

## Prevalence of elevated anxiety symptoms among children in quarantine with COVID-19 infection in the State of Qatar: A cross-sectional study

Yasser Saeed Khan<sup>1\*</sup>, Abdul Waheed Khan<sup>2</sup>, Islam Ahmed Noureldin Ahmed<sup>3</sup>, Samar Hammoudeh<sup>4</sup>, Halla Salim<sup>5</sup>, Mohammed AbuKhattab<sup>5</sup>, Muna A Rahman S Al-Maslmani<sup>6</sup>, Abdulwahed Zainel<sup>7</sup>, Sarah Nidal Salameh<sup>6</sup>, Majid Alabdulla<sup>2,8</sup>

<sup>1</sup>Child and Adolescent Mental health Service, Hamad Medical Corporation (HMC), Qatar; <sup>2</sup>Mental Health Services, HMC, Qatar; <sup>3</sup>Primary Health Care Corporation, Qatar; <sup>4</sup>Medical Research Centre, HMC, Qatar;

<sup>5</sup>Department of Infectious Diseases, HMC, Qatar; <sup>6</sup>Communicable Disease Centre, HMC, Qatar;

<sup>7</sup>Sidra Hospital, Sidra Medicine, Qatar; <sup>8</sup>College of Medicine, Qatar University, Qatar

\*Corresponding author: drkhanyasser1@gmail.com

### Abstract

**Background:** Children are particularly vulnerable to the psychological effects of the COVID-19 pandemic. The disruption in daily life has impacted children significantly. Moreover, the increased worrying associated with the probability of getting infected or becoming seriously unwell due to infection can potentially precipitate anxiety disorders among children.

**Objective:** This study aimed to determine rates of elevated anxiety symptoms in children with COVID-19 infection. It also explored whether there were any differences in terms of age, gender, and residency status.

**Method:** A cross-sectional, questionnaire-based study with 88 participants (children aged 7-13 years, 54.5% males, 45.5% females) from two institutional quarantine centers. The Spence Children's Anxiety Scale and its validated Arabic version (self-reported questionnaires) were used to measure anxiety symptoms.

**Results:** 36.3% children reported elevated anxiety symptoms. A lower rate of 32.8% was reported in younger children (7-11 years) compared to 45.8% in older children (12 and 13 years). 70.4% and 57.9% children reported physical injury fears and separation anxiety respectively. A higher prevalence of overall anxiety was reported in children from expatriate families (40.6%) compared to native children (25%). The difference in the mean scores between the expatriate and native group of children was found statistically significant for obsessive-compulsive symptoms.

**Conclusions:** The prevalence of elevated anxiety symptoms among children in quarantine with COVID-19 infection can be much higher than that reported in the general population. Older children can have elevated anxiety symptoms more commonly than their younger counterparts can. Expatriate children are likely to be more vulnerable to the psychological impact of the pandemic compared to children from local families. Our results suggest the crucial need of focusing on the psychological impact of COVID-19 pandemic on children. The prioritization and effective management of the mental health needs of children should be a vital component of the overall, global response to the pandemic.

**Keywords:** Child and adolescent psychiatry; anxiety disorders; child behavior

### Introduction

Worrying is considered a normal and adaptive component of emotional development in children. By the time they reach primary school, up to 70% of children report some kind of worrying (1). However, worrying can become pathological when excessive and persistent, and when it interferes with the child's functioning (2). Such pathological worrying in children usually exists as part of an anxiety or mood

disorder (3). Anxiety disorders are the most common mental disorders with onset during childhood, with a prevalence that ranges from 10 to 30 percent (4-6). The worldwide prevalence of any anxiety disorder among children according to the Diagnostic and Statistical Manual (DSM) and International Statistical Classification of Diseases and Related Health Problems (ICD) is around 6.5% (7).

Although the median age of onset of anxiety disorders is thought to be around 11 years (8), specific anxiety disorders may have their onset at different developmental stages. Separation anxiety is more common during the preschool or early school-age years; specific phobias in the school-age years; social anxiety in the later school-age and early adolescent years; and generalized anxiety, panic, and agoraphobia in the later adolescent years (9). Anxiety disorders during childhood are associated with impaired socio-occupational functioning and render an individual vulnerable to experiencing recurring anxiety and other mental health disorders in later life (10, 11). Children with anxiety disorders have an increased risk of developing other comorbid mental disorders that can negatively impact academic performance and achievement later in life (12-14). Anxiety disorders in children and adolescents, if left untreated, can therefore result in a plethora of sequelae as its complications (15, 16).

