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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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Abstract

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.

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 mortality[6], 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 meant to verify their age and nationality.

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 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 has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Latino children[17-19] 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

variables ($p < 0.05$) were maintained for the final model. Analysis was conducted using Stata version 15.0.

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

(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

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

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 psychological impairment in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychological impairment n (%)	PR (95% CI)	*p* value
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)	0.115
Gender				
Female	513 (47.63)	112 (21.83)	1.0	
Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.426
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)	0.641
11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.252
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)	0.222
Complete primary or incomplete secondary	54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.227
Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0.291
Nationality				
Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	
Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.184
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)	0.916
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)	0.946
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	
Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	0,029
Family and household Characteristics				
Family structure				

Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	
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				
House	656 (60.91)	135 (20.58)		
Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	0,825
Number of bedrooms				
> 3	251 (23.31)	48 (19.12)	1.0	
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)	0,692
Inhabitants in the household				
≤ 3	309 (28.69)	66 (21.36)	1.0	
> 3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	0.773
Children in the household				
≤ 3	1013 (94.06)	210 (20.73)	1.0	
> 3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.826
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)	0.7423
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)	0.459
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)	0,843

PR: Prevalence Rate, CI: Confidence Interval

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

Variables	Total Score Mean (SD)	Externalizing symptoms Mean (SD)	Internalizing symptoms Mean (SD)	Attention symptoms 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)

SD: standard deviation

[b]t test p<0,005; [a]ANOVA, p<0,005

Table 3. Bivariate association between lockdown variables and psychological impairment in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychological impairment n (%)	PR (95% CI)	*p* 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 games?				
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 traditional 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 games?				
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 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

During lockdown, has your child helped with the housework?				
Always	127 (11.79)	10 (7.87)	1.0	
Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004
Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	<0.001
Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004
Attitudes regarding COVID-19				
Someone had or died from COVID-19				
No friend or family member	215 (19.96)	40 (18.60)	1.0	
A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443
A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274
As an adult, are you afraid of COVID-19?				
Definitely not	22 (2.04)	3 (13.64)	1.0	
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
Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502
I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245
Is your child afraid of COVID-19?				
No	790 (73.35)	143 (18.10)	1.0	
Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	<0.001
Are you worried that your child may need psychological aid after lockdown?				
I am not worried at all	514 (47.73)	59 (11.48)	1.0	
I am a bit worried	391 (36.3)	105 (26.85)	2.33 (1.74-3.12)	<0.001
I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	<0.001
Are you worried that your child may need medication for any mental problem after lockdown?				
I am not worried at all	811 (75.3)	140 (17.26)	1.0	
I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	<0.001
I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	<0.001
Are you worried that your child may need emotional therapy after lockdown?				
I am not worried at all	625 (58.03)	73 (11.68)	1.0	
I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)	<0.001
I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	<0.001
Are you worried that your child may not be able to go back to normal life?				
I am not worried at all	519 (48.19)	64 (12.33)	1.0	
I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	<0.001
I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	<0.001

PR: Prevalence Rate, CI: Confidence Interval

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

Variables	PR (95% CI)	*p* value
Family relationship during lockdown		
Excellent	1.0	
Good	1.98 (1.44-2.72)	<0.001
Bad or awful	2.23 (1.22-4.07)	0.009
During lockdown, has your child played videogames?		
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
During lockdown, has your child helped 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 emotional therapy after lockdown?		
I am not worried at all	1.0	
I am a bit worried	2.37 (1.75-3.21)	<0.001
I am very worried	2.86 (1.97-4.15)	<0.001

