



Universidade de  
Aveiro

2021

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MARTINS PEREIRA**

**REVISÃO SISTEMÁTICA DA PREVALÊNCIA DE  
SINTOMAS DE ANSIEDADE E DEPRESSÃO EM  
CRIANÇAS E ADOLESCENTES ANTES E DURANTE  
A PANDEMIA COVID-19**

**SYSTEMATIC REVIEW OF ANXIETY AND  
DEPRESSION SYMPTOM PREVALENCE BEFORE  
AND DURING COVID-19 PANDEMIC IN CHILDREN  
AND ADOLESCENTS**



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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Psicologia da Saúde e Reabilitação Neuropsicológica, realizada sob a orientação científica do Doutor José Ignácio Guinaldo Martín, Professor Auxiliar do Departamento de Educação e Psicologia da Universidade de Aveiro.

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## palavras-chave

ansiedade, depressão, prevalência, revisão sistemática, pandemia COVID-19, crianças e adolescentes.

## resumo

A saúde mental das crianças e adolescentes durante a pandemia COVID-19 requer especial atenção, visto serem uma população vulnerável.

Revisões sistemáticas e meta-análises recentes sugerem um agravamento de sintomas de ansiedade e depressão em crianças e adolescentes durante a pandemia COVID-19, no entanto, recorrem a prevalências combinadas que podem não se traduzir numa significância clínica, pois assumem igual prevalência para ambos. Adicionalmente, os resultados decorrentes de estudos individuais mostram-se inconsistentes.

A presente investigação teve como objetivo avaliar a diferença (diff) entre a prevalência de sintomas de ansiedade e depressão antes e durante a pandemia COVID-19 em crianças e adolescentes com idades entre os 3 e 18 anos.

Conduziu-se uma revisão sistemática segundo as diretrizes PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) e realizou-se uma pesquisa de literatura na PubMed por artigos publicados entre março de 2020 e julho de 2021. A pesquisa inicial identificou 251 artigos, tendo os 8 estudos incluídos (7 transversais e 1 longitudinal) sido conduzidos em 5 países (China, Itália, Portugal, Espanha e Suíça).

A maioria das comparações analisadas entre estudos sugerem uma tendência de agravamento dos sintomas de ansiedade e depressão durante a pandemia. Uma comparação apresentou uma tendência oposta tanto para os sintomas de ansiedade como de depressão.

Apenas um pequeno número de artigos (n=8) correspondeu aos critérios de inclusão. A causalidade e direção das associações encontradas podem apenas ser assumidas a partir do único estudo longitudinal analisado.

Questões metodológicas, fatores de risco e de proteção, limitações e direções futuras foram discutidas.

**keywords**

anxiety, depression, prevalence, systematic review, COVID-19 pandemic, children and adolescents.

**abstract**

Child and adolescent mental health during COVID-19 pandemic requires special attention, as they are a vulnerable population.

Recent systematic reviews and meta-analyses suggest a worsening of anxiety and depression symptoms in children and adolescents during COVID-19 pandemic, however, they resort to combined prevalence that may not translate into clinical significance, as they assume equal prevalence for both. Additionally, results from individual studies are inconsistent.

The current research aimed to assess the difference (diff) between prevalence of anxiety and depression symptoms before and during the COVID-19 pandemic in children and adolescents aged 3 to 18 years.

A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. A literature search was carried out in PubMed for studies published between March 2020 and July 2021 that reported the prevalence of anxiety and depression symptoms in this population during the COVID-19 pandemic. Initial database search identified 251 articles, with 8 studies included (7 cross-sectional and 1 longitudinal) conducted in 5 countries (China, Italy, Portugal, Spain and Switzerland) meeting inclusion criteria.

Most analyzed comparisons between studies suggest a worsening trend of anxiety and depression symptoms during the pandemic. One comparison showed an opposite trend for both anxiety and depression symptoms.

Only a small number of articles (n=8) matched the inclusion criteria. Causality and direction of found associations can only be assumed from one analyzed longitudinal study.

Methodological issues, risk and protective factors, limitations and future directions have been discussed.

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## Introduction

A new chapter in human history has been opened since 2019, when coronavirus disease (COVID-19) was first reported in Wuhan, China. It was declared as a pandemic in March 2020 (World Health Organization (WHO), 2020).

