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Narrative review: COVID-19 and pediatric anxiety

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ABSTRACT

The coronavirus (COVID-19) pandemic has brought focus to the effects of anxiety on children. This study aimed to review the existing literature regarding the impact of the pandemic on pediatric anxiety. This review analyzed the existing literature between the open-sourced collection on PubMed inputting “anxiety disorder in children during pandemic” and “pediatric anxiety OR child anxiety AND COVID” and that of the *Journal of the American Academy of Child & Adolescent Psychiatry* using the keywords “social anxiety AND COVID.” This yielded 149 + 312 (461) entries and 68 articles were selected. Anxiety was found to have a prevalence of 18.9–23.87% in children during the COVID-19 pandemic whereas adolescent populations demonstrated a prevalence of 15.4–39.9%. Female gender was the most studied risk factor and physical activity was the most documented preventative factor. This review supported the notion that the COVID-19 pandemic is a major contributor to anxiety in the pediatric population.

1. Introduction

The definition of “pandemic” has been fluid throughout history. According to the World Health Organization (WHO), “a pandemic is the worldwide spread of new disease” (Pitlik, 2020). National Institutes of Health (NIH) proposed eight characteristics of pandemics: novelty, minimal population immunity, explosiveness, fast disease movement, wide geographic extension, infectiousness, contagiousness, severity (Pitlik, 2020). Given the lack of indisputable criteria, it is estimated that the current pandemic is the 21st documented pandemic in recorded history (Pitlik, 2020). With over 100 million cases and greater than 2 million deaths, its impact is staggering. Existing evidence has reflected increased anxiety, fear and panic during SARS and H1N1 (Kılınçel et al., 2020). However, these pale in comparison to the magnitude of lifestyle changes witnessed during the COVID-19 pandemic.

The ongoing coronavirus (COVID-19) pandemic has had a major impact on various aspects of society. At the time of writing there have been over 100,000,000 cases with over 2,000,000 deaths by the World Health Organization’s count. Mental health is not spared from the pandemic and the psychosocial sequelae it has brought about. Governments have implemented restrictions to prevent the spread of COVID-19. These have imposed a variable on the environment that has never been well studied. There is evidence that certain populations may be more prone to mental health problems including anxiety during this

pandemic.

The ICD-10 defines unspecified anxiety as “a category of psychiatric disorders which are characterized by anxious feelings of fear often accompanied by physical symptoms associated with anxiety” (World Health Organization, 1992). Further specified diagnoses that fall within the scope of this review include Generalized Anxiety Disorder (GAD), Panic Disorder, Separation Anxiety Disorder, Social Anxiety Disorder and Obsessive Compulsive Disorder (OCD).

This study aimed to review the existing literature regarding the impact of the pandemic on pediatric anxiety. Children are a particularly vulnerable population when it comes to mental health. While all age groups have experienced mental health challenges during this crisis, school closure and self-quarantine heavily impact children. Additionally, the pandemic’s impact on parents indirectly produces distress and anxiety. Infection, economic challenges, social changes, and deterioration of physical and mental health can be traumatic for children and caregivers, producing a dual source of stress. We aim to discuss a broad range of causes and manifestations of rising pediatric anxiety.

2. Methods

A literature search was conducted primarily in PubMed. The keywords “anxiety disorder in children during pandemic” and “pediatric anxiety OR child anxiety AND COVID” were inputted, yielding 149 +

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312 (461) entries. Articles were included if they contained the words “anxiety,” “COVID,” “pandemic,” and/or “children” in the title or abstract, or in the body of the article if it was relevant to the topic at hand. A separate search was conducted in the *Journal of the American Academy of Child & Adolescent Psychiatry* with the keywords “social anxiety AND COVID.” This yielded four articles, two of which were included. A total of 68 articles were included for this review. Roughly half were reviewed by JF and half by KW to confirm their relevance.