Exposure to a natural disaster can pose mental health challenges in children (17). Research has consistently shown a positive correlation between anxiety disorders in children and exposure to natural disasters (18, 19). Children and adolescents who experienced disasters might suffer from greater stress because of the lack of development of the required emotional reactions and coping strategies (20). However, research evidence is scanty when it comes to the effects of a pandemic on anxiety disorders, particularly in children. This group among the general population deserves special attention, as it is particularly vulnerable to the psychological effects of the pandemic. The severity of symptoms of the disease in most children, fortunately, has been rather mild though, with death being an extremely rare outcome (19). However, this is not an indication that children have been affected less than any other age group as they continue to be vulnerable to the significant negative outcomes of the pandemic's unprecedented societal and economic disruption (21). The long period of separation from the usual outside world, excessive worries of being infected, and the impact of the multi-channel negative information have all resulted in people experiencing fear, loneliness, panic, anxiety, and depression amid the coronavirus outbreak (22, 23). It is anticipated that this unprecedented disruption to children's lives may precipitate the development of anxiety and depressive disorders in children (24).

Disease-containment measures such as quarantine and isolation can adversely affect the mental health of children and adolescents significantly (25). Children quarantined with suspected or diagnosed COVID-19 infection are likely to develop acute stress, anxiety, and adjustment disorders (26). Previous studies have also demonstrated that

quarantine can have a long-term adverse psychological impact on children (27). The consequences of COVID-19 on children, both immediate and long-term, are therefore vast in terms of their health, safety, and wellbeing. A preliminary study conducted in the Shaanxi province during the COVID-19 epidemic by the China-EPA-UNEPSA collaborative working group showed that clinging, inattention, and irritability were the most severe psychological conditions demonstrated by the children in all age groups (28). A nationwide longitudinal survey conducted in two waves during the COVID-19 pandemic concluded that up to 30.1% of 11-17 years old had symptoms of generalized anxiety compared to 14.9% prior to the pandemic (29). Moreover, a recent meta-analysis found a pooled prevalence estimate of clinically elevated anxiety symptoms obtained during the first year of the COVID-19 pandemic to be around 20.5%, almost double the pre-pandemic estimate (30).

The impact of the COVID-19 pandemic on children's lives in the state of Qatar has been no different than the rest of the world. The population of Qatar was estimated to be around 2.7 million in September 2020 out of which 14.4% (393K) were aged 0-14 years (31). The state took several immediate and effective measures at the outset to reduce the spread of the deadly virus some of which have continued throughout the pandemic with variable extent, depending on the number of daily new cases. These measures included closures of schools, parks, and leisure centers, quarantining individuals and families in their homes or dedicated institutional quarantine centers, where appropriate, and implementing several other strategies to ensure social distancing. The quarantine process involved placing children with covid-19 in designated facilities to limit the infection from spreading further. Furthermore, these children did not require acute medical care and were accompanied by at least one parent/guardian during their stay at the quarantine facility. They had access to on-site medical support if required.

This study aimed to determine the rates of elevated levels of overall anxiety as well as specific anxiety disorders in children in quarantine with COVID-19 infection. Furthermore, it explored any differences in terms of age, gender, and residency status. It also aimed to provide further insights into the psychological support that may be required for children with confirmed COVID-19 infection who report elevated anxiety symptoms and, therefore, indicating a propensity to develop an anxiety disorder. This study is the first of its kind as there is no similar previous published work at the time of writing of this manuscript.

## Methods

### *Design and participants*

This questionnaire-based cross-sectional study was conducted during the spread of COVID-19 infection in the state of Qatar. The two dedicated, institutional pediatric COVID-19 quarantine centers under the auspices of Hamad Medical Corporation, the main public health care provider in Qatar, formed the two main sites of the study.

All one hundred and forty-nine children aged 7-13 years who were admitted to the two quarantine centers between 18<sup>th</sup> June to 16<sup>th</sup> July 2020 with a confirmed diagnosis of COVID-19 were assessed for eligibility to participate in the study. Children with a previous diagnosis of a mental or behavioral disorder, intellectual disability greater than mild, those who were critically unwell or who were not fluent in English or Arabic languages were excluded from the study. A total of 88 children and their parents agreed to participate in the study and also met the eligibility criteria as outlined above. Out of the sixty-one children who were excluded from the study, fifty-seven chose not to participate and the remaining four reported an established history of mental or neurodevelopmental disorders as mentioned in the exclusion criteria. It is worthy to mention that the excluded group was not overrepresented in terms of gender, age or residential status compared to the included group thereby mitigating the risk of selection bias.

### **Ethical considerations and data collection**

The study received prior approval from the Medical Research Center (MRC-05-036) and the Institutional Review Board (IRB) of Hamad Medical Corporation, Qatar. The study investigators present on the quarantine sites made phone contact with the parents of all children included in the sample to invite their children to participate in the study voluntarily. All information relevant to the study including its purpose, impact on clinical care and confidentiality safeguards, was provided to the parents and their participating children using an invitation form with a standard script developed specifically for the study, in both English and Arabic languages.

Informed, written parental consent and child's assent (where applicable) were obtained. The web link of the online questionnaire including consent/assent confirmation was securely communicated by the study investigators deployed at the two quarantine centers to the parents of the participating children. The usage of paper and face-to-face contact was avoided to mitigate the spread of infection. Data collection was completed during July 2020. All completed responses were received online.