PR: Prevalence Rate, CI: Confidence Interval

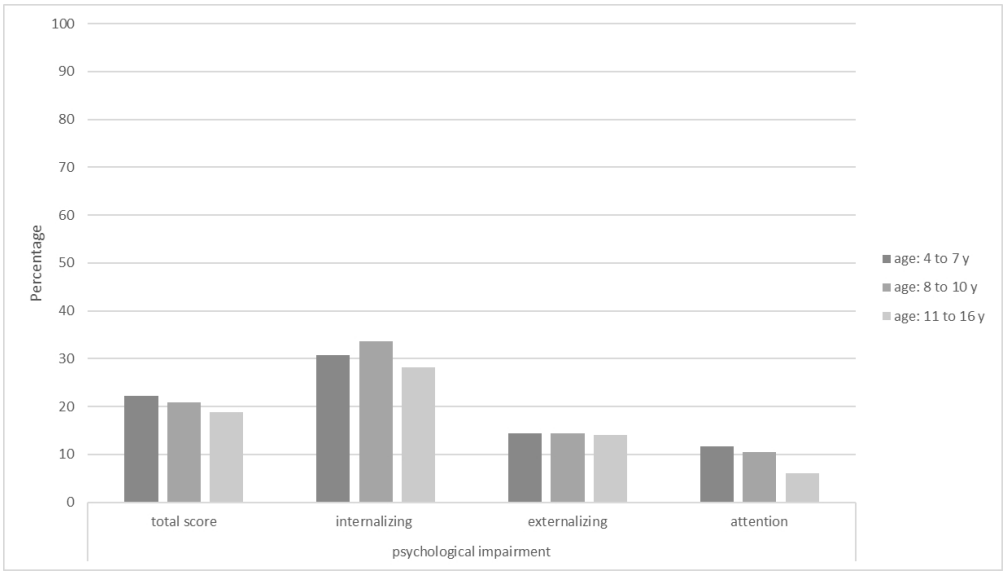

Figure 1. Prevalence of psychological impairment by age groups during COVID-19 lockdown in Ecuador.

104x58mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	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 found	Page 1
Introduction			
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, follow-up, and data collection	Page 3
Participants	6	(*a*) 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. Give 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 groupings were chosen and why	Page 3 and 4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page 4
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	Page 4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 4
		(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	(*a*) 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 cohort and cross-sectional 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.strobe-statement.org.

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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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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% 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.

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, social-emotional 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 mortality[6], 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.

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-35[16] has proven to have good validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children[17-20]. 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

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* value
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)	0.115
Gender				
Female	513 (47.63)	112 (21.83)	1.0	
Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.426

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)	0.641
11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.252
Caregivers´ characteristics				
Gender				
Female	825 (76.60)	178 (21.58)	1.0	
Male	252 (23.40)	46 (18.25)	0.85 (0.61-1.17)	0.312
Age (years)				
20-29	237 (22.00)	54 (22.78)	1.0	
30-39	350 (32.50)	78 (22.29)	0.98 (0.69-1.38)	0.900
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)	0.302
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)	0.222
Complete primary or incomplete secondary	54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.227
Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0.291
Nationality				
Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	
Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.184
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)	0.916
Work type during lockdown				
Business at home	60 (5.57)	12 (20.00)	1.0	
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	
Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	0.029
Family and household Characteristics				
Family structure				
Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	
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				
House	656 (60.91)	135 (20.58)		
Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	0,825
Number of bedrooms				

> 3	251 (23.31)	48 (19.12)	1.0	
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)	0,692
Inhabitants in the household				
≤ 3	309 (28.69)	66 (21.36)	1.0	
> 3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	0.773
Children in the household				
≤ 3	1013 (94.06)	210 (20.73)	1.0	
> 3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.826
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)	0.742
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)	0.459
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)	0.843

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).

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

Variables	Total Score Mean (SD)	Externalizing symptoms Mean (SD)	Internalizing symptoms Mean (SD)	Attention symptoms 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 deviation

[a]t test p<0,005; [b]ANOVA, 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,

Table 3. Bivariate association between lockdown variables and psychosocial dysfunction in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychosocial dysfunction n (%)	PR (95% CI)	*p* 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	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?				
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 games?				
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 traditional 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 the lockdown, has your child played board games?				
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 the lockdown, has your child watched movies or TV?				

sometimes, or often played video games had a 55%, 4.8%, and 58% lower prevalence of psychosocial dysfunction than children who always played.

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
During the lockdown, has your child helped with the housework?				
Always	127 (11.79)	10 (7.87)	1.0	
Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004
Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	<0.001
Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004
Attitudes regarding COVID-19				
Someone had or died from COVID-19				
No friend or family member	215 (19.96)	40 (18.60)	1.0	
A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443
A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274
As an adult, are you afraid of COVID-19?				
Definitely not	22 (2.04)	3 (13.64)	1.0	
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
Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502
I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245
Is your child afraid of COVID-19?				
No	790 (73.35)	143 (18.10)	1.0	
Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	<0.001
Are you worried that your child may need psychological aid after the lockdown?				
I am not worried at all	514 (47.73)	59 (11.48)	1.0	
I am a bit worried	391 (36.3)	105 (26.85)	2.33 (1.74-3.12)	<0.001
I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	<0.001
Are you worried that your child may need medication for any mental problem after the lockdown?				
I am not worried at all	811 (75.3)	140 (17.26)	1.0	
I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	<0.001
I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	<0.001
Are you worried that your child may need emotional therapy after the lockdown?				
I am not worried at all	625 (58.03)	73 (11.68)	1.0	
I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)	<0.001
I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	<0.001
Are you worried that your child may not be able to go back to normal life?				
I am not worried at all	519 (48.19)	64 (12.33)	1.0	
I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	<0.001
I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	<0.001