3. Results

3.1. Psychological distress and somatic symptoms

Anxiety and distress are linked to physical health risks. During adverse childhood events (ACEs), the body’s stress response is hijacked. Dysregulation of cortisol and pro-inflammatory cytokines leads to delays in physical and cognitive development, obesity, asthma, frequent infections, diabetes, and premature death (Araújo et al., 2020; Mahajan et al., 2020). Many negative outcomes emerge later in life, others emerge early. Stress can manifest in children as somatic complaints, insomnia, bedwetting, and emotional changes such as anger, withdrawal, becoming clingy, or fear of being alone (Mahajan et al., 2020; Haleemunnissa et al., 2021). History of ACEs was associated with heightened anxiety and post-traumatic stress disorder (PTSD) (effect size 0.27–0.47) during the pandemic compared to no history of ACEs (Guo et al., 2020). More adverse childhood experiences were predictive of more PTSD and anxiety (Guo et al., 2020). Fear and anxiety provocation has been addressed in several studies (Kılınçel et al., 2020; Ferrando et al., 2020; Duan et al., 2020; Palacio-Ortiz et al., 2020; Masuyama et al., 2020; Lo Moro et al., 2020; Jepsen et al., 2020; Liu et al., 2020; Panda et al., 2020; Ravaldi et al., 2020; Oosterhoff et al., 2020). Fear of COVID is common in anxious children (Ferrando et al., 2020; Palacio-Ortiz et al., 2020; Jepsen et al., 2020; Panda et al., 2020).

Somatic symptom prevalence among primary students in one study was 2.39% (all mild). It was much higher in college students at 34.85%, with moderate-severe symptoms noted in the older cohort (Liu et al., 2020). There is evidence of greater precipitation of somatic symptoms in children aged 1.5–6 years than in children aged 6–18 years (Jiao et al., 2020).

Anxiety during the pandemic is having a negative effect on sleep (Chtourou et al., 2020; Zhou et al., 2020a). A study found that 41.5% of parents stated their children gained weight, 34.2% noted increased tendency to sleep, and 69.3% noted increased internet use (Adibelli and Sümen, 2020).

3.2. Stressors and risk factors

Many stressors and risk factors are associated with worsening anxiety during the pandemic. One study found the most frequently reported adversities are parental illness, financial difficulties, conflict within the family, and parental alcohol consumption (Palacio-Ortiz et al., 2020). It has been shown that adolescent girls are more prone than adolescent boys (Chtourou et al., 2020; Marques de Miranda et al., 2020). This has been shown using data both from the current pandemic and past pandemics such as H1N1 and SARS-CoV-1. There is disagreement over whether older or younger age is a greater risk factor for developing anxiety during this pandemic (Chtourou et al., 2020; Marques de Miranda et al., 2020). Recent and older data agreed that living in a rural area was a risk factor for heightened anxiety (Chtourou et al., 2020; Marques de Miranda et al., 2020; C Fong and Iarocci, 2020).

Confinement to home produces anxiety and other mental health symptoms (Kılınçel et al., 2020; Duan et al., 2020; Adibelli and Sümen, 2020; Xie et al., 2020; McGuine et al., 2020; Zhou et al., 2020b; Crescentini et al., 2020; Sama et al., 2020; Singh et al., 2020). This is perhaps not surprising, but the trend is increasing in this pandemic. Loneliness is a consequence of quarantine, and its relationship to mental health is

well-studied (Wang et al., 2017). It has been found that social anxiety is more tightly linked to duration of loneliness, not intensity (Loades et al., 2020). Inability to activate one’s social network is associated with anxiety and distress (Chardavoine and Olympia, 2020; Imran et al., 2020). School closure-related stressors include not having access to education and food, a lack of face-to-face contact with schoolmates and teachers, and being unable to play sports (Palacio-Ortiz et al., 2020; McGuine et al., 2020). Social distancing can be protective against anxiety if one chooses to self-quarantine for the right motivations, but can be a source of anxiety if not internally motivated (i.e. to avoid judgment by peers) (C Fong and Iarocci, 2020). Other protective factors include optimism about pandemic predictions, emotional reactivity, and knowledge about the virus (C Fong and Iarocci, 2020).

Differences in anxiety were seen between countries that had different quarantine rules, with stricter countries seeing more anxiety (Akkaya-Kalayci et al., 2020). In another study, more lenient policies were associated with greater caregiver-identified anxiety, internalizing, and externalizing problems (Fitzpatrick et al., 2020).

Confinement to home can also expose children to maltreatment and abuse in conflict-ridden families. The lockdown has exposed more women to intimate partner violence, which can traumatize children and produce anxiety (Haleemunnissa et al., 2021; Guo et al., 2020; Palacio-Ortiz et al., 2020; Lo Moro et al., 2020; Marques de Miranda et al., 2020; Singh et al., 2020; Chardavoine and Olympia, 2020).

Anxiety is linked to excessive exposure to media related to COVID in children, but not in parents (Mahajan et al., 2020; Haleemunnissa et al., 2021; Lo Moro et al., 2020; Jepsen et al., 2020; Singh et al., 2020). Overexposure to the internet in general is linked to greater anxiety (Singh et al., 2020) and this same pattern was observed during COVID-19 (Dong et al., 2020). The pandemic has resulted in more time indoors at home, and more time playing video games. Disordered gaming worsens anxiety, depression, stress, insomnia, and quality of life (Fazeli et al., 2020).