## Measures

We used the original English version as well as a previously validated Arabic version of the Child-reported Spence Children's Anxiety Scale (32, 33).

The Spence Children's Anxiety Scale (SCAS) was developed to assess the severity of anxiety symptoms broadly in line with the dimensions of anxiety disorder proposed by the DSM-IV (34, 35). The scale assesses six domains of anxiety namely generalized anxiety, panic/agoraphobia, social phobia, separation anxiety, obsessive-compulsive disorder, and physical injury fears. SCAS is also used to screen children at risk for the emergence of anxiety disorders secondary to elevated anxiety symptoms (36). Moreover, it is considered a reliable instrument for cross-cultural use (37).

It is designed to be relatively easy and quick for children to complete, normally taking only around 10 minutes to answer the questions. It consists of a total of 44 items, of which 38 relate to specific symptoms of anxiety and 6 are positive, filler items to mitigate negative response bias. Of the 38 anxiety items, 6 reflect separation anxiety, 6 social phobia, 6 obsessive-compulsive problems, 6 panic/3 agoraphobia, 6 generalized anxiety/overanxious symptoms, and 5 items relate to fears of physical injury. Items related to specific anxiety disorders are allocated randomly within the questionnaire. Children are asked to rate the frequency of each symptom on a 4-point scale involving never (0), sometimes (1), often (2), and always (3).

The SCAS has now been used in a significant number of research studies to measure symptoms of anxiety. It has been evaluated in community and clinical samples of children and young people with evidence to support their internal consistency, test-retest reliability, convergent and divergent validity, and ability to distinguish between children with anxiety disorders versus community samples (38-40). Its test-retest reliability has also been found to be high for overall anxiety as well as symptoms of specific anxiety disorders (35). In addition to normative data, T-Scores have been developed to establish whether anxiety symptoms are elevated above what would be regarded as normal levels in equivalent age and gender groups within the community. They are standardized scores calculated from the total distribution of scores within the community sample. The cut-off points for elevated levels of anxiety are established using age-range and gender-specific T-scores. Raw total scores for overall anxiety and specific anxiety disorders obtained after adding responses on the scale are considered in elevated range if their equivalent T-scores are above 60.

### Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 25 was used to carry out statistical analysis. A two-tailed  $p$ -value of  $\leq 0.05$  was considered for statistical significance. The results of a descriptive analysis were presented as frequency and percentage. A student  $t$ -test was utilized to analyze continuous data. The results were presented as mean  $\pm$  SD. A chi-square test was used to analyze categorical values. The results were presented as frequency and percentage.

### Results

The sample of this study consisted of 88 COVID-19 positive children admitted to institutional quarantine centers. The results were compiled in a manner to allow for investigators to look at all 88 participants as a single group for common findings as well as break the data down into sub-groups based on age (7-11 years and 12-13 years), gender, and residency status (expatriates/natives) in line with the objectives of the study. The age-ranges used to form two groups for compilation of results were consistent with the age requirement for cut-off scores on the Spence Children's Anxiety Scale (SCAS). Moreover, they drew a reasonable distinction between younger and older children. The 7-11 years group had 64 participants (72.7%), and the 12-13 years group had 24 participants (27.3%). The majority of participants were males,  $n=48$  (54.5%), and expats,  $n=64$  (72.7%). See Table 1.

A total of 36.3% ( $n=32$ ) of the study sample met the respective elevated cut-off score for overall anxiety disorder. Among males, 37.8% ( $n=14$ ) of the 7-11 years age group and 63.6% ( $n=7$ ) of the 12-13 years age group had an elevated score for overall anxiety disorder above the assigned cutoff for each group (total score  $\geq 40$  and  $\geq 33$ , respectively),  $p=0.13$ . Among females, 25.9% ( $n=7$ ) of the 7-11 years age group and 30.8% ( $n=4$ ) of the 12-13 years age group had an elevated score above the assigned cutoff for each group (total score  $\geq 50$  and  $\geq 40$ , respectively),  $p=0.74$ . The percentages of the study sample that met the various criteria for total score and subscale scores are outlined in table 2 below.

The largest group among the 88 children reported elevated levels of physical injury fears,  $n=62$  (70.4%), followed by Separation anxiety,  $n=51$  (57.9%), Obsessive-Compulsive disorder,  $n=28$  (31.8%), Social Phobia,  $n=21$  (23.8%), Generalized Anxiety Disorder,  $n=19$  (21.5%) and panic/agoraphobia,  $n=17$  (19.3%). See Table 2.

The mean score for overall anxiety disorder was  $36.7 \pm 15.7$  on the Spence Children's Anxiety Scale. The following are the mean scores on each of the sub-scales: generalized anxiety  $5.7 \pm 3.4$ , obsessive-compulsive  $6.7 \pm 3.8$ , physical injury fears  $6.7 \pm 3.2$ ,

social phobia  $5.7 \pm 3.7$ , panic/agoraphobia  $3.9 \pm 3.8$ , and separation anxiety  $7.7 \pm 4.0$ .