Prolonged lockdown and enforced closure of non-essential services led to rise in unemployment, telework and economic uncertainty, transformation in the household functioning, change in standard of living, and disruption in daily routines for all family members. These changes increased parental stress, which can spill over to vulnerable children and adolescents, carrying potential for maltreatment (Beckerman et al., 2017; Hagger et al., 2020). Lockdown and school closures forced them into social isolation from peers, teachers, and extended family, and stopped them from pursuing their outdoor leisure activities, consequently increasing screen time and disturbing sleep patterns (Choi et al., 2021).

For some children, an increased interaction with their families might lead to positive outcomes, while it can be a source of emotional distress for others (Sprang and Silman, 2013; Xie et al., 2020, as cited in Ma et al., 2021). Supportive families help children and adolescents build resilience which moderates depression and anxiety, while abusive ones can increase these symptoms (Cao et al., 2021).

Anxiety and depression are debilitating internalizing disorders that often lead to long-term mental and physical health problems. In these age groups, they are the most common mental health disorders, whose diagnostic criteria have been defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013; Racine et al., 2021). During the pandemic, females and adolescents have displayed a higher prevalence of these mental health problems as compared to males and children (Chawla et al., 2021; Ma et al., 2021; McKune et al., 2021).

Ma et al. (2021) recent systematic review and meta-analysis reported a pooled prevalence of anxiety and depression symptoms of 26% (95% CI: 16%, 35%) and 29% (95% CI: 17%, 40%),

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respectively, and Racine et al. (2021) meta-analysis reported a pooled prevalence of anxiety and depression symptoms of 20.5% (95% CI, 17%, 24%) and 25.2% (95% CI, 21%, 30%), respectively, both showing a worsening of symptoms during the COVID-19 pandemic. The latter compared the pooled prevalence of included pandemic studies with the pooled prevalence for Finnish (anxiety symptoms) and American (depression symptoms) adolescents sample. The prevalence differences (before and after the pandemic) for anxiety and depression symptoms were 8.9% and 12.3%, respectively. However, pooled prevalence estimates assume that prevalence across different subgroups is the same (e.g., children and adolescents), whereas this may not be the case. Therefore, a pooled estimate may not have clinical significance needed for designing interventions (Walker et al., 2013).

Most studies have used screening measures rather than longer diagnostic assessments (clinical interviews or gold standards) based on diagnostic criteria of DSM-5 that refer to “nature, severity, and duration of symptoms” (Walker et al., 2013, p. 895). The screening approach doesn’t assess or distinguish between different anxiety and depression diagnoses, therefore true prevalence of clinically anxious or depressed children and adolescents remains unclear.

There is still a lack of research in this area, as findings of individual studies are somewhat inconsistent. Some studies report worsening of anxiety and depression symptoms (Duan et al., 2020; Magson et al., 2021), while others report an improvement in the anxiety and depression symptoms (Liu et al., 2021). Moreover, there are some studies that have reported both tendencies depending on the mental health status prior to the pandemic (Hu & Qian, 2021).

### **Objectives**

The aim of this systematic review was to examine the impact of COVID-19 outbreak on children and adolescents mental health. The goal of this study was to analyze the trends in anxiety and depression symptom prevalence in children and adolescents aged 3 to 18 years, through comparison of available prevalence data collected before and during the COVID-19 pandemic.

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## Method

### Design

A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines (Moher et al., 2009). The eligibility criteria were defined according to PICO (Participants, Intervention/exposure, Comparator/control, Outcome) (Schiavenato & Chu, 2021; Tawfik et al., 2019).

### Eligibility criteria

**Type of studies.** The current systematic review included original peer-reviewed papers of observational studies with or without an internal comparison group (cohort – prospective and retrospective – and case-control), for gathering the maximum number of articles and cross-sectional studies.

**Participants.** Included studies were conducted on typically developing children (3-12 years old) and adolescents (13-18 years old), with no restrictions on gender or ethnicity, in any country. Studies that included participants with previous mental disorders (e.g., anxiety, depression), neurodevelopmental disorders (e.g., attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD)), or any other previous health condition (e.g., COVID-19) were excluded.

**Intervention/exposure and comparator/control.** Since COVID-19 pandemic is a global event, included studies were without control groups for this exposure.

**Outcome measures.** Outcome measures included prevalence (%) of anxiety and depression, as well as the chosen cut-off points. Only validated questionnaires that measured anxiety or depression were accepted for inclusion. Qualitative parent reports or any other subjective measures were excluded.

### Search strategy and data extraction

A preliminary search was conducted for the identification of relevant articles.