Parental anxiety is linked to younger age, lower socioeconomic status (SES), and female gender (C Fong and Iarocci, 2020; Yue et al., 2020). One study found 34.5% of children were suffering from anxiety, and 52.3% of parents developed it during the pandemic (Panda et al., 2020). Teachers are more anxious about the performance and well-being of their students, and this has rebound effects on students (Zhao et al., 2020a).

Previously diagnosed anxiety in children predicted higher concern about COVID-19 (Ravaldi et al., 2020). COVID-19 acts as a universal stressor that increases common mental distress (CMD, or the *p* factor) across the entire pediatric population. CMD is a conglomerate of symptoms common to multiple diseases, including depression and anxiety (Lo Moro et al., 2020).

3.3. Protective factors

There is data that being a child is protective against anxiety (de Lijster et al., 2017). Physical activity is protective against anxiety during the pandemic (Chtourou et al., 2020; Marques de Miranda et al., 2020; McGuine et al., 2020; Gualano et al., 2020; Alves et al., 2020; Chen et al., 2020; Pigaiani et al., 2020). Increased physical activity was associated with less anxiety in both the unadjusted model and after adjusting for age, sex, SES and BMI Z score (Alves et al., 2020). One source recommended that adults get 150 min of moderately intense activity a week, but children should get 105 min if they also play actively at home or recess. Exercise through video games may be effective at reducing anxiety, particularly when paired with music, which also may reduce anxiety (Chtourou et al., 2020). Additionally, study by Ferrando and colleagues compared pre COVID-19 and COVID-19 periods and observed significant decline in emergency psychiatric volume for children and adolescents but not for adults (Pitlik, 2020).

Urban setting proved protective against anxiety in one population (Kılınçel et al., 2020), but was associated with more anxiety in another

(Duan et al., 2020). Other protective factors include motivations for social distancing, optimism about the pandemic, emotional reactivity, experiential avoidance, and knowledge of COVID-19 (C Fong and Iarocci, 2020). Lower knowledge scores pertaining to COVID-19 and prevention of spread were associated with higher anxiety scores (Xue et al., 2020). Benefit finding (the positive effects that result from a traumatic event) and parent-child discussion on the pandemic were two additional protective factors against anxiety, stress, and depression (Tang et al., 2021).

3.4. Other anxiety subtypes

3.4.1. Generalized anxiety disorder

To paraphrase the DSM-5, Generalized Anxiety Disorder (GAD) is characterized by excessive worry or anxiety in a wide variety of settings that is difficult to control and accompanied by 3 or more physical or cognitive symptoms (American Psychiatric Association, 2013). One Bangladeshi study found that GAD prevalence was increasing in Bangladeshi youth (Islam et al., 2020). Others found GAD's prevalence to be on the rise for both young children and adolescents (Duan et al., 2020; Murata et al., 2021; Smirni et al., 2020). On the other hand, while Ferrando et al. found that GAD has been shown to be on the rise in the adult population during this pandemic, they did not specifically comment on GAD prevalence in children or adolescents (Ferrando et al., 2020). Some studies grouped adolescents together with young adults, and these often found that being younger than 30 was protective (Ferrando et al., 2020; Islam et al., 2020).

How clinicians measure GAD during the pandemic is evolving. School nurses are well-placed to recognize new onset GAD as children return to school, particularly with tools like the Coronavirus Anxiety Scale (CAS) which has been shown to be as valid as the Generalized Anxiety Disorder Assessment (GAD-7) as a screening tool for symptoms of a variety of anxiety disorders (Chardavoyne and Olympia, 2020).

3.4.2. Separation anxiety disorder

The DSM-5 describes Separation Anxiety Disorder as developmentally inappropriate and excessive fear or anxiety concerning separation from those to whom the individual is attached. There are a myriad of signs and symptoms that can act as evidence of separation anxiety disorder, and at least 3 of them must be present to make the diagnosis. (Desk Reference to the Dia).

Isolation due to COVID infection produces separation anxiety (Kilincel et al., 2020; Mahajan et al., 2020; Duan et al., 2020; Marques de Miranda et al., 2020; McGuine et al., 2020; Sama et al., 2020; Singh et al., 2020; Tang et al., 2021). Separation anxiety could worsen if children become overly attached to their parents while homeschooling and then return to school (Palacio-Ortiz et al., 2020). Other children suffer when their healthcare worker parents have to quarantine away from the family and cannot see their children (Mahajan et al., 2020).

