher in children who had a poor family relationship during confinement (PR 2.23; 95% CI 1.22-4.07), children who never helped with housework (PR 2.63; 95% CI 1.13-6.14), and whose caregivers were worried about children's needs for emotional therapy (PR 2.86; 95% CI 1.97-4.15). Never playing video games (PR 0.34; 95% CI 0.17-0.69) or playing video games infrequently (PR 0.39; 95% CI 0.20-0.79) was a protective factor for the psychosocial problems of children and adolescents.

Conclusion Our study demonstrates that children and adolescents have experienced a deterioration of mental health due to the pandemic. Family factors played an important role in the mental health

of children during the lockdown. When a public crisis occurs, supportive mental health policies should be developed and implemented to promote children's psychological welfare.

STRENGTHS AND LIMITATIONS

- This study is one of few to investigate the psychosocial dysfunction of children and adolescents during the COVID-19 lockdown in Ecuador and in developing countries.
- The Spanish version of the Pediatric Symptom Check List (PSC) has proven to have strong validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children.
- This was a convenience sample and as such may not be representative of all children and adolescents in Ecuador.

Introduction

The 2019 novel coronavirus illness (COVID-19) outbreak has severely affected most of the world's population. Ecuador reported its first case on February 29th, 2020, and the Ministry of Health declared a State of Emergency on March 11 due to its rapid spread and mortality burden. Consequently, a national lockdown and quarantine period was imposed on March 16 to prevent the spread of the virus.¹ In this context, non-essential activities were suspended, including the closure of educational institutions at all levels.² Ecuador was one of the countries in the region that kept schools closed for the longest time during the pandemic (> 40 weeks until January 2022).³

The quarantine modified the children's daily routines, healthy behaviors, physical activity, diet, and sleep habits.^{4,5} Confinement negatively influenced their academic performance, social-

emotional learning, and the social interaction necessary for their overall well-being and development.^{4,5} Although children and adolescents are the groups that are less affected by the virus in terms of morbidity and mortality⁶, the pandemic strongly impacted their mental health. The fear of infection, death of relatives, and family financial loss have all contributed to increasing the feeling of anxiety and stress among this vulnerable age group.^{4,5}

Previous systematic reviews and meta-analyses have looked at the impact of the lockdown during the COVID-19 pandemic on the mental health of children and adolescents.⁷⁻¹¹ High levels of anxiety and depression, insomnia, emotional disorders, or post-traumatic stress disorders have been identified. Some studies have been carried out in Ecuador on the general population^{12,13} and adolescents^{1,14}; however, to the best of our knowledge, there are no studies that have focused on the impact of confinement on children's mental health. Therefore, this study aims to investigate the psychosocial functioning of children and adolescents during the COVID-19 lockdown in Ecuador. A better understanding of how the government restrictions during the COVID-19 pandemic affected children's and adolescents' mental health can help to guide current and future interventions.

Methods

An online cross-sectional survey was conducted with residents of Ecuador aged 18 or older who had at least one child between the ages of 4 and 16 years. The study was carried out in 2020 (July and August) while Ecuador was under a strict COVID-19 lockdown. The method used was snowball sampling starting with the authors' networks. Using the Google survey tool (Google Forms), a structured questionnaire was created, and the resulting link was distributed to the public on social media (i.e., Facebook, WhatsApp, Instagram, and Twitter). Participants were informed that the study was completely anonymous and participation was voluntary. Participants had access

to the questionnaire after confirming their willingness to participate and completing two screening tasks to verify their age and place of residence.

Patient and public involvement statement

This study was designed and conducted without patient and public involvement. Our results will be disseminated to the public through publication in this journal.