PubMed database was searched in August of 2021, using the following search script: ("COVID-19"[MeSH Terms] OR "pandemic covid 19"[Text Word] OR "SARS-CoV-2

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Infection"[Text Word]) AND ("mental health"[MeSH Terms] OR "Emotional well-being"[Text Word] OR "psychological well-being"[Text Word] OR "social well-being"[Text Word]) AND ("child"[MeSH Terms] OR "child\*"[Text Word] OR "youth\*"[Text Word]). Following search filters were used in PubMed: Publication date: 2020-2021, Language: English, Child: birth-18 years, Child: 6-12 years, and Adolescent: 13-18 years.

Titles and abstracts brought forth by the search were screened to identify and retrieve eligible records. It was assessed whether the articles answered the research questions and fulfilled the inclusion criteria. Reasons for exclusion of each paper were recorded. Full text screening was followed for the final inclusion of studies. A PRISMA flowchart was created to report the selection process (Figure 1).

Finally, the following data was extracted and tabulated (Table 1) from the studies selected for inclusion: study characteristics (authors, year of publication, and country), participant information (sample size (female participants, %), mean age (range)), and symptom (criteria, cutoff point (before COVID-19, during COVID-19), and prevalence for anxiety and depression (before COVID-19, during COVID-19)). When information was not available, it was indicated with "NR" (Not Reported).

## Results

### Search results

The literature search of PubMed database identified a total of 251 articles for further screening. The PRISMA flowchart in Figure 1 illustrates the study selection process and search results (Moher et al., 2009).

### Methodological characteristics of the studies

The main characteristics of the included studies have been summarized in Table 1.

Of the eight studies included in this systematic review, five were conducted in China, one in Switzerland, one in Spain, and one in three countries simultaneously (Spain, Italy, and Portugal). Seven studies were cross-sectional, while one study was longitudinal. Due to COVID-19 restrictions, the prevailing data collection method was online questionnaires. Data from the studies were collected

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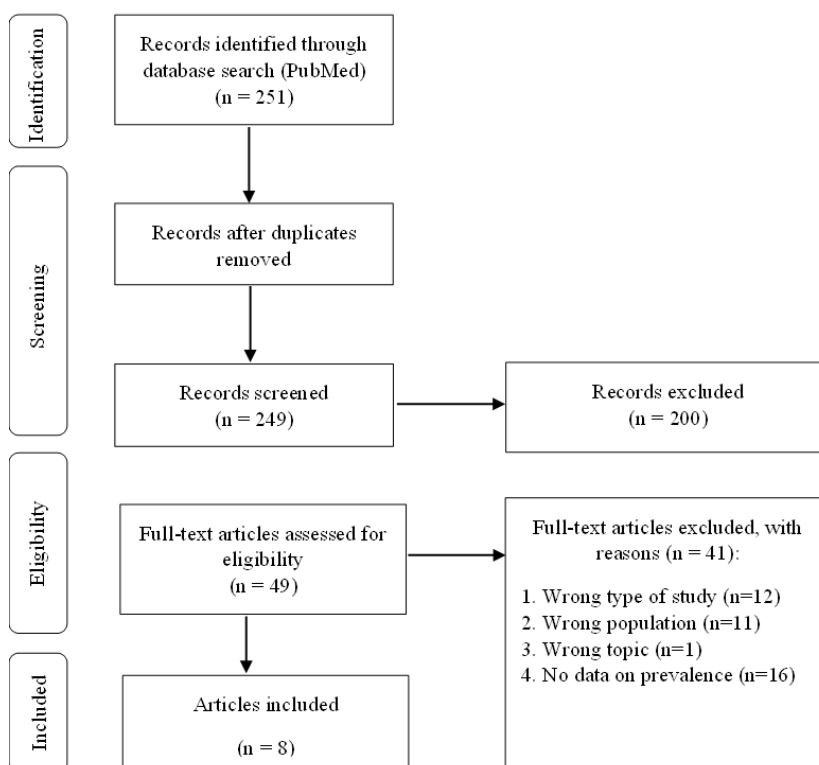
in a period from 8 March 2020 to 31 October 2020 (n=5). One study (Mohler-Kuo et al., 2021) did not report data collection date, but it mentioned only its duration, while two other studies (Duan et al., 2020; Orgilés et al., 2021) did not report any information.

All studies focused on children and adolescents (3-18 years), with exception of Cao et al., 2021, Mohler-Kuo et al., 2021, and Zhou et al., 2020, whose work focused solely on teenagers.