PR: Prevalence Rate, CI: Confidence Interval

Regarding 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 dysfunction than children who are not afraid.

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 independent variables and psychosocial dysfunction in children and adolescents, Ecuador, 2020 (N=1077).

Variables	PR (95% CI)	*p* 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 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
During the lockdown, has your child helped 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 emotional therapy after the lockdown?		
I am not worried at all	1.0	
I am a bit worried	2.37 (1.75-3.21)	<0.001
I am very worried	2.86 (1.97-4.15)	<0.001

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 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%), 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 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 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 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.[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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Contributors ECV, MAL, and CF contributed to the conception and study design. ECV, MAL, and CGJD conducted the statistical analysis. ECV, MAL, and AM conducted the interpretation of results and drafting of 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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Patient consent for publication Not applicable

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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.

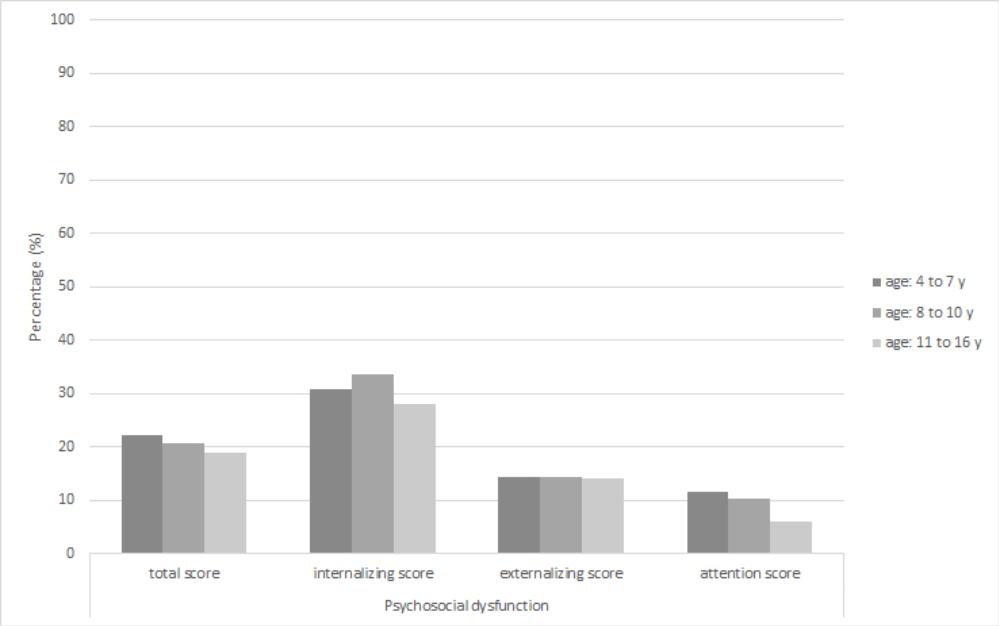

Figure 1. Prevalence of psychosocial dysfunction by age groups during COVID-19 lockdown in Ecuador, 2020.

62x39mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2 (line 8), 3 (line 17)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	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, follow-up, and data collection	5 (line 37-56)
Participants	6	(*a*) 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. Give 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 groupings were chosen and why	6
Statistical methods	12	(*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
		(*c*) Explain how missing data were addressed	7 (line 24-26)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7 (lines 19-26)
		(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 interval). Make clear which confounders were adjusted for and why they were included	10,11,12,13,14
		(*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			
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 cohort and cross-sectional 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.strobe-statement.org.