Measures

The psychosocial functioning of children and adolescents was assessed by employing the Pediatric Symptom Checklist (PSC)¹⁵, which is made up of 35 items divided into three subscales that identify specific types of child psychosocial problems: internalizing/anxiety/depression symptoms, externalizing/conduct symptoms, and attention symptoms.¹⁶ Each question has three alternative responses: never (scored 0), sometimes (scored 1), and frequently (scored 2). Item scores are summed, and the total score is recoded in a dichotomous variable. For children aged 6 through 16 years, the cutoff score is 28 or higher. For 4- and 5-year-old children, the PSC cutoff is 24 or higher.¹⁵ A positive score for each subscale is as follows: 5 or greater for the internalizing subscale and 7 or greater for the externalizing subscale and attention subscale. The Spanish version of PSC-35¹⁶ has been proven to have high validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children¹⁷⁻²⁰. The survey also collected demographic and socio-economic data, as well as family, household, and lockdown information.

Statistical analysis

Descriptive statistics were used to summarize PSC scores according to age and gender and to determine the prevalence of psychological dysfunction in the study population. We computed

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prevalence ratios (PR) for the association between the psychological problems and independent variables using generalized linear models (GLM) with a binomial family and a log link with robust standard errors. All significant variables at p < 0.20 were included in the multivariable model to obtain adjusted PR with their 95% confidence intervals (95% CI). Finally, only significant variables (p < 0.05) were maintained for the final model. The analysis was conducted using Stata version 15.0.

RESULTS

Sample characteristics

In this survey, 1124 caregivers answered the questionnaire and 1077 were included in the study. We excluded 27 children and adolescents who had been receiving treatment for any mental problem before the pandemic. In addition, participants with missing data for any of the variables were excluded from the study (2%). As Table 1 shows, the study participants were comprised of 513 females (47.63%) and 564 males (52.37%), and 68.99% were less than 11 years old. Most of the caregivers lived in urban areas (81.06%), had university studies (75.02%), and had a partner (74.28%). The children belonged primarily to nuclear families (74.09%). More than half of the families lived in a house (60.91%) and most of the families had three or fewer children in the household (94.06%). The percentage of families earning less than two minimum wages was 38.90%.

Table 1. Bivariate analysis of the association between children's and caregiver's characteristics and psychological dysfunction in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychological dysfunction n (%)	PR (95% CI)	p value
Children's characteristics				
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2					BM
3					0
4	Area of residence			1.0	pen
5	Urban	873 (81.06)	190 (21.76)	1.0	: fir
6	Rural	204 (18.94)	34 (16.67)	0.76 (0.54-1.06)	0.115
7 8	Gender				BMJ Open: first published as 1
9	Female	513 (47.63)	112 (21.83)	1.0	shec
10	Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.426 g
11	Age (years)				10.
12	4 to 7	445 (41.32)	99 (22.25)	1.0	113
13 14	8 to 10	298 (27.67)	62 (20.81)	0.93 (0.71-1.24)	0.641g
15	11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.252^{3}
16	Caregivers' characteristics			0.01 (0.01 1.12)	pen
17	Gender				10.1136/bmi 0.641/bmi 0.2522-068761 0.3128761
18 10	Female	825 (76.60)	178 (21.58)	1.0	22-0
19 20	Male	· · · ·	46 (18.25)		0.212
20		252 (23.40)	40 (18.23)	0.85 (0.61-1.17)	0.3125
22	Age (years)		54 (22 7 0)	1.0	on 22
23	20-29	237 (22.00)	54 (22.78)	1.0	
24 25	30-39	350 (32.50)	78 (22.29)	0.98 (0.69-1.38)	0.9005
25 26	40-49	375 (34.82)	72 (19.20)	0.84 (0.59-1.20)	0.342 _N
20	≥50	115 (10.68)	20 (17.39)	0.76 (0.46-1.27)	0.302 ^N
28	Education level				Dov
29	University or college	808 (75.02)	179 (22.15)	1.0	Download 0.222de
30	Complete secondary	148 (13.74)	26 (17.57)	0.79 (0.54-1.15)	0.222
31 32	Complete primary or incomplete secondary	54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.227 ⁸
33	Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0 291 3
34	Nationality	J, (J)	()	0.,. (0=	Diff.
35	Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	y://b
36 27	Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.184g
37 38	Marital status	50 (2.77)		1.40 (0.05-2.55)	<u>4</u>
39		000 (74 20)	1(7 (20.00)	1.0	ı.bm
40	With partner	800 (74.28)	167 (20.88)	1.0	
41	No partner	277 (25.82)	57 (20.58)	0.98 (0.75-1.28)	0.916m/ on April 27, 0.9467,
42	Work type during lockdown				on /
43 44	Business at home	60 (5.57)	12 (20.00)	1.0	Apri
44 45	Work out of home every day	260 (24.14)	51 (19.62)	0.98 (0.55-1.77)	0.946
46	Mixed (teleworking and office)	267 (24.79)	61 (22.85)	1.14 (0.65-1.98)	0.637× 0.7914
47	Teleworking	241 (22.4)	52 (21.58)	1.08 (0.62-1.89)	0.791 <u>×</u>
48	Unemployed	249 (23.12)	48 (19.28)	0.96 (0.54-1.69)	0.899
49 50	Health worker		·		0.899 guest. Protected by copyright.
51	No	701 (65.09)	132 (18.83)	1.0	ř. P
52	Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	0.029
53	Family and household Characteristics	0,0(0)_()	1	čte
54	Family structure				d by
55 56	-	708 (74.00)	169 (21.05)	1.0	6
50 57	Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	pyri
58					ght.
59					