Samples reported in studies were not equally balanced regarding gender distribution, having more female than male participants. The female participation ranged from 46% to 55.30%, and sample sizes had great variation, ranging from 515 (Orgilés et al., 2021) to 11180 participants (Cao et al., 2021).

**Figure 1.**

*PRISMA flowchart showing search process and results*



## **Pandemic effects in anxiety and depression symptoms prevalence**

Four out of five analyzed comparisons between studies conducted before and during COVID-19 pandemic showed a worsening of anxiety symptoms during the pandemic.

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The smallest symptom prevalence increase observed was 6.1% (only child condition) and 10.3% (non-only child condition) (Cao et al., 2021; Wang et al., 2019), followed by a difference of 23% (Wang et al., 2019; Zhou et al., 2020). Both studies assessed the anxiety symptoms with the same instrument, the 7-item Generalized Anxiety Disorder (GAD-7), and they also used the same cut-off points in the pre-pandemic period (10) and the pandemic period (5).

In Spain, the prevalence difference reported by Orgilés et al. (2021) during the COVID-19 pandemic and a previous study conducted by the same author in 2012 (Orgilés et al., 2012) was 29.59%, which corresponds to an increase in anxiety symptoms.

Pizarro-Ruiz & Ordóñez-Cambor (2021) conducted a Student's t test comparing a sample of children and adolescents assessed during the pandemic with data from the clinical validation sample of Assessment System for Children and Adolescents (SENA) conducted before COVID-19 pandemic (Fernández-Pinto et al., 2015). They found statistically significant differences, reporting 33.20% prevalence of anxiety symptoms in children ( $t=2.49$ ,  $p=0.013$ ) and 43% prevalence of anxiety symptoms ( $t=5.64$ ,  $p<0.0001$ ) in adolescents.

Finally, the prevalence comparison for Liu et al., 2021 and Wang et al., 2019 was the only showing an opposite trend, with 7.67% improvement in anxiety symptoms during the pandemic.

A similar pattern was observed for depression symptoms by comparing the prevalence of these symptoms before and during COVID-19 pandemic. Five out of six analyzed comparisons showed an increase in prevalence of depressive symptoms during the pandemic, with exception of prevalence comparison between Liu et al. (2021) and Wang et al. (2019) which showed a decrease of 4.34%. The prevalence differences found in the remaining studies were: 4.92% (Lam, 2014; Tang et al., 2021), 9.08% (Duan et al., 2020; Stewart & Sun, 2007), 25.6% (Wang et al., 2019; Zhou et al., 2020), and 17.1% for only child condition and 20.7% for non-only child condition (Cao et al., 2021; Wang et al., 2019).

Lastly, the comparison between Fernández-Pinto et al. (2015) and Pizarro-Ruiz & Ordóñez-Cambor (2021) studies also reported an increase in prevalence of depression symptoms: 22.80% ( $t=3.132$ ,  $p=0.002$ ) in children and 34% ( $t=6.53$ ,  $p<0.0001$ ) in adolescents. The differences are found

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**Table 1**

*Prevalence of depression and anxiety in children and adolescents (n= 8, from PubMed database)*

