

TITLE: The impact of COVID-19 on the mental health of children and young people: an umbrella review

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ABSTRACT:

Background: Over the past two years, a multitude of studies have highlighted the impact of the COVID-19 pandemic on the mental health of children and young people (CYP). In this umbrella review, we synthesise global evidence on the impact of COVID-19 on the mental health of CYP from existing systematic reviews with and/or without meta-analysis.

Methods: Adopting the PRISMA guidelines, we evaluated 349 citations and identified 24 eligible reviews with medium to high methodological quality to be reviewed narratively.

Results: Most of the reviews reported a high prevalence of anxiety disorders, depression, suicidal behaviour, eating disorders and other mental health problems. Most studies that used data at multiple time points indicate a significant increase in mental health problems in CYP, particularly in females and older adolescents.

Conclusions: multipronged psychosocial care services, policies, and programs are needed to alleviate the burden of mental health problems in CYP as a consequence of the COVID-19 pandemic and associated global health measures.

What is already known on this topic

Children and young people seem particularly vulnerable to developing mental health problems due to the COVID-19 pandemic. Systematic reviews on the topic have been published, but there are not many umbrella reviews that provide a more comprehensive and up-to-date synthesis of the data.

What this study adds

This umbrella review highlights that the prevalence of mental health problems in children and young people over the past three years has been very high across the world, with females and older adolescents being at particularly high risk.

How this study might affect research, practice or policy

The present findings are concerning. Collaboration between researchers, clinicians and policymakers should aim at the development of psychosocial interventions that target mental health difficulties in high-risk populations.

INTRODUCTION

Since March 2020, the world has been learning to cope with COVID-19. This global pandemic has caused a wide range of consequences, including biological, socioeconomic, and psychological[1]. There have been several primary studies and systematic reviews that have highlighted the impact of global health measures (such as social restrictions, school closures etc.) on the mental health of the population[2, 3]. The mental health problems that the COVID-19 pandemic caused and/or exacerbated include anxiety disorders and depression[4, 5], posttraumatic stress disorders or PTSD[6], sleep disorders[7, 8], and eating disorders[9].

Researchers have investigated the mental health impact that COVID-19 pandemic had on vulnerable populations. These include health professionals[10], the elderly[11], and children and young people or CYP[12, 13]. This last category seems to have suffered significant mental health difficulties as a result of the pandemic, and there is a plethora of studies that support this, including several types of reviews[14].

Given the number of systematic reviews published on the impact of COVID-19 on the mental health of CYP, we deemed helpful to conduct an umbrella review of systematic reviews on the topic to synthesise the data in a useful way for both researchers, clinicians, and public health professionals. Umbrella reviews are helpful in synthesising and understanding the information available in a given research domain and provide a “snapshot” of the evidence available in a given area that may help the development and implementation of prevention and intervention programmes[15]. A recent umbrella review on this topic has been recently published[14]. However, this work included non-systematic reviews[16] and was not registered on PROSPERO. In addition, we have included more systematic reviews that took into account longitudinal studies[17]. The lack of longitudinal studies this work is one of the limitations that the authors highlighted. Finally, our work has the advantage of including more recent reviews[18]. Including the most recent data on this topic is particularly relevant considering the fast pace at which the pandemic is evolving.

The aim of the present work is to systematically review the literature on the impact of COVID-19 on the mental health of CYP and gather evidence from systematic reviews that have been conducted in this area.

Depending on the data available, we will try to identify whether there are characteristics that are associated with heightened risk for MH in CYP.

METHODS

The present umbrella review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines[19] and was registered on PROSPERO (CRD42021276312). We ran a search through multiple scientific databases using Medical Subject Headings (MeSH) terms including the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, Cochrane Database of Systematic Reviews, PROSPERO, PubMed/MEDLINE, Web of Science, and Scopus. The complete search strategy is shown below:

(MH "COVID-19") OR AB (COVID-19 or coronavirus or 2019-ncov or sars-cov-2 or cov-19) AND ((MH "Child, Preschool") OR (MH "Adolescent") OR (MH "Infant") OR (MH "Child")) OR (children or adolescents or youth or child or teenager) AND (MH "Mental Health") OR (mental health or mental illness or mental disorder or psychiatric illness) AND TI systematic review

Due to concerns about missing understudied conditions in CYP (such as bipolar disorder and substance use), two additional searches were run through PubMed and psycINFO which included: *(bipolar disorder or manic depression or bipolar affective disorder or bipolar depression)* and *(substance use or drug use or drug addiction or alcohol use or alcoholism or alcohol dependence or alcohol abuse or alcoholic or alcohol addiction)*.