Among the gender groups, elevated scores for overall anxiety disorder were reported more frequently in males,  $n=21$  (43.75%) as compared to females, 11 (27.5%) (Table 2). There were no significant differences in the mean scores of anxiety levels between males and females. Table 3 reports the mean  $\pm$ SD among gender groups on each subscale.

When comparing natives to expats, elevated levels for overall anxiety disorder were reported more frequently in expats,  $n=26$  (40.6%) compared to natives,  $n=6$  (25%) (Table 4). No significant differences were reported between the mean scores of the two groups except for the OCD sub-scale ( $p=0.03$ ). Table 4 below shows further comparisons between the two groups.

When comparing the two age groups included in this study, elevated symptoms of overall anxiety were reported by 32.8% of younger children (7-11 years) compared to 45.8% of older children (12-13 years). There was no significant statistical difference found between the mean scores of these two age groups though. Table 5 shows further comparisons between the two age groups.

### Discussion

This study, to our knowledge, is the first of its kind to explore the prevalence rates of anxiety disorders in children with COVID-19 infection. It is also unique in that it compares the severity of anxiety symptoms between the native and expatriate populations.

This study found high prevalence rates of anxiety disorders among children with COVID-19 infection under quarantine. As many as 36.3 % of the children reported elevated levels of overall anxiety. This rate is higher than reported in children in the general population both before and during the pandemic. A cross-sectional study conducted in China ( $n=2330$ ) during the pandemic among children with an age range similar to our sample found a rate of 18.9% for anxiety disorders (41). This rate, as may be observed, is almost half of that reported in our study.

A recent systematic review suggested that quarantine is associated with far reaching and significant negative impact on psychological wellbeing of children and adolescents (42). Another recent study involving 1143 parents of Italian and Spanish children aged 3 to 18 years showed that 85.7% of the parents perceived changes in their children's emotional state and behaviors during COVID-19 quarantine. Boredom, irritability, restlessness, nervousness, feelings of loneliness, and being more uneasy and more worried were reported by more than 30% of parents (43).

**TABLE 1.** Sample's demographics

	Male (n=48)		P-value	Female (n=40)		P-value
	Natives	Expats		Natives	Expats	
7-11 years	11 (29.7%)	26 (70.3%)	0.44	8 (29.6%)	19 (70.4%)	0.66
12-13 years	2 (18.2%)	9 (81.8%)		3 (23.1%)	10 (76.9%)	

**TABLE 2.** Elevated overall anxiety and sub-scale scores on the Spence Children's Anxiety Scale

	Male 7-11			Male 12-13			Female 7-11			Female 12-13		
	Cutoff score	Natives (n=11)	Expat (n=26)	Cutoff score	Natives (n=2)	Expat (n=9)	Cutoff score	Natives (n=8)	Expat (n=19)	Cutoff score	Natives (n=3)	Expat (n=10)
Total Score	≥40	3(27%)	11(42%)	≥33	0	7(77%)	≥50	2(25%)	5(26%)	≥40	1(33%)	3(30%)
Generalized anxiety	≥8	3(27%)	5(19%)	≥7	0	3(33%)	≥10	3(37%)	3(15%)	≥9	1(33%)	1(10%)
Obsessive-Compulsive	≥9	1(9%)	8(30%)	≥7	0	6(66%)	≥10	1(12%)	5(26%)	≥7	2(66%)	5(50%)
Physical injury fears	≥5	8(72%)	17(65%)	≥4	0	8(88%)	≥6	5(62%)	13(68%)	≥6	3(100%)	8(80%)
Social phobia	≥8	2(18%)	5(19%)	≥8	0	6(66%)	≥10	2(25%)	4(21%)	≥10	0	2(20%)
Panic/agoraphobia	≥7	1(9%)	6(23%)	≥4	0	5(55%)	≥9	3(37%)	1(.05%)	≥7	0	1(10%)
Separation anxiety	≥7	7(63%)	16(61%)	≥4	1(50%)	9(100%)	≥9	2(25%)	10(52%)	≥6	2(66%)	4(40%)

**TABLE 3.** Mean overall anxiety and subscale scores (gender)

	Male (n=48)	Female (n=40)	P-value
	Mean ± (SD)		
Total score	35.4 ± (15.3)	38.2 ± (16.1)	0.41
Generalized anxiety	5.5 ± (3.1)	6.0 ± (3.7)	0.47
Obsessive-Compulsive	6.2 ± (3.6)	7.4 ± (4.1)	0.15
Physical injury fears	6.6 ± (3.5)	6.8 ± (3.0)	0.74
Social phobia	5.2 ± (3.5)	6.3 ± (4.02)	0.18
Panic/agoraphobia	3.9 ± (3.8)	4.0 ± (3.9)	0.85
Separation anxiety	7.8 ± (4.0)	7.5 ± (3.9)	0.64