Authors (year) Country	Study design	Participant information			
		N (female %)	M (range)	Anxiety Criteria CPb   CPd; Pb   Pd (%)	Depression Criteria CPb   CPd; Pb   Pd (%)
<b>Cao et al. (2021)</b> China	Cross-sectional	11180 (49.92%)	14.33 (12-18)	GAD-7 10   5; 14.40% <sup>a</sup>   20.50% (only child); 24.70% (non-only child)	PHQ-9 10   5; 18.10% <sup>a</sup>   35.20% (only child); 38.80% (non-only child)
<b>Duan et al. (2020)</b> China	Cross-sectional	3613 (49.85%)	12.50 (7-18)	NR	CDI 19   19; 13.20% <sup>b</sup>   22.28%
<b>Liu et al. (2021)</b> China	Cross-sectional	5175 (48.35%)	13.50 (9-18)	GAD-7 10   10; 14.40% <sup>a</sup>   6.73%	PHQ-9 10   10; 18.10% <sup>a</sup>   13.76%
<b>Mohler-Kuo et al. (2021)</b> Switzerland	Cross-sectional	1146 (50.40%)	14.50 (12-17)	SCAS NR   girls: 7.5, boys: 5.5; NR   girls: 13.60%, boys: 12.50%	PHQ-2 NR   3; NR   girls: 9.7%, boys: 4.6%
<b>Orgilés et al. (2021)</b> Spain, Italy, and Portugal	Cross-sectional	515 (46%)	8.98 (3-18)	SCAS-P 7.5   7.5; 26.41% <sup>c</sup> (Spain, n=2522)   56% (Spain, n=140)	SMFQ-P 17   10.5; NR   26.40% (Spain, n=140)
				SCAS-P NR   7.5; NR   34.10% (Italy, n=258)	SMFQ-P 19   10.5; NR   19.80% (Italy, n=258)
				SCAS-P NR   7.5; NR   26.50% (Portugal, n= 117)	SMFQ-P NR   10.5; NR   8.50% (Portugal, n= 117)
<b>Pizarro-Ruiz &amp; Ordóñez-Cambor (2021)</b> Spain	Longitudinal	590 (55.30%)	12.67 (8-18)	SENA NR; 33.20%* (children); 43.00%*** (adolescents) <sup>d</sup>	SENA NR; 22.80%* (children); 34%*** (adolescents) <sup>d</sup>
<b>Tang et al. (2021)</b> China	Cross-sectional	4342 (49%)	11.86 (6-17)	DASS-21 NR   8; NR   24.90%	DASS-21 NR   10; 14.78% <sup>e</sup> (adolescents; n=248)   19.70%
<b>Zhou et al. (2020)</b> China	Cross-sectional	8079 (53.50%)	15 (12-18)	GAD-7 10   5; 14.40% <sup>a</sup>   37.40%	PHQ-9 10   5; 18.10% <sup>a</sup>   43.70%

*Note.* N = sample size. M = mean age. CPb | CPd = cut-off point (CP) before (b) | during (d) COVID-19 pandemic. Pb | Pd (%) = prevalence (P) before (b) | during (d) COVID-19 pandemic. NR = not reported. GAD-7 = 7-item Generalized Anxiety Disorder; PHQ-9 = 9-item Patient Health Questionnaire; CDI = Child Depression Inventory; HADS = Hospital Anxiety and Depression Scale; SMFQ-P = Short Mood and Feelings Questionnaire - Parent report; SCAS = Spence Children's Anxiety Scale; SCAS-P = Spence Children's Anxiety Scale - Parent version; PHQ-2 = 2-item Patient Health Questionnaire; SENA = Assessment System for Children and Adolescents; DASS-21 = 21-item Depression, anxiety, and stress scale.

Studies used for prevalence comparison (before the COVID-19 pandemic): <sup>a</sup> Wang et al. (2019). <sup>b</sup> Stewart and Sun (2012). <sup>c</sup> Orgilés et al. (2012). <sup>d</sup> Fernández-Pinto et al., 2015. <sup>e</sup> Lam et al. (2014).

\*p < .05. \*\*\*p < .001.



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to be statistically significant.

Pizarro-Ruiz & Ordóñez-Cambor (2021) reported a higher prevalence in adolescents as compared to children (anxiety: 43% vs. 33.20%, and depression: 34% vs. 22.80% respectively), suggesting that older students are at higher risk of developing anxiety and depression symptoms, which is in line with previous literature on this topic.

In other studies, the prevalence differences (diff) were also higher for anxiety in adolescent samples (diff= 6.1% for only child and 10.3% for non-only child, Cao et al., 2021; diff= 23%, Zhou et al., 2020) than in samples that include children (diff= -7.67%, Liu et al., 2021). The only exception was the comparison Orgilés et al., 2012, 2021 (anxiety diff= 29.59%, Spain). However, the Spanish sample in the pandemic study had a higher proportion of preschoolers (3-5 years old; n= 41) and school children (6-12 years old; n=79) than adolescents (12-18 years old; n= 20). The prevalence differences (diff) are also higher in adolescent samples for depression (diff= 17.1% for only child and 20.7% for non-only child, Cao et al., 2021; diff= 25.6%, Zhou et al., 2020) than in samples that include children (diff= 9.08%, Duan et al., 2020; diff= 4.92%, (Tang et al., 2021), and diff= -4.34%, Liu et al., 2021).