Initial searches were conducted on 1st May 2022 with a follow-up search conducted on 10th December 2022. EPPI Reviewer was used to screen all the studies identified by the searches[20]. Figure 1 shows the PRISMA flowchart, with details of included and excluded papers with reason.

Figure 1. PRISMA flow chart

Studies were included if they were:

- Systematic reviews that looked at prevalence of mental health problems (using either non-diagnostic or diagnostic information) during the COVID-19 pandemic in CYP (age 0-18);
- Systematic reviews that compared rates of mental health problems in CYP before vs during the COVID-19 pandemic;
- Systematic reviews with mixed participants (e.g., including adolescents and young adults) were still included if it was possible to extract data specific to CYP.

Studies were excluded if they were:

- Primary studies/analysis that included adult population only, where it was not possible to extract CYP specific data, or where age of included participants was not specified;
- Non-systematic narrative reviews (rapid non-systematic or scoping reviews, or reviews where PRISMA statement was not available).

Three reviewers (LB/GB/AS) independently screened all titles and abstracts identified from the literature search (n=338). Full paper manuscripts of any titles and abstracts that were considered relevant by any of the three reviewers were obtained (n=50) and independently assessed for inclusion. Any discrepancies were resolved by consensus. Only studies meeting the inclusion criteria underwent data extraction (n=24).

A standardized data extraction table was used which included the following variables: study authors, sample size by geographical area, sample characteristics, number of studies included in the systematic review, pandemic exposure, mental health outcomes (see Table 1 in the supplementary material).

Quality assessment including risk of bias of the systematic reviews included was conducted using the AMSTAR tool[21]. AMSTAR comprises 11 criterion items (see Table 2 in the supplementary material) and each item is given a score of 1 if the specific criterion is met, or a score of 0 if the criterion is not met, is unclear, or is not applicable. The scores are summed to give an overall quality score of the review: 8 to 11 is considered high quality, 4 to 7 is medium quality, and 0 to 3 is low quality. Despite an ongoing and complex debate about the use of scoring systems, the items of the AMSTAR can be used to highlight methodological aspects of a systematic review that impact its overall quality[22].

The studies included in this umbrella review presented with a degree of heterogeneity in terms of methods and outcomes included. Also, not all of them included a quantitative synthesis (i.e., meta-analysis). For these reasons, it was decided to conduct a narrative synthesis in the present work.

RESULTS

We included 24 studies for a narrative review. The sample size spanned from 939 to $\pm 3,895,508$, with the majority of participants being from Asia, particularly China (about 13 reviews recruited predominantly or exclusively from China, with 2 studies including over 1 million CYP from this country). The age range across

all reviews spanned from 0 to 24, but we extracted data relative to CYP (i.e., 0-18) only, when possible. It is possible however, that a very small minority of the participants considered for the narrative review presented may be >18. The studies included for each review ranged from 3 to 116. In terms of pandemic exposure, most studies did not consider specific aspects of the pandemic, but 8 studies mentioned lockdown and school closures as the main exposures of interest. In terms of mental health outcomes, most studies considered looked at anxiety and depression, followed by stress, PTSD symptoms, eating difficulties, sleep difficulties, emotion regulation, quality of life, well-being, OCD symptoms, self-harm, and suicide rates and addictive/substance use behaviours. To note, the number of overlapping primary studies was quite high based on the fact the two largest systematic reviews we included[23, 24], which considered 116 and 102 studies respectively, had 40 studies in common. 13 of these also appeared in the third largest systematic review, which considered 61 studies in total[25].

The majority of the studies (17) included were of “medium” quality, the remaining were of “high” quality, and no study scored in the “low” range of the AMSTAR. No systematic review reported a list of excluded studies (see Table 2 in the supplementary material).

The vast majority of the studies considered indicated that the COVID-19 pandemic caused a deterioration of MH in CYP. Table 1 (see supplementary material) provides a detailed account of the main characteristics and outcomes of each study. It follows a summary of the main findings from the studies, grouped by mental health outcome.