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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 mortality[6], 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-35[16] has been proven to have high validity and reliability as a screening tool for psychosocial dysfunction in Hispanic children[17-20]. 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 (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				

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)	0.115
Gender				
Female	513 (47.63)	112 (21.83)	1.0	
Male	564 (52.37)	112 (19.86)	0.91 (0.72-1.14)	0.426
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)	0.641
11 to 16	334 (31.01)	63 (18.86)	0.84 (0.64-1.12)	0.252
Caregivers´ characteristics				
Gender				
Female	825 (76.60)	178 (21.58)	1.0	
Male	252 (23.40)	46 (18.25)	0.85 (0.61-1.17)	0.312
Age (years)				
20-29	237 (22.00)	54 (22.78)	1.0	
30-39	350 (32.50)	78 (22.29)	0.98 (0.69-1.38)	0.900
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)	0.302
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)	0.222
Complete primary or incomplete secondary	54 (5.01)	8 (14.81)	0.66 (0.34-1.28)	0.227
Illiterate or incomplete primary	67 (6.22)	11 (16.42)	0.74 (0.42-1.29)	0.291
Nationality				
Ecuadorian	1047 (97.21)	1047 (20.53)	1.0	
Others (Colombian, Venezuelan)	30 (2.79)	9 (30)	1.46 (0.83-2.55)	0.184
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)	0.916
Work type during lockdown				
Business at home	60 (5.57)	12 (20.00)	1.0	
Work out of home 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	
Yes	376 (34.91)	92 (24.47)	1.29 (1.02-1.64)	0.029
Family and household Characteristics				
Family structure				
Traditional nuclear family	798 (74.09)	168 (21.05)	1.0	

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				
House	656 (60.91)	135 (20.58)		
Apartment	421 (39.09)	89 (21.14)	1.02 (0.81-1.30)	0,825
Number of bedrooms				
> 3	251 (23.31)	48 (19.12)	1.0	
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)	0,692
Inhabitants in the household				
≤ 3	309 (28.69)	66 (21.36)	1.0	
> 3	768 (71.31)	158 (20.57)	0.96 (0.74-1.24)	0.773
Children in the household				
≤ 3	1013 (94.06)	210 (20.73)	1.0	
> 3	64 (5.94)	14 (21.88)	1.05 (0.65-1.70)	0.826
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)	0.742
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)	0.459
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)	0.843

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 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).

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

Variables	Total Score Mean (SD)	Externalizing symptoms Mean (SD)	Internalizing symptoms Mean (SD)	Attention symptoms 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 deviation
[a]t test p<0,005; [b]ANOVA, 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.

Table 3. Bivariate association between lockdown variables and psychosocial dysfunction in children and adolescents, Ecuador, 2020 (N=1077).

Variables	Total N (%)	Psychosocial dysfunction n (%)	PR (95% CI)	*p* 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
Poor	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?				
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 games?				
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 traditional 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 the lockdown, has your child played board games?				
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 the lockdown, has your child watched movies 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

During the lockdown, has your child helped with the housework?				
Always	127 (11.79)	10 (7.87)	1.0	
Often	432 (40.11)	86 (19.91)	2.52 (1.35-4.72)	0,004
Sometimes	469 (43.55)	116 (24.73)	3.14 (1.69-5.81)	<0.001
Never	49 (4.55)	12 (24.49)	3.11 (1.43-6.73)	0,004
Attitudes regarding COVID-19				
Someone had or died from COVID-19				
No friend or family member	215 (19.96)	40 (18.60)	1.0	
A friend	766 (71.12)	161 (21.02)	1.13 (0.83-1.54)	0.443
A relative	96 (8.91)	23 (23.96)	1.29 (0.82-2.06)	0.274
As an adult, are you afraid of COVID-19?				
Definitely not	22 (2.04)	3 (13.64)	1.0	
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
Yes, but it is normal	601 (55.8)	118 (19.63)	1.43 (0.49-4.17)	0,502
I am very afraid	319 (29.62)	82 (25.71)	1.88 (0.64-5.48)	0,245
Is your child afraid of COVID-19?				
No	790 (73.35)	143 (18.10)	1.0	
Yes	287 (26.65)	81 (28.22)	1.56 (1.23-1.97)	<0.001
Are you worried that your child may need psychological aid after the lockdown?				
I am not worried at all	514 (47.73)	59 (11.48)	1.0	
I am a bit worried	391 (36.3)	105 (26.85)	2.33 (1.74-3.12)	<0.001
I am very worried	172 (15.97)	60 (34.88)	3.04 (2.21-4.16)	<0.001
Are you worried that your child may need medication for any mental problem after the lockdown?				
I am not worried at all	811 (75.3)	140 (17.26)	1.0	
I am a bit worried	174 (16.16)	55 (31.61)	1.83 (1.4-2.38)	<0.001
I am very worried	92 (8.54)	29 (31.52)	1.82 (1.3-2.55)	<0.001
Are you worried that your child may need emotional therapy after the lockdown?				
I am not worried at all	625 (58.03)	73 (11.68)	1.0	
I am a bit worried	335 (31.1)	102 (30.45)	2.61 (1.99-3.41)	<0.001
I am very worried	117 (10.86)	49 (41.88)	3.58 (2.64-4.85)	<0.001
Are you worried that your child may not be able to go back to normal life?				
I am not worried at all	519 (48.19)	64 (12.33)	1.0	
I am a bit worried	393 (36.49)	100 (25.45)	2.06 (1.55-2.74)	<0.001
I am very worried	165 (15.32)	60 (36.36)	2.94 (2.17-4.00)	<0.001