**TABLE 4.** Mean overall anxiety and subscale scores (natives vs expatriates)

	Natives (n=24)	Expats (n=64)	P-value
	Mean $\pm$ (SD)		
Total score	34.5 $\pm$ (17.7)	37.5 $\pm$ (14.9)	0.42
Generalized anxiety	6.1 $\pm$ (4.3)	5.5 $\pm$ (3.0)	0.58
Obsessive-Compulsive	5.3 $\pm$ (3.1)	7.2 $\pm$ (4.0)	0.03
Physical injury fears	6.3 $\pm$ (3.0)	6.8 $\pm$ (3.3)	0.51
Social phobia	5.3 $\pm$ (3.4)	5.8 $\pm$ (3.9)	0.54
Panic/agoraphobia	4.1 $\pm$ (4.4)	3.9 $\pm$ (3.6)	0.79
Separation anxiety	7.1 $\pm$ (4.0)	7.9 $\pm$ (3.9)	0.40

**TABLE 5.** Mean overall anxiety and subscale scores (age)

	Age 7-11 group (n=64)	Age 12-13 group (n=24)	P-value
	Mean $\pm$ (SD)		
Total score	36.9 $\pm$ (16.2)	35.9 $\pm$ (14.5)	0.78
Generalized anxiety	5.8 $\pm$ (3.6)	5.3 $\pm$ (2.8)	0.49
Obsessive- Compulsive	6.5 $\pm$ (3.9)	7.2 $\pm$ (3.6)	0.48
Physical injury fears	6.9 $\pm$ (3.4)	6.2 $\pm$ (2.7)	0.34
Social phobia	5.3 $\pm$ (3.6)	6.6 $\pm$ (3.9)	0.15
Panic/agoraphobia	3.9 $\pm$ (4.0)	4.0 $\pm$ (3.4)	0.98
Separation anxiety	8.1 $\pm$ (4.0)	6.5 $\pm$ (3.7)	0.08

Furthermore, a systematic review and meta-analysis examining the pooled prevalence of anxiety and other mental disorders among children and adolescents during global COVID-19 pandemic in 2019 to 2020 reported a rate of 26% for anxiety disorders (44)

Several factors may explain the high prevalence rates of elevated anxiety symptoms reported in our study. These may include staying away from the home environment in a quarantine center, worrying and uncertainty related to the outcome of disease, and the impact of disease symptoms.

The prevalence of anxiety disorders tends to increase with age in children and adolescents (45). A nationally representative survey of adolescents (age 13-18 years) in the US, reported the lifetime prevalence of anxiety as high as 31.9% (46). In our sample, 32.8% younger children (7-11 years) compared to 45.8% older children (12-13 years) reported elevated levels of symptoms of overall anxiety. A similar trend has been found in children with no COVID-19 infection during the pandemic. A large cross-sectional study in China (n=8079) was conducted in March 2020 and found anxiety prevalence to be 37.4 % in older adolescents (12-18 years) without COVID-19 infection (47).

The difference in the prevalence of elevated anxiety symptoms between younger children and older adolescents as reflected in our study is consistent with previous research. However, it may be surmised that older children may report higher anxiety rates because of their greater understanding of the situation and associated uncertainty. In other words, the differences in these age groups may be

further accentuated since older children and adolescents can better conceptualize the COVID-19 situation.

Our study also revealed alarmingly high rates (70.4%) of elevated symptoms of physical injury fears elicited by things and events commonly considered the objects of specific phobias. This rate is several times higher than what has been reported previously. The 1-year prevalence of specific phobia in children and adolescents has been reported previously as 7.9% (48). In a Dutch study of 13-18 years old adolescents, the prevalence rate for self-reported specific phobias was found to be 4.5% (49).

Similarly, the rates of elevated levels of separation anxiety symptoms reported in this study (57.9%) were much higher than reported previously (50, 51). Furthermore, the higher mean score of separation anxiety reported in this study among younger children (7-11 years) compared to their older counterparts (12 and 13 years) is consistent with the previously held view that symptoms of separation anxiety are more elevated in younger children. It is pertinent to mention that children were quarantined with at least one parent or guardian after obtaining the required permissions. The proximity with usual caregivers may have allowed children more flexibility with adapting to their environment. This may have mitigated slightly the rates of elevated anxiety symptoms reported in our study, particularly those of separation anxiety.

It is well-established that the migrant population is more susceptible to stress (52) and mental health issues among them pose a public health challenge globally (53). This observation is reflected in our

study as a higher prevalence rate of overall anxiety was reported in children from expat families (40.6%) compared to native children (25%).

The difference in the mean scores between the expat and native group of children was found statistically significant for obsessive-compulsive symptoms. Although the possibility of the differences in the OCD-symptom scores between the two groups may have been influenced by differences in their attitudes to conform to COVID-19 guidance, individuals engaging in such behaviors may still be indicative of the likelihood of underlying obsessiveness. It has been established through previous research that obsessive-compulsive disorder is particularly relevant to pandemic worrying and is most significant in this context (54, 55). Fear of contamination and washing compulsions are among the core symptom dimensions of OCD (56). In previous outbreaks such as SARS and H1N1 influenza, obsessive-compulsive beliefs and symptoms worsened and predicted fears related to the infection (57, 58).