				BMJ
Others different from parents	264 (24.51)	51 (19.32)	0.91 (0.69-1.21)	0.549
Single parent	15 (1.39)	5 (33.33)	1.58 (0.76-3.28)	0.216 [¬]
Housing type				rstp
House	656 (60.91)	135 (20.58)		oubli
Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	rst published
Number of bedrooms				das
> 3	251 (23.31)	48 (19.12)	1.0	\$ 10
3	543 (50.42)	118 (21.73)	1.14 (0.84-1.53)	0,404
1 - 2	283 (26.3)	58 (20.5)	1.07 (0.76-1.51)	
Inhabitants in the household		~ /		0,692 ⁶ /bmjopen
≤ 3	309 (28.69)	66 (21.36)	1.0	ben-
> 3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	0.773
Children in the household	× ,	× ,		0.77322-068761 0.8260n
≤3	1013 (94.06)	210 (20.73)	1.0	6876
> 3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.826
Family income (monthly minimum wa	· · · ·			n 22
≤ 1	197 (18.29)	71 (23.67)	1.0	Jur
1 to < 2	222 (20.61)	35 (22.29)	0.94 (0.65-1.34)	0.742 ^{ສັ}
2 to < 3	201 (18.66)	34 (16.92)	0.71 (0.49-1.03)	0.074
3 to <4	157 (14.58)	43 (19.37)	0.81 (0.58-1.14)	0.244
≥4	300 (27.86)	41 (20.81)	0.87 (0.62-1.23)	
– Pets in the household		()	· · · · ·	0.4595 0aded
No	299 (27.76)	61 (20.4)	1.0	ed f
Yes	778 (72.24)	163 (20.95)	1.02 (0.78-1.33)	0.843 ⁵
PR: Prevalence Rate, CI: Confidence Int		()	(http:
				, And

Table 2 shows the descriptive analysis of the PCS score by sex and age. The mean of the total score was 18.40 (SD: 10.57) and the highest mean was for attention symptoms (3.60, SD 2.10). When the data were examined for female and male children separately, we found statistically significant differences in mean values of PSC internalizing symptoms (p<0.005). The highest mean of externalizing and attention scores were observed in children between 4 and 7 years old (3.64, SD: 2.83 and 3.84, SD: 2.15, respectively). On the other hand, the mean of the internalizing score was higher in children between 8 and 10 years old (2.58, SD: 2.09).