PR: Prevalence Rate, CI: Confidence Interval

Regarding attitudes toward COVID-19, children who were afraid of COVID-19 had a 1.56 (95% CI 1.23-1.97) times higher prevalence of psychosocial dysfunction than children who were not afraid. 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 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.

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

Variables	PR (95% CI)	*p* value
Family relationships during lockdown		
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 child 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
During the lockdown, has your child helped 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 emotional therapy after the lockdown?		
I am not worried at all	1.0	
I am a bit worried	2.37 (1.75-3.21)	<0.001
I am very worried	2.86 (1.97-4.15)	<0.001

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%

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

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.

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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.

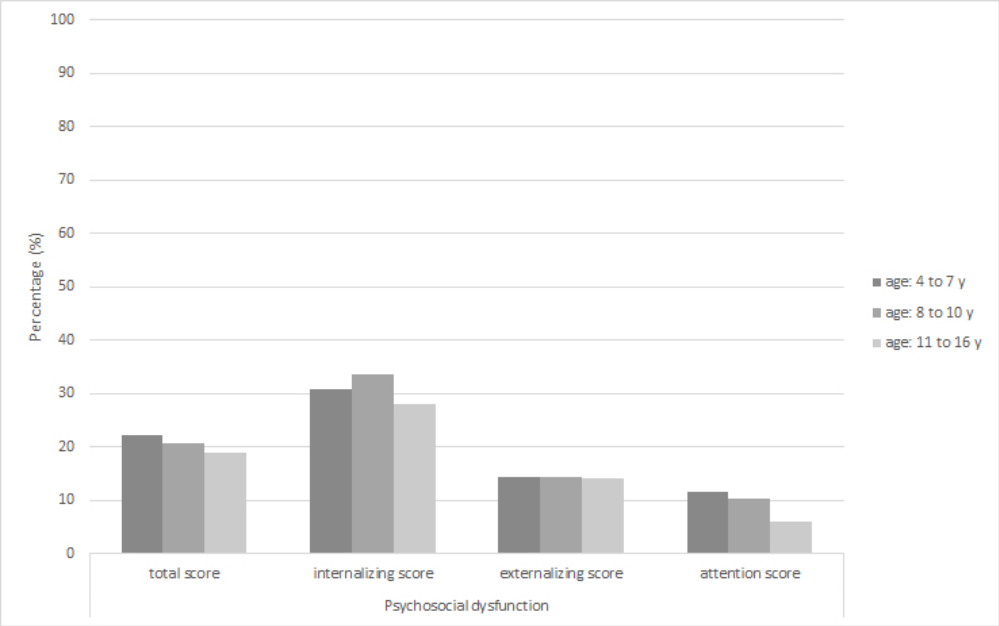

Figure 1. Prevalence of psychosocial dysfunction by age groups during COVID-19 lockdown in Ecuador, 2020.

62x39mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2 (line 8), 3 (line 17)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	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, follow-up, and data collection	5 (line 37-56)
Participants	6	(*a*) 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. Give 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 groupings were chosen and why	6
Statistical methods	12	(*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
		(*c*) Explain how missing data were addressed	7 (line 24-26)
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7 (lines 19-26)
		(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 interval). Make clear which confounders were adjusted for and why they were included	10,11,12,13,14
		(*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			
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 cohort and cross-sectional 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.strobe-statement.org.