Anxiety

Anxiety seems to be one of the most investigated mental health outcomes across all the reviews included in our work (only two did not look at anxiety). Studies which reported data prior to 2020 suggest that anxiety levels during the pandemic were higher compared to pre pandemic levels in CYP. Chai *et al*, reported through a meta-analysis that the prevalence of anxiety during the pandemic amongst Chinese CYP was about 25%, compared to the 17% pre-pandemic[26]. Others show that 17 of the studies they included in their review reported an increase in anxiety amongst CYP[23]. Studies with lower estimates of anxiety (e.g., 8-25%) included more children while those with higher estimates (e.g., 34-74%) included more adolescents suggesting that this specific population is at particularly high risk of developing anxiety symptomatology. Panchal *et al*. states that anxiety was the most common mental health outcome reported in the primary studies they reviewed, with 57.4% of the studies included in their review showing worsening of anxiety symptoms during the lockdown[25]. 59.6% of CYP reported excessive ruminative thinking and 13.4% reported severe anxiety. Like Windarwati *et al*. and Chawla *et al*., it was observed that being an adolescent and being female increased the risk of developing anxiety symptomatology significantly[24, 27].

It is important to note that anxiety was considered in a broad sense by most studies, in that most data available comes from questionnaires such as the GAD-7, STAI, and SCARED. Data regarding more specific forms of anxiety disorders such as social anxiety, specific phobias, or separation anxiety are less known.

Depression

Like anxiety, depression was extensively studied in the papers we included in this umbrella review (only two studies did not look at depression). Samji *et al*. reports that 25 of the 116 studies included in their review show that prevalence of depression in CYP was higher during the pandemic compared to pre-pandemic times[23]. Panchal *et al*. included 24 studies in their review which looked at depression in CYP during the pandemic[25]. They reported that the rate of positive screen for depression (PHQ-9 score ≥ 11) significantly increased from 48.5% (pre-pandemic) to 63.8% (during lockdown) and the rate of those scoring within severe depression range (PHQ-9 ≥ 20) from 10% to 27%[25]. Others estimated pooled prevalence of

depression in adolescence to range between 18.2% and 50.7%, with a median of 34.4% and between 1.3 and 22.3% with a median of 11.8% in children, during the first half of 2020 in China[28]. Females and older adolescents seem to be particularly vulnerable to depression compared to males and younger children[27, 29, 30].

Other mental health outcomes

Beyond anxiety and depression, symptoms considered by the different reviews included inattention and hyperactivity, poor sleep, self-harm and suicide, eating problems, and PTSD symptoms. Overall, the number of reviews focusing on these symptoms was smaller than those looking at anxiety and depression. All studies reviewed report an overall worsening at the level of other mental health outcomes as a consequence of the COVID-19 pandemic.

Panchal *et al.*, report that ADHD symptoms exacerbated during the pandemic, particularly in males and younger children, and to a lesser degree in females and adolescents[25]. Panda *et al.*, reported that during the COVID-19 pandemic CYP exacerbated the clinical symptoms of those with a previous diagnosis of ADHD[31].

Sleep quality has significantly worsened in CYP during the pandemic, with high school teenagers being at particularly high risk of experiencing insomnia[27]. Viner *et al.* reports that 25% of 895 UK participants complained the onset of new sleep problems because of worrying in the UK[32]. In their meta-analysis, Sharma *et al.* report that the prevalence of sleep problems during the pandemic seems to be doubled compared to pre pandemic times in CYP. School-aged children, and those with previously diagnosed ADHD or ASD suffered sleep problems the most[33].

Panchal *et al.* reported that the prevalence of non-suicidal self-injury in Chinese CYP increased by 10% during the pandemic[25]. The authors also reported a three-fold increase in suicide ideation amongst Canadian youth in 2020 compared to 2017, and a 49% increase suicide rates in Japan between July and October 2020. In another systematic review the authors highlighted that suicidal ideation and attempts were more common in female adolescents[27].

Panchal *et al.* reported that individuals with eating disorders struggled to maintain feeding routines, and a large proportion (approximately 41%) of CYP who were suffering with eating disorder and disordered eating experienced a reactivation of their symptoms post lockdown[25]. Jones *et al.* report that adolescents with a previous diagnosis of anorexia nervosa complained an increase in poor eating habits and increased thoughts associated with eating disorders during the pandemic[34].

In the first half of 2020, Oliveira *et al.* report that 85.5% of Chinese under-16-year-olds displayed symptoms of PTSD that would place them in the “moderate” or “severe” range, according to that IES-R[18]. Panchal *et al.* report that 3.2% of Chinese children during the COVID-19 pandemic met diagnostic criteria for PTSD around that same period[25]. This discrepancy may be attributed to differences in measurement. The authors argue that an increase in PTSD symptoms may be observed some time after the outbreak and not during. Being female (vs male) and adolescent (vs child) seemed to increase the risk of PTSD[18].