Variables	Total Score	Externalizing symptoms	Internalizing symptoms	Attention symptoms
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total	18.40 (10.57)	3.42 (2.83)	2.26 (2.01)	3.60 (2.10)
Gender			`	
Boys	18.06 (10.40)	3.40 (2.82)	2.11 (1.91) ^a	3.62 (2.08)
Girls	18.77 (10.74)	3.44 (2.85)	2.44 (2.11)	3.58 (2.12)
Age (years)				
4-7	18.32 (10.30)	3.64 (2.83) ^b	1.95 (1.91) ^b	3.84 (2.15) ^b
8-10	19.33 (10.83)	3.47 (2.76)	2.58 (2.09)	3.81 (2.00)
11-16	17.67 (10.62)	3.08 (2.87)	2.39 (2.02)	3.10 (2.05)

Table 2. Mean scores of the Pediatric Symptom Checklist for all children separated by age and sex, Ecuador, 2020 (N=1077).

SD: standard deviation

^at test p<0,005; ^bANOVA, p<0,005

Psychosocial functioning of children and adolescents and associated factors

Psychosocial dysfunction was present in 20.8% of the children (21.8% in females and 19.9% in males) and the lowest proportion (18.9%) was observed in children between 11 and 16 years of age (Figure 1). However, no statistically significant differences were observed by sex and age. Internalizing symptoms were the most prevalent (30.73%), followed by externalizing symptoms (14.30%) and attention symptoms (9.56%).

Table 3 shows the bivariate association between independent variables and psychosocial dysfunction. The prevalence of psychosocial dysfunction in children and adolescents was higher in families who reported a bad family relationship during lockdown (PR 2.44; 95% CI 1.47-4.06), children that used electronic devices for 4 or more hours per day (PR; 1.68; 95% CI 1.09-2.58), and that never helped with housework (PR 3.11; 95% CI 1.43-6.73). Children who never, sometimes, or often played video games had a 55%, 4.8%, and 58% lower prevalence of psychosocial dysfunction than children who always played.

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		Psychosocial		р
Variables	Total N (%)	dysfunction n (%)	PR (95% CI)	valu
Characteristics of lockdown	11 (70)	n (70)		
Family relationship				
Excellent	462 (42.8)	54 (11.69)	1.0	
Good	566 (52.55)	156 (27.56)	2.35 (1.77-3.13)	< 0.0
Poor	49 (4.55)	14 (28.57)	2.44 (1.47-4.06)	0,00
Children's homework time	+) (+.55)	1+(20.57)	2.11 (1.17 1.00)	0,00
Decreased	187 (17.36)	39 (20.86)	1.0	
Equal	271 (25.16)	41 (15.13)	0.72 (0.48-1.07)	0,1
Increased	619 (54.47)	144 (23.26)	1.11 (0.81-1.52)	0,1
Children's time with electronic devices	017 (34.47)	144 (23.20)	1.11(0.01-1.52)	0,4
≤1 hour	135 (12.53)	20 (14.81)	1.0	
2-3 hours	329 (30.55)	20 (14.81) 51 (15.5)	1.04 (0.64-1.68)	0,83
≥4 hours	613 (56.92)	153 (24.96)	1.68 (1.09-2.58)	0,8. 0,0
		133 (24.90)	1.08 (1.09-2.38)	0,0
During the lockdown, has your child exercise		9(15(0))	1.0	
Always	51 (4.74)	8 (15.69)		0.6
Often	192 (17.83)	26 (13.54)	0.86 (0.41-1.79)	0,6
Sometimes	708 (65.74)	157 (22.18)	1.41 (0.73-2.71)	0,2
Never	126 (11.7)	33 (26.19)	1.66 (0.82-3.36)	0,1
During the lockdown, has your child played w	0	0 (12 0 ()	1.0	
Always	21 (1.95)	9 (42.86)	1.0	0.0
Often	202 (18.76)	37 (18.32)	0.42 (0.24-0.75)	0,0
Sometimes	412 (38.25)	92 (22.33)	0.52 (0.31-0.88)	0,0
Never	442 (41.04)	86 (19.46)	0.45 (0.26-0.77)	0,0
During the lockdown, has your child played t	0		1.0	
Always	40 (3.71)	3 (7.5)	1.0	0.1
Often	214 (19.87)	37 (17.29)		,
Sometimes	570 (52.92)	126 (22.11)	2.94 (0.98-8.85)	0,0
Never	253 (23.49)	58 (22.92)	3.05 (1.01-9.29)	0,04
During the lockdown, has your child played b	0			
Always	31 (2.88)	3 (9.68)	1.0	~ <i>·</i>
Often	261 (24.23)	40 (15.33)	1.58 (0.52-4.82)	0,4
Sometimes	545 (50.6)	125 (22.94)	2.37 (0.79-7.02)	0,1
Never	240 (22.28)	56 (22.28)	2.41 (0.8-7.24)	0,1
During the lockdown, has your child watched				
Always	112 (10.4)	21 (18.75)	1.0	_
Often	523 (48.56)	94 (17.97)	0.95 (0.62-1.47)	0,84
Sometimes	405 (37.6)	100 (24.69)	1.31 (0.86-2.01)	0,20
Never	37 (3.44)	9 (24.32)	1.29 (0.65-2.57)	0,43