3.4.3. Social anxiety disorder

The paraphrased DSM-5 definition of Social Anxiety Disorder is out of proportion fear in social situations and avoidance of social situations causing significant impairment in key areas of functioning that can manifest in physical symptoms such as freezing, crying or clinging. (Desk Reference to the Dia).

While children with social anxiety appeared to be functionally well in a socially distant homeschool setting, they will eventually return to a stressful environment where they need refined social skills, and they may not be getting the support they need (Palacio-Ortiz et al., 2020; Morrisette, 2021).

3.4.4. Obsessive compulsive disorder

The DSM-5 defines Obsessive Compulsive Disorder as the presence of obsessions, compulsions or both that occur more than 1 h per day or cause clinically significant distress in key areas of functioning. The

symptoms in this disorder must also not be better attributed to another medical or mental health condition. (Desk Reference to the Dia).

Very little is known about the effects of the COVID-19 pandemic on Obsessive Compulsive Disorder (OCD) symptomatology in the young population. OCD is a chronic disorder which affects about 0.5%–3% of children and adolescents (Heyman et al., 2003). Stress and trauma are associated with the development and expression of OCD symptoms (Adams et al., 2018). The quarantine environment may contribute to stress in children and adolescents due to the deterioration of daily routines, restrictions on socializing, the inability to attend school, and the uncertainty of the disease (Nissen et al., 2020). One source reported that 32.3–54.1% of OCD children and adolescents have worsening anxiety and 44.6–73% have worsening of OCD symptoms during the pandemic (Nissen et al., 2020). Tanir and colleagues found a significant increase in the frequency of contamination obsessions ($p = 0.008$) and cleaning/washing compulsions ($p = 0.039$) during the pandemic period (Tanir et al., 2020).

3.5. Special populations

Patients with pediatric neurodevelopmental disorders are affected by the pandemic in unique ways. This includes children with Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), and Gilles de la Tourette Syndrome (GTS). Comorbid anxiety is very common in these diagnoses, and is as likely to be exacerbated as isolated anxiety is (Panda et al., 2020; Singh et al., 2020; Graziola et al., 2020; Robertson et al., 2020). One study noted an increase of social problems as defined by the Child Behavior Checklist in patients with preexisting neuropsychiatric illness (Pasca et al., 2020). Quarantine produced new anxiety symptoms in children with autism while alleviating symptoms common before the pandemic (Jefsen et al., 2020; Reicher, 2020). The pandemic has disrupted habits and sources of structure, which has led to increased behavioral symptoms in children with ASD (Jefsen et al., 2020). Conversely, they are benefitting from quarantine because remote learning removes the “hidden curriculum” they struggle with, i.e. social norms (Reicher, 2020). Such norms include knowing when to participate actively in class and when to listen quietly, and misinterpreting these rules can produce emotional distress in children with ASD (Reicher, 2020). They may be doing well now, but will eventually have to return to school and need to navigate this hidden curriculum (Reicher, 2020). Children with GTS are doing better in quarantine, with fewer tics, possibly because of decreased social stressors. However, they also saw an increase in psychiatric symptoms including anxiety (Graziola et al., 2020), and generalized anxiety and specific phobias have been linked to an increase in tics (Robertson et al., 2020).

The restrictions of the pandemic affect families of children requiring procedures like kidney replacement or dialysis, producing anxiety in parents (Zhao et al., 2020b). This has also been seen in parents of children with chronic lung disease (CLD) (AdemhanTural et al., 2020). Anxiety was higher in chronic lung disease participants versus healthy controls ($p = 0.007$). Behaviors such as talking about the pandemic were higher in parents of CLD participants (AdemhanTural et al., 2020).

It is well known that the well-being of a parent or guardian is incredibly important to the mental health of the child (Giannakopoulos et al., 2009; PoppertCordts et al., 2020). Anxiety in pregnant women and postpartum mothers has tangible effects on the fetus or neonate (Singh et al., 2020; Schwank et al., 2020). This population is facing similar mental health challenges to those of children in the pandemic. What percentage of pregnant women meeting criteria for an anxiety disorder has been debated, with rates ranging from 9.44% to 37% (Ravaldi et al., 2020; Schwank et al., 2020; Yan et al., 2020). Zhou and colleagues found that pregnancy may even be protective against anxiety (Zhou et al., 2020c). Why this might be was not directly studied but was conjectured. The data could have been confounded by the timing of their study compared to earlier studies, when the world knew less about this

frightening new disease. Alternatively, Zhou and colleagues provided possible explanations such as the inherently increased contact with knowledgeable health professionals when receiving adequate prenatal care. Other studies were able to show which women were most at risk, including multigravida women and women in their first and third trimesters (Yan et al., 2020).