The findings from our study highlight the global need to focus on the psychological health of young children and adolescents with COVID-19 infection. A multitude of factors may have contributed to the increased anxiety levels in these children. Worrying about possible complications from the infection, the fear of spreading the infection to family and friends, and the curtailment of social functioning due to quarantine may all have played their role. As part of its robust COVID-19 response, Qatar has fortunately made several psychological services available including around-the-clock telephone helplines, outpatient and inpatient services as well as virtual consultations. Providing mental health support to young children and adolescents in general and those who contract the COVID-19 infection in particular is an important aspect of mitigating the impact of the pandemic.

This includes the need for effective screening and prompt identification of clinical features of emerging mental disorders and providing appropriate early interventions. Such an approach, if adopted globally, has the potential to mitigate the mental health burden associated with COVID-19. On the other hand, if the mental health complications associated with the pandemic are not addressed effectively, it has the potential to cause a global crisis of epic proportions.

Future follow-up studies exploring anxiety symptoms at a different time of the pandemic may help clarify whether the severity of anxiety varies with the time and setting. There is a possibility that the fears related to the illness may be allayed with better understanding of the illness, its prevention and management. Furthermore, future studies focusing on anxiety symptoms in children who have not

contracted the infection may help with drawing a distinction between the impact of the stress or stigma related to quarantine/infection and that of the usual pandemic-related worries.

### **Conclusion**

Children subjected to institutional quarantine due to COVID-19 infection may be at risk of developing anxiety disorders. Expatriate children are more likely to report elevated levels of anxiety disorder than their native counterparts suggesting that this group of children and their families may be particularly vulnerable to the psychological impact of the COVID-19 pandemic. The governments and organizations across the globe need to ensure the availability of the required resources and services so that the mental health needs of children during the pandemic are identified and addressed promptly and effectively.

### **Limitations and strengths**

One limitation of our study could be its relatively small sample size. The cross-sectional design also did not allow for follow up to measure any changes in symptoms over time. A follow-up study exploring whether children with elevated anxiety symptoms go on to develop anxiety disorders and require input from mental health services, may prove helpful. The strengths of the study include use of a recognized and validated scale (SCAS) and its uniqueness in that no previous study has looked at the prevalence rates of anxiety disorders among children in quarantine with confirmed COVID-19 infection. The findings of the study are crucial for future healthcare planning in relation to early identification and management of mental disorders in children.

### **Acknowledgements**

We would like to acknowledge the Medical Research Center at Hamad Medical Corporation for their support. We would also like to thank Prof. Susan H Spence for her support with using the Spence Children's Anxiety Scale.

### **Funding**

None.

### **Conflicts of interest**

The authors declare no competing or potential conflicts of interest

### **Author contribution**

YSK and AWK contributed to the conceptualization and design of the study, acquisition and interpretation of the data, and drafting/revising the manuscript. IANA and HS contributed to study design and data acquisition. SH contributed to the interpretation/statistical analysis of data and revision of the manuscript. MAK and MRSM contributed to study conceptualization and data acquisition. AZ contributed to study design and

conceptualization. SNS contributed to study design and data acquisition. MA contributed to study design, conceptualization and provided overall supervision. All authors reviewed and approved the manuscript.