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3	During the lockdown, has your child helped with th	ne housework?			
4 5	Always	127 (11.79)	10 (7.87)	1.0	
5 6	Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004
7	Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	< 0.001
8	Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004
9	Attitudes regarding COVID-19		(,)		-,
10	Someone had or died from COVID-19				
11 12	No friend or family member	215 (19.96)	40 (18.60)	1.0	
12	A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443
14	A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274
15	As an adult, are you afraid of COVID-19?		- ()	()	
16	Definitely not	22 (2.04)	3 (13.64)	1.0	
17	No, as long as I am at home everything will be fine	135 (12.53)	21 (15.56)	1.14 (0.37-3.51)	0,818
18 19	Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502
20	I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245
21	Is your child afraid of COVID-19?	517(2).02)	02 (25.71)	1.00 (0.04-5.40)	0,245
22	No	790 (73.35)	143 (18.10)	1.0	
23	Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	< 0.001
24	Are you worried that your child may need psychological	()	(/	1.30 (1.23-1.97)	<0.001
25	I am not worried at all	514 (47.73)	59 (11.48)	1.0	
26 27			· · · ·		< 0.001
28	I am a bit worried	391 (36.3)	105(26.85)	2.33 (1.74-3.12)	
29	I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	< 0.001
30	Are you worried that your child may need medicat	-	-		
31	I am not worried at all	811 (75.3)	140 (17.26)	1.0	.0.001
32	I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	< 0.001
33 34	I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	< 0.001
54 35	Are you worried that your child may need emotion	al therapy after	the lockdown?)	
36	I am not worried at all	625 (58.03)	73 (11.68)	1.0	
37	I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)	< 0.001
38	I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	< 0.001
39	Are you worried that your child may not be able to			· · · · · ·	
40	I am not worried at all	519 (48.19)	64 (12.33)	1.0	
41 42	I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	< 0.001
43	I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	< 0.001
44	PR: Prevalence Rate, CI: Confidence Interval	100 (10.52)		2.91 (2.17 1.00)	0.001
45	TR. Trevalence Rate, CI. Confidence Interval				
46					
47					
48 49	Regarding attitudes toward COVID-19, child	en who were afra	aid of COVID-1	19 had a 1.56 (95%)	
49 50					
51	CI 1.23-1.97) times higher prevalence of psy	chosocial dysfur	nction than child	dren who were not	
52					
53	afraid. The highest prevalence of psychosoci	al problems occu	urred in childrer	n whose caregivers	
54					
55 56	were worried about the need for: a) psycholog	ical aid (PR 3.04	; 95% CI 2.21-4	.16), b) medication	
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(PR 1.82; 95% CI 1.30-2.55), c) emotional therapy (PR 3.58; 95% CI 2.64-4.85), and/or d) inability to return to normal life (PR 2.94; 95% CI 2.17-4.00).