Pregnant women were worried about the health of their unborn children (Ravaldi and Vannacci, 2020). Such anxiety has direct biological effects on the health of the fetus (Singh et al., 2020; Schwank et al., 2020). Perinatal anxiety can have long-term effects on a child's health, behavior, and cognition. These are mediated through epigenetic changes that elevate maternal cortisol and dysregulate placental glucocorticoid genes (Schwank et al., 2020).

Significant impact was also seen in postpartum women. The prevalence of anxiety disorders has been found to be around 10% in postpartum women, and the prevalence of anxiety symptoms is 15% (Molgora and Accordini, 2020). Compared to non-postpartum women, they felt more anxious and helpless (Stojanov et al., 2020). New mothers can express feelings of inadequacy, which can damage their mental health and attachment to the newborn (Schwank et al., 2020; Molgora and Accordini, 2020). Ongoing studies will yield more data on the mental health of mothers, including the Mental Health of Urban Mothers (MUM) study, a randomized control trial (RCT) studying web-based peer-to-peer interventions on postpartum depression and generalized anxiety (Schwank et al., 2020). The study is evaluating the effectiveness of these interventions in reducing bad outcomes related to perinatal mental illness.

4. Discussion

This review examined the current literature to determine the impact of COVID-19 on anxiety in children and adolescents. An improved comprehension of risk factors and protective factors may predicate better mental health outcomes and decrease the severity of other medical comorbidities. Studies in this review claim overall anxiety in children during the pandemic to be 5 standard deviations greater than pre-pandemic levels in healthy controls (Tang et al., 2021). This review has identified many risk factors associated with heightened anxiety during the pandemic.

The most studied risk factor was female gender. It is well documented that females are at higher risk to develop an anxiety disorder (McLean et al., 2011) and this was upheld during the COVID-19 pandemic. It can be reasoned that increased anxiety in adults is a risk factor for worsening children's anxiety. Children are inclined to model parental behavior and worsening parental anxiety may be causing more anxious responses in children (Palacio-Ortiz et al., 2020). Other risk factors of increased pediatric anxiety include chronic disease, lower SES, and younger parental age.

Physical activity was the most studied protective factor identified in this review. Combining exercise, video games, and music may be particularly beneficial. Knowledge about COVID-19 was also associated with lower anxiety. Parent-child discussion on the pandemic was another important protective factor, as children and adolescents who discussed the pandemic with their parents were less likely to present symptoms of depression, anxiety, and stress, highlighting the crucial role of the parent-child relationship during crisis (Tang et al., 2021). One study of primary students reported approximately 14.4% of participants did not wash hands after coughing or sneezing (Xue et al., 2020). Investing resources in further education not only prevents spread, but addresses anxiety as well. Other protective factors include motivation for social distancing, optimism about pandemic projections or "benefit finding," emotional reactivity, experiential avoidance, and potentially urban living.

4.1. Limitations and future directions

This review included only open-sourced articles from PubMed and the *Journal of the American Academy of Child & Adolescent Psychiatry's* collection. Other existing evidence is outside the scope of this review. Language was restricted to English, creating the potential for biased results. Given there is no existing clear-cut definition of "pandemic," it is challenging to apply these results to future or past pandemics. The sample is also restricted to 15 months of the pandemic. Structuring this article as a narrative review leads to intrinsic limitations. The methods of gathering data are prone to selection bias, which can disrupt the reliability of drawing conclusions from results. However, this method was chosen for the desired target of incorporating more extensive coverage of a novel topic.

This review supported the notion that the COVID-19 pandemic is a major source of anxiety in children. It also sheds light on future directions of study that warrant attention. It remains to be explored if females are more affected by anxiety associated with COVID-19 or whether this is merely a reflection of that demographic being inherently more dispositioned to anxiety disorders in general. Protective factors such as physical activity could warrant further investigation as well. It would be interesting to contrast the influence of fear of contracting contagion versus the influence of restrictions on daily life. Specifying the type of anxiety seen would be beneficial; there are few sources that clarify the influence of COVID-19 on social anxiety, separation anxiety, and obsessive-compulsive disorder.

In summary, this review describes the landscape of the effects of COVID-19 on anxiety in children. Given the 15 months of study included, there is enough evidence to affirm the notion that the current pandemic is disrupting mental wellness in children acutely. It remains to be seen how long such effects may be observed. More focus is warranted to better identify which populations are most affected and how to best address management and prevent decompensation.

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