## References

- Muris P, Meesters C, Merckelbach H, Sermon A, Zwakhalen S. Worry in normal children. *J Am Acad Child Adolesc Psychiatry* 1998;37:703–10.
- Vasey MW, Daleiden EL. Worry in children. In Davey GCL, Tallis F (Eds.). *Worrying: Perspectives on theory, assessment and treatment*. Hoboken, NJ, USA, John Wiley & Sons; 1994, pp. 185–207.
- Weems CF, Silverman WK, La Greca AM. What do youth referred for anxiety problems worry about? Worry and its relation to anxiety and anxiety disorders in children and adolescents. *J Abnorm Child Psychol* 2000;28:63–72.
- Kessler RC, Avenevoli S, Costello EJ, Georgiades K, Green JG, Gruber MJ, He J, et al. Prevalence, persistence, and sociodemographic correlates of DSM-IV disorders in the National Comorbidity Survey Replication Adolescent Supplement. *Arch Gen Psychiatry* 2012;69:372–80.
- Achenbach TM, Howell CT, McConoughy SH, Stanger C. Six-year predictors of problems in a national sample: III. Transitions to young adult syndromes. *J Am Acad Child Adolesc Psychiatry* 1995;34:658–69.
- Kessler RC, Avenevoli S, McLaughlin KA, Green JG, Lakom MD, Petukhova M, et al. Lifetime comorbidity of DSM-IV disorders in the NCS-R adolescent supplement (NCS-A). *Psychol Med* 2012;42:1997.
- Polanczyk GV, Salum G. A, Sugaya LS, Caye A, Rohde LA. Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *J Child Psychol Psychiatry* 2015;56:345–365.
- Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005;62:617–27.
- Beesdo-Baum K, Knappe S. Developmental epidemiology of anxiety disorders. *Child Adolesc Psychiatr Clin N Am* 2012;21:457–78.
- Copeland WE, Angold A, Shanahan L, Costello EJ. Longitudinal patterns of anxiety from childhood to adulthood. The Great Smoky Mountains Study. *J Am Acad Child Adolesc Psychiatry* 2014;53:21–33.
- Essau CA, Lewinsohn PM, Olaya B, Seeley JR. Anxiety disorders in adolescents and psychosocial outcomes at age 30. *J Affect Disord* 2014;163:125–32.
- Russo MF, Beidel DC. Comorbidity of childhood anxiety and externalizing disorders. Prevalence, associated characteristics, and validation issues. *Clin Psychol Rev* 1994;14:199–221.
- Mazzone L, Ducci F, Scoto MC, Passaniti E, D'Arrigo VG, Vitiello B. The role of anxiety symptoms in school performance in a community sample of children and adolescents. *BMC Public Health* 2007;7:347.
- Grover RL, Ginsburg GS, Ialongo N. Psychosocial outcomes of anxious first graders: A seven-year follow-up. *Depress Anxiety* 2007;24:410–20.
- Bittner A, Egger HL, Erkanli A, Jane Costello E, Foley DL, Angold A. What do childhood anxiety disorders predict? *J Child Psychol Psychiatry* 2007;48:1174–83.
- Copeland WE, Shanahan L, Costello EJ, Angold A. Childhood and adolescent psychiatric disorders as predictors of young adult disorders. *Arch Gen Psychiatry* 2009;66:764–72.
- Overstreet S, Salloum A, Burch B, West J. Challenges associated with childhood exposure to severe natural disasters: Research review and clinical implications. *J Child Adolesc Trauma* 2011;4:52–68.
- Leon GR. Overview of the psychosocial impact of disasters. *Prehosp Disaster Med* 2004;19(1):4–9.
- Ludvigsson JF. Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults. *Acta Paediatr* 2020;109(6):1088–95.
- Lazarus PJ, Jimerson SR, Brock SE. Helping children after a natural disaster: Information for parents and teachers 2003. National Association of School Psychologists; 2003. Available at [www.nasponline.org](http://www.nasponline.org).
- Fry-Bowers EK. Children are at Risk from COVID-19. *J Pediatr Nurs* 2020;53:A10–A12..
- Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *Lancet Psychiatry* 2020;7:300–2.
- Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry* 2020;7(3):228–9..
- Lee J. Mental health effects of school closures during COVID-19. *Lancet Child Adolesc Health* 2020;4:421.
- Sprang G, Silman M. Posttraumatic stress disorder in parents and youth after health-related disasters. *Disaster Med Public Health Prep* 2013;7(1):105–10..
- Liu JJ, Bao Y, Huang X, Shi J, Lu L. Mental health considerations for children quarantined because of COVID-19. *Lancet Child Adolesc Health* 2020;4:347–9.
- Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395(10227):912–20.
- Jiao WY, Wang LN, Liu J, Fang SF, Jiao FY, Pettoello-Mantovani M, et al. Behavioral and emotional disorders in children during the COVID-19 epidemic. *J Pediatr* 2020;221:264–6.e1.
- Ravens-Sieberer U, Kaman A, Erhart M, Otto C, Devine J, Löffler C, et al. Quality of life and mental health in children and adolescents during the first year of the COVID-19 pandemic: results of a two-wave nationwide population-based study. *Eur Child Adolesc Psychiatry* 2021:1–14.
- Racine N, McArthur BA, Cooke JE, Eirich R, Zhu J, Madigan S. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: a meta-analysis. *JAMA Pediatr* 2021;175(11):1142–50..
- Planning and Statistics Authority-State of Qatar (February 2020). Available from [www.psa.gov.qa/en/statistics1/StatisticsSite/pages/population.aspx](http://www.psa.gov.qa/en/statistics1/StatisticsSite/pages/population.aspx)
- Essau CA, Muris P, Ederer EM. Reliability and validity of the Spence Children's Anxiety Scale and the screen for child anxiety related emotional disorders in German children. *J Behav Ther Exp Psychiatry* 2002;33(1):1–18..
- Alahmed AS: Assessing abused children in Saudi Arabia for behavioural and emotional disorders. [Doctoral dissertation] Ulster University; 2015.
- Spence SH. Structure of anxiety symptoms among children: a confirmatory factor-analytic study. *J Abnorm Psychol* 1997;106(2):280–97.