After the multivariable analysis was performed (Table 4), psychosocial dysfunction was positively associated with good (PR 1.98; CI 95% 1.44-2.72) or bad (PR 2.23; 95% CI 1.22-4.07) family relationships during lockdown compared to those with excellent relationships. In addition, the prevalence of psychosocial dysfunction was 3 times higher in children who never (PR 2.63; 95% CI 1.13-6.14), sometimes (PR 2.76; 95% CI 1.44-4.29), or often (PR 2.68; 95% CI 1.39-5.17) helped with housework compared to those who always helped. The highest prevalence of psychosocial problems occurred in children whose caregivers were very worried (PR 2.86; 95% CI 1.97-4.15) and a bit worried (2.37; 95% CI 1.75-3.21) that their children may need emotional therapy after lockdown compared to those who were not worried at all. Finally, not having played video games (PR 0.34; 95% CI 0.17-0.69) or having played them infrequently (PR 0.39; 95% CI 0.20-0.79) was associated with a lower probability of psychosocial problems in children and adolescents.

Variables	PR (95% CI)	<i>p</i> value
Family relationships during lock	lown	
Excellent	1.0	
Good	1.98 (1.44-2.72)	< 0.001
Poor	2.23 (1.22-4.07)	0.009
During the lockdown, has your cl	nild played video games?	
Always	1.0	
Often	0.36 (0.17-0.76)	0.007
Sometimes	0.39 (0.20-0.79)	0.008
Never	0.34 (0.17-0.69)	0.003

Table 4. Multivariate regression of the association between independent variables and psychosocial dysfunction in children and adolescents, Ecuador, 2020 (N=1077)

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1.0							
2.68 (1.39-5.17)	0.003						
2.76 (1.44-4.29)	0.002						
2.63 (1.13-6.14)	0.025						
Are you worried that your child may need emotional therapy after the lockdown?							
1.0							
2.37 (1.75-3.21)	< 0.001						
2.86 (1.97-4.15)	< 0.001						
	2.68 (1.39-5.17) 2.76 (1.44-4.29) 2.63 (1.13-6.14) nal therapy after the 1.0 2.37 (1.75-3.21)						

PR: Prevalence Rate, CI: Confidence Interval

Discussion

The results obtained in this study show that 20.8% of the children suffered psychosocial dysfunction during the COVID-19 lockdown in Ecuador, and internalizing symptoms were the most common. The prevalence of psychosocial dysfunction was higher in children who had a poor family relationship during confinement, children who never helped with housework, and those whose caregivers were worried about the need for emotional therapy for their children. Never playing video games or playing video games infrequently was a protective factor against the psychosocial problems of children and adolescents.

Our study showed a higher prevalence of psychosocial dysfunction in children and adolescents compared to a study carried out in Mexico from February to May 2021 that showed a prevalence of 12% using the same evaluation instrument; attention symptoms were the most common, followed by internalizing/anxiety-depression and externalizing/conduct symptoms.²¹ The differences in prevalence could be partially related to the period of the pandemic being studied. A study performed in Ecuador showed moderate to severe emotional distress levels (anxiety-depressive symptoms and stress) in adolescents.¹ Specifically, 40.6% of the adolescents suffered from severe or very severe symptoms of anxiety, 36.4% from depressive symptoms, and 28.2%