Further analysis of prevalence patterns by country and over time suggests that the different onset of COVID-19 in countries and different confinement measures taken by each country have influenced these values. Given that China was the source of COVID-19, this country was affected before others had any cases, and had improvements in the management of the pandemic earlier. Studies conducted in China that reported dates of data collection exhibited a temporal pattern, with higher symptoms of anxiety and depression near the onset of the pandemic (Cao et al., 2021; Tang et al., 2021; Zhou et al., 2020) that decreased with time (Liu et al., 2021). A pattern of higher symptomatology in southern European countries (Spain, Italy, and Portugal) than in a northern European country (Switzerland) also emerges from data (Table1).

## Discussion

The aim of the present systematic review was to examine the pandemic impact on children and adolescents, through trend analysis of prevalence of anxiety and depression symptoms before and during the COVID-19 pandemic.

Most comparisons between studies conducted before and during the COVID-19 pandemic showed a worsening of anxiety (four out of five) and depression (five out of six) symptoms in the pandemic period. However, three authors of studies conducted during the pandemic have chosen to use a lower cut-off point than recommended (Cao et al., 2021; Orgilés et al., 2021; Zhou et al., 2020). This may have been used to draw attention to the social impact of the pandemic in children and adolescents, or for gathering a big enough sample for inferential statistics purposes. Regardless of the reasons, this decision can unfortunately translate into a sensibility increase of the selected instruments and a subsequent overestimation of prevalence, consequently preventing from reaching strong conclusions about the worsening or improvement of symptoms due to COVID-19 pandemic.

Pizarro-Ruiz & Ordóñez-Cambor (2021) was the only study to have conducted an unpaired t-test comparing confined children and adolescents samples with the clinical validation sample of SENA (Fernández-Pinto et al., 2015). This study provided a higher level of evidence in favor of the worsening tendencies of anxiety and depressive symptoms during the pandemic. Unlike other cross-sectional studies, which used self-reports, the assessment of symptoms in this longitudinal study was through an interview.

Notwithstanding, two studies conducted during the pandemic show contradictory results. Although Duan et al. (2020) did not assess anxiety symptoms, results from this study for depressive symptoms are opposite to those of Liu et al. (2021). While the first found a worsening tendency of 9.08%, the latter reported an improvement of 4.34% during the pandemic. Both studies were conducted in China with similar age range samples, employed an equal cut-off point and in the same year, 2020 (Duan et al., 2020; Liu et al., 2021). These contradictory results may be explained by protective factors and risk factors, however these mechanisms aren't completely understood (Qin et al., 2021). Yet, there are some known protective factors for anxiety and depression symptoms in

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children and adolescents with and without siblings, such as resilience and positive relationships with their parents (Cao et al., 2021). Perceived social support was also linked to fewer symptoms of anxiety and depression as well as a greater life satisfaction in adolescents (Magson et al., 2021). On the other hand, female gender, abusive or impoverished relationships with their parents, or emotional abuse are some known factors associated with a higher risk for anxiety and depression symptoms in children and adolescents (Cao et al., 2021; Magson et al., 2021; McKune et al., 2021). A high risk exposure to COVID-19 infection is also a risk factor for both anxiety and depressive symptoms, but only for adolescents with siblings (Cao et al., 2021). According to Cao et al. (2021), adolescents with siblings are more likely to develop symptoms of anxiety and depression than only children in the pandemic context. Emotional and physical neglect also contributes to anxiety symptoms but not for depressive symptoms, and physical abuse is a risk factor for depressive symptoms (Cao et al., 2021).

Additionally, harsher containment measures, despite better weather conditions in southern European countries, led to a lack of physical activity which alongside inadequate diet contributes to weight gain, increasing risk for anxiety and depression (Abukabda & Razzaque, 2021; Epstein et al., 2002; Harrison et al., 2017; Orgilés et al., 2021; Rao et al., 2020; Zheng et al., 2021).

This systematic review has some limitations. Only eight studies were identified from PubMed database search. Of these studies fewer reported enough data for trend analysis for anxiety (four studies) and depression (five studies) symptoms, and their methodology revealed several limitations, which are discussed below. Also, all except one of the included studies used a cross-sectional design, therefore causality cannot be determined. Additionally, methods such as a snowball sampling do not allow for generalization of study findings. Finally, short windows between baseline and follow-up could also not be enough time to assess symptoms.

More knowledge about risk and protective factors is needed to understand the long lasting effects of the pandemic and for designing improved interventions that could help reduce the pandemic impact. Future studies should employ longitudinal designs with paired samples and make use of diagnostic assessments (clinical interviews or gold standards) based on diagnostic criteria of DSM-5 for finding clinically significant prevalence.

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