35. Spence SH. A measure of anxiety symptoms among children. *Behav Res Ther* 1998;36(5):545-66..
36. Dadds MR, Holland DE, Laurens KR, Mullins M, Barrett PM, Spence SH. Early intervention and prevention of anxiety disorders in children: results at 2-year follow-up. *J Consult Clin Psychol* 1999;67(1):145-50..
37. Orgilés M, Fernández-Martínez I, Guillén-Riquelme A, Espada JP, Essau CA. A systematic review of the factor structure and reliability of the Spence Children's Anxiety Scale. *J Affect Disord* 2016;190:333-40.
38. Spence SH, Barrett PM, Turner CM. Psychometric properties of the Spence Children's Anxiety Scale with young adolescents. *J Anxiety Disord* 2003;17(6):605-25. 5.
39. Nauta MH, Scholing A, Rapee RM, Abbott M, Spence SH, Waters A. A parent-report measure of children's anxiety: psychometric properties and comparison with child-report in a clinic and normal sample. *Behav Res Ther* 2004;42(7):813-39.
40. Arendt K, Hougaard E, Thastum M. Psychometric properties of the child and parent versions of Spence children's anxiety scale in a Danish community and clinical sample. *J Anxiety Disord* 2014;28:947-56.
41. Xie X, Xue Q, Zhou Y, Zhu K, Liu Q, Zhang J, et al. Mental health status among children in home confinement during the coronavirus disease 2019 outbreak in Hubei Province, China. *JAMA Pediatr* 2020;174(9):898-900.
42. Imran N, Aamer I, Sharif MI, Bodla ZH, Naveed S. Psychological burden of quarantine in children and adolescents: a rapid systematic review and proposed solutions. *Pak J Med Sci* 2020;36(5):1106-16..
43. Orgilés M, Morales A, Delvecchio E, Mazzeschi C, Espada JP. Immediate psychological effects of the COVID-19 quarantine in youth from Italy and Spain. *Front Psychol* 2020;11:579038..
44. Jiao WY, Wang LN, Liu J, Fang SF, Jiao FY, Pettoello-Mantovani M, et al. Behavioral and emotional disorders in children during the COVID-19 epidemic. *J Pediatr* 2020;221:264-6.e1..
45. Essau CA, Conradt J, Petermann F. Frequency, comorbidity, and psychosocial impairment of anxiety disorders in German adolescents. *J Anxiety Disord* 2000;14(3):263-79.
46. Merikangas KR, He JP, Burstein M, Swanson SA, Avenevoli S, Cui L, et al. Lifetime prevalence of mental disorders in U.S. adolescents: results from the National Comorbidity Survey Replication--Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry* 2010;49(10):980-9.
47. Zhou SJ, Zhang LG, Wang LL, Guo ZC, Wang JQ, Chen JC, et al. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *Eur Child Adolesc Psychiatry* 2020;29(6):749-58.
48. Kim SJ, Kim BN, Cho SC, Kim JW, Shin MS, Yoo HJ, et al. The prevalence of specific phobia and associated co-morbid features in children and adolescents. *J Anxiety Disord* 2010;24(6):629-34.
49. Verhulst FC, van der Ende J, Ferdinand RF, Kasius MC. The prevalence of DSM-III-R diagnoses in a national sample of Dutch adolescents. *Arch Gen Psychiatry* 1997;54(4):329-36.
50. Shear K, Jin R, Ruscio AM, Walters EE, Kessler RC. Prevalence and correlates of estimated DSM-IV child and adult separation anxiety disorder in the National Comorbidity Survey Replication. *Am J Psychiatry* 2006;163(6):1074-83.
51. Mohammadi MR, Badrfam R, Khaleghi A, Hooshyari Z, Ahmadi N, Zandifar A. Prevalence, comorbidity and predictor of separation anxiety Disorder in children and adolescents. *Psychiatr Q* 2020;91(4):1415-29.
52. Bhugra D. Migration and mental health. *Acta Psychiatr Scand* 2004;109(4):243-58.
53. Meyer SR, Lasater M, Tol WA. Migration and mental health in low- and middle-income countries: a systematic review. *Psychiatry* 2017;80(4):374-81.
54. Khan YS, Jouda M, Albobali Y, Osman Abouelseoud M, Soud A, AlMeraiji MJ, et al. COVID-19 pandemic fears and obsessive-compulsive symptoms in adolescents with pre-existing mental disorders: an exploratory cross-sectional study. *Clin Child Psychol Psychiatry* 2021;28:13591045211017606.
55. Banerjee DD. The other side of COVID-19: impact on obsessive compulsive disorder (OCD) and hoarding. *Psychiatry Res* 2020;288:112966.
56. Bloch MH, Landeros-Weisenberger A, Sen S, Dombrowski P, Kelmendi B, Coric V, et al. Association of the serotonin transporter polymorphism and obsessive-compulsive disorder: systematic review. *Am J Med Genet B Neuropsychiatr Genet* 2008;147B(6):850-8.
57. Mak IW, Chu CM, Pan PC, Yiu MG, Chan VL. Long-term psychiatric morbidities among SARS survivors. *Gen Hosp Psychiatry* 2009;31(4):318-26.
58. Brand J, McKay D, Wheaton MG, Abramowitz JS. The relationship between obsessive compulsive beliefs and symptoms, anxiety and disgust sensitivity, and Swine Flu fears. *J Obsessive Compuls Relat Disord* 2013;2(2):200-6.