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from stress six months after the beginning of the COVID-19 pandemic.¹ In addition, a study of Ecuadorian high school students (14 to 18 years old) showed a 16% occurrence of mental health problems during the COVID-19 quarantine.¹⁴ In studies done pre-COVID-19, it was found that 6.2% of Ecuadorian college students met the criteria for diagnosis of a major depressive episode;²² this level of depression is substantially lower than the 30.7% rate of internalizing symptoms reported in our study, suggesting that depression rates have increased as a consequence of the COVID-19 lockdown. Finally, the most common mental health issues reported in a review of 35 survey studies with 65,508 participants, ranging from 4 to 19 years of age, were: Anxiety (28%), depression (23%), loneliness (5%), stress (5%), fear (5%), tension (3%), anger (3%), fatigue (3%), confusion (3%), and worry (3%) as a result of the COVID-19 pandemic.⁷ In our study, internalizing/anxiety/depression symptoms were also the most prevalent.

Our results indicate that the presence of psychosocial problems was higher in children who did not have a good family relationship during confinement and in children who did not share family activities like housework. Previous studies showed that family characteristics, particularly parent-child interactions, were directly associated with children's mental health in situations when bad life events such as hurricanes, earthquakes, migrations, and terrorist attacks occurred.^{23,24}A study in Northwest China reported that frequent parent-child communication and better parent-child relationships improve children's psychological status associated with children's home isolation.²⁵ A study conducted by Liu *et. al.* on 5000 Chinese children found that a poor parent-child relationship resulted in depression and anxiety in children during quarantine.²⁶ While confined together, families have more time to work through difficulties, which may result in better and more meaningful relationships. Contrarily, family conflicts might also easily occur when families are isolated in their homes for an extended period of time.²⁷ In those circumstances, the stressful

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confined environment may exacerbate preexisting issues or perhaps lead to the development of new ones. A study in the United States reported a high level of closeness between parents and children during the pandemic, as well as increased conflicts, discipline, and harsh words.²⁸ Research in Australia found a decrease in positive family expressiveness during the pandemic.²⁹ Families can reduce stress during a pandemic by keeping open lines of communication, participating in common activities, seeking out social support, and cultivating thankfulness.³⁰

Considering the family factors, our study found a higher prevalence of psychosocial problems in those children whose caregivers were concerned about the children's mental health. In a Canadian study, parents with children <18 at home reported unique pressures, including worrying about their children's health, mental health, and education and being stressed about looking after children while continuing to work.²⁷ Higher parent stress has been associated with elevated child anxiety during the COVID-19 pandemic.³¹ In addition, higher levels of parenting stress have been associated with an increased use of harsh parenting practices.³² Therefore, interventions should also be focused on the mental health of parents since they affect the well-being of their children.

In our study, children who sometimes or never played video games (VGs) showed a reduced prevalence of psychological deterioration during COVID-19. Playing video games for prolonged periods of time is a major risk factor for the emergence of pathological behavioral signs.³³ Some studies support suggestions that the COVID-19 pandemic will lead children and adolescents to be more engaged in playing video games because of their decreased access to social activities.^{34,35} A longitudinal study showed that video game use and internet gaming disorder severity increased significantly among adolescents during the COVID-19 pandemic.³⁵ Theoretically, during home confinement, children and teens spent more time playing video games to prevent boredom and loneliness, which led to an increase in use and, ultimately, pathologic gaming. Effective

monitoring techniques that can assist in preventing the emergence of video game addiction should be rapidly adopted by parents of children and teenagers.

Our research has some limitations. The cross-sectional study design restricts the ability to demonstrate causality. The study represents a short time-lapse of exploration during the strict COVID-19 lockdown in Ecuador; therefore, the results could have been influenced by situational factors. We did not conduct a more detailed analysis of the risk factors for psychosocial problems across different age groups. Understanding the impacts on different age cohorts can provide valuable insights for age-specific interventions and policies. Another potential limitation is that our data only include a proxy report of the child/adolescent's psychosocial problems, as the PSC was completed by caregivers. Using the youth self-report version of the Pediatric Symptom Checklist (PSC-Y) for adolescents aged 11 to 18 could enhance sensitivity in detecting psychosocial problems within this age group. In addition, parents who were more concerned about their children's mental health were more motivated to participate, which could have influenced the symptoms that were reported. Finally, the use of social networks may lead to a bias in selection and the lack of representation of vulnerable groups.