Findings in relation to substance use are mixed, but there seems to be a general trend towards a reduction of substance use in adolescents during the pandemic. This includes alcohol, cannabis, tobacco, and e-cigarette/vaping[35]. A significant increase in internet and smartphone addiction was observed during the pandemic, and this was strongly associated with MH difficulties such as low-self-esteem depression, anxiety, alexithymia, and stress[36].

DISCUSSION

The aim of the present work was to review the literature on the impact of COVID-19 on the mental health of CYP. The prevalence of MH difficulties in CYP at the time of the pandemic was high, and where pre pandemic data was available, a significant increase was observed. The most studied mental health outcomes were anxiety and depression, where a consistent increase in prevalence and symptom severity was observed in CYP across the globe. There was less evidence of consideration around other mental health outcomes, though some evidence that outcomes including inattention and hyperactivity, sleep problems, self-harm and suicide, eating disorder and disordered eating, and PTSD symptoms also worsened. MH intervention programmes should consider the most vulnerable populations of CYP, which seem to be females and older adolescents according to the present work and others[14].

There appears to be no major differences in CYP's MH difficulties associated with the COVID-19 pandemic across the world. We need to acknowledge however, that most of the data comes from Asia (particularly China), and we did not conduct an in-depth analysis across countries. This study did not look at the causal mechanisms underlying this dramatic change in MH in CYP during the pandemic. However, it is plausible that a combination of factors, including limitations to socialising opportunities had a major role in this. We have provided evidence that indeed lockdowns and school closures had a major impact on the MH of CYP[31, 32, 37]. This can provide an insight into one of the factors that underlie MH problems in CYP more broadly, and potentially guide prevention and intervention programmes.

Limitations:

The findings of this umbrella review should be considered in the light of a number of limitations. First, the present work included mostly cross-sectional studies. Future research should focus on longitudinal studies, and ideally studies where pre, during, and post-pandemic data is available to assess the extent to which CYP are still suffering from the effect of the pandemic.

Second, the majority of the systematic reviews included here had large samples of CYP from China and not many from the Mediterranean countries and south America. Africa was significantly underrepresented while Europe and US were moderately represented.

Third, it is worth mentioning that during 2020-2022 different countries put in place different public health measures at different times. These variations may have affected the MH of CYP in multiple ways and our work does not account for these variations but may partially explain the large MH prevalence gaps observed. Despite being unable to conduct an in-depth and systematic cross-country comparison, the present data does not suggest major differences in terms of the general impact of the pandemic on the MH of CYP (i.e., virtually no study reported an improvement in MH in CYP during the pandemic).

Fourth, most of the data was from cross-sectional studies and came from 2020 and 2021 which leaves us without a clear picture of how CYP are coping now that the worst phases of the COVID-19 pandemic are

over in most countries. Future research should compare pre and post-pandemic data on a large to clarify this aspect.

Fifth, this umbrella review did not include articles that were not in English.

CONCLUSIONS

To the best of our knowledge, the present umbrella review represents the most up to date and comprehensive work on the impact of the COVID-19 pandemic on the MH of CYP. There seems to be a general and worrying trend towards deterioration in general MH in CYP across the globe due to the pandemic. Females and older adolescents seem to be particularly vulnerable.

Future research should consider synthesising data from longitudinal studies where prevalence of MH difficulties in CYP is available ideally pre, during, and post-pandemic. This will shed light on the long-term consequences of the COVID-19 pandemic on the MH of CYP and will guide the next steps in public health prevention and intervention policies.

These findings should encourage collaboration between researchers, clinicians and policy makers in order to minimise societal and financial costs associated with the MH of CYP locally and globally. This effort should aim at the development of psychosocial interventions programmes with special focus on targeted MH difficulties (such as anxiety and depression) in at high-risk populations. Novel intervention programmes should be implemented within the context of a strengthened set of safety nets for CYP locally and globally. This can only be done by improving access and utilisation of MH services to CYP and their families[1].

ETHICAL APPROVAL STATEMENT

Ethical approval was not necessary being this a secondary data synthesis work using completely anonymous data.

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COMPETING INTERESTS

None

CONTRIBUTORS

LB, PB, and RMS participated in the design of the study. LB collected, analysed, and synthesised the data and led the writing of the article. LFS, AL, PJ, AS, and GB contributed to screening and quality assessment. All the named authors approved the final version of the manuscript.

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