Conclusion

Prolonged school closures and confinement during the COVID-19 pandemic had a remarkable impact on children's and adolescents' mental well-being in Ecuador. There is a need to further explore the long-term consequences of the lockdown on the mental health of these vulnerable groups and to develop structured strategies that focus on parent-child relationships when facing adverse events such as pandemics. To better maximize these efforts, future studies should investigate how services, such as virtual mental health support, may be implemented.

Acknowledgments

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Contributors ECV, MAL, and CF contributed to the conception and study design. ECV, MAL, and CGJD conducted the statistical analysis. ECV, MAL, and AM interpreted the results and drafted the manuscript. The methodology and data collection were completed by CAC and NAM. All authors read and approved the final manuscript.

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Competing interests None declared

Patient consent for publication Not applicable

Ethics approval The study was approved by the Ethics Board of the College of Medicine, Pontificia Universidad Católica del Ecuador (SB-CEISH-POS-458). Participants were informed that the study was completely anonymous and their participation was voluntary. Online informed consent was provided by the respondents before they completed the questionnaire.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request through the corresponding author.

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Figure Legends

Figure 1. Prevalence of psychosocial dysfunction by age groups during COVID-19 lockdown in

Ecuador, 2020.

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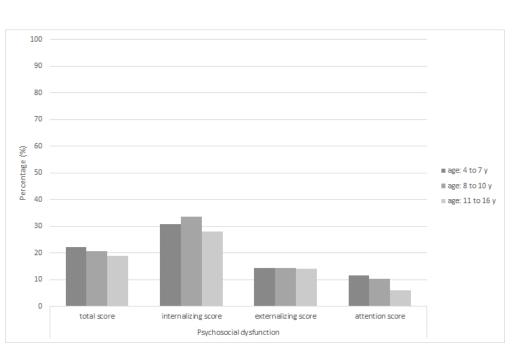


Figure 1. Prevalence of psychosocial dysfunction by age groups during COVID-19 lockdown in Ecuador, 2020.

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Section/Topic	ltem #	Recommendation	Reported on page #
Title and abstract	1	(<i>a</i>) Indicate the study's design with a commonly used term in the title or the abstract	2 (line 8), 3 (line 17)
		(<i>b</i>) Provide in the abstract an informative and balanced summary of what was done and what was to und	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	5 (line 22-24)
Methods			
Study design	4	Present key elements of study design early in the paper	5 (line 37-56)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, folew-up, and data collection	5 (line 37-56)
Participants	6	(<i>a</i>) Give the eligibility criteria, and the sources and methods of selection of participants	5 (line 37-56)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Gree diagnostic criteria, if applicable	6 (line 16-42)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6 (line 16-42)
Bias	9	Describe any efforts to address potential sources of bias	5,6
Study size	10	Explain how the study size was arrived at	7 (lines 19-26)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which group ings were chosen and why	6
Statistical methods	12	why o (a) Describe all statistical methods, including those used to control for confounding	6,7
		(b) Describe any methods used to examine subgroups and interactions	NA
		(b) Describe any methods used to examine subgroups and interactions Image: Constraint of the second sec	7 (line 24-26)
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examin 🛱 for eligibility,	7 (lines 19-26)
		confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	7 (lines 19-26)
		c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7 (lines 26-38)
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9 (lines 31-45) and 10 (lines 31-40)
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence	10,11,12,13,14
		interval). Make clear which confounders were adjusted for and why they were included	10,11,12,13,14
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	14 (lines 26-40)
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17 (lines 13-31)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14,15,16
Generalisability	21	Discuss the generalisability (external validity) of the study results	17 (line 29-32)
Other information		7, 20	
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18 (line 21-23)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in controls in case-control studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examed be of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.spobe-statement.org.

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