



Comparison of Anxiety of the Children of Healthcare Workers and Non-Healthcare Workers During the COVID-19 Pandemic

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ABSTRACT

Aim: The children of healthcare workers (HCWs) constitute a group highly vulnerable to anxiety disorders during the coronavirus disease-2019 (COVID-19) pandemic. This study aimed to compare the prevalence and severity of anxiety between the children of HCWs and non-HCWs while identifying factors contributing to this anxiety.

Materials and Methods: A cross-sectional study was conducted involving 334 children aged between 6 and 17 years to assess their anxiety levels. The risk factors related to anxiety were determined using binary logistic regression analysis.

Results: Significant risk factors for anxiety included having parents who were HCWs, having parents with psychiatric disorders, changes in household members, and following news updates ($p=0.045$, 0.022 , 0.021 , and 0.024 , respectively). Children of HCWs working in COVID-19 clinics exhibited a higher prevalence of moderate to severe anxiety than the other groups ($p=0.036$). Additionally, prolonged screen time and changes in sleep duration were more common in children with moderate to severe anxiety.

Conclusion: The results suggest that the children of HCWs may be more prone to anxiety symptoms than the children of parents in other professions.

Keywords: Anxiety, COVID-19, pandemic, children, healthcare workers

Introduction

Coronavirus disease-2019 (COVID-19) emerged as a global health crisis, affecting nations worldwide (1). Following the first reported cases, stringent quarantine measures were enacted to curb the infection's spread worldwide. The COVID-19 pandemic also significantly impacted mental health. Early pandemic research in China found that 16.5-28.8% of respondents had moderate to severe depression

and anxiety (2). Increased anxiety stemmed from the virus's uncertain incubation, asymptomatic transmission, shortages of medical supplies and staff, and overexposure to COVID-19 news (3,4).

Healthcare workers (HCWs) are especially vulnerable to pandemic-related mental health issues. Their sleep quality is poorer than that of the general public. Among HCWs, women and frontline HCWs report anxiety symptoms

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more frequently (2-5). The main stressors include virus transmission fears, handling fears and anxiety, and HCW shortages (1,6).

Children and adolescents are especially vulnerable to pandemic-related mental health issues. Factors such as separation from caregivers, infection risk, hospital isolation, and loss can amplify their anxiety. Parents play a pivotal role in easing their children's distress. Their own stress and ability to handle their children's anxiety directly influence their child's anxiety levels (7,8). School closures resulted in less physical activity, altered eating patterns, and more screen time, increase anxiety and distress in children (9-11).

This study aims to evaluate the anxiety levels of children during the COVID-19 pandemic, identify its underlying causes, and compare the severity of anxiety between children of HCWs and those of other professions.

Materials and Methods

This study employed a cross-sectional, case-control design. A Google form survey was constructed for this study to be completed by the parents and children. Ethics committee approval was obtained from the Ege University Faculty of Medicine Clinical Research Ethics Committee (approval no.: 20-7T/51, date: 08.07.2020), and written informed consent was obtained from all participating children and their legal guardians, either via email or in writing. Participants were recruited through notices posted on hospital boards, explicitly targeting children aged 6-17 years and their parents. The participants were without any history of psychiatric disorders. HCWs, encompassing doctors, nurses, health technicians, and secretaries, were identified as potential participants. Those with a familial COVID-19 history were excluded from this study to avoid potential confusion. Four hundred and eighty-two participants and their children completed the online forms. However, 81 were excluded due to incomplete form filling, under cut-off points for anxiety, or a COVID-19 family history. Of these excluded participants, 56 had a familial COVID-19 history, while 25 left form responses incomplete. Sixty-seven participants (30 children of HCWs and 37 children of other professions) were excluded from this study due to providing no or almost no responses to the questions in the The Diagnostic and Statistical Manual of Mental Disorders (DSM) Level 1 Anxiety section, as completed by their parents. Consequently, the final sample consisted of 334 parents and their children who consented to participate between the dates of July to November, 2020.

Sociodemographic data form: This survey includes multiple-choice and open-ended questions. The collected

demographic data included the children's pre-existing medical conditions, parents' age, profession, education level, residence, alterations in household members, and the current living conditions of the child. For HCW parents, their workplace information was also collected. The survey queried total screen time, durations of physical activity and sleep, and eating habit changes.

The Diagnostic and Statistical Manual of Mental Disorders 5 - Level 1 Cross-Cutting Symptom Measure Anxiety Disorders Part:

The anxiety section of the scale contains three questions assessing symptoms over two weeks. Scoring options were as follows: never (0), almost never (1), mild (2), moderate (3), and severe (4). Answering as mild or above on any question prompted further evaluation with the Level 2 DSM-5 Anxiety Scale. The parent form evaluated anxiety symptoms in children aged 6-17.

The Diagnostic and Statistical Manual of Mental Disorders 5 - Level 2 Anxiety Scale:

This scale was utilized to evaluate the anxiety levels of the children. It is a 4-point Likert-type scale with 26 items. The scale is scored as follows: never (1 point), almost never (2 points), sometimes (3 points), often (4 points) and almost always (5 points). This scale assessing anxiety symptoms over the past seven days consists of a 10-item parent form completed by parents or legal guardians of the children aged 6-17 years and a 13-item self-report form for adolescents aged 11-17 years to complete themselves. A cut-off score of 55 was set for anxiety: 55-59.9 denotes mild anxiety, 60-69.9 signifies moderate anxiety, and scores above 70 indicate severe anxiety (12).

Statistical Analysis

The statistical analysis was conducted using IBM SPSS 25.0 software. The Kolmogorov-Smirnov test and Shapiro-Wilk tests assessed the normality of the quantitative data. Parametric methods were used for normally distributed variables, while non-parametric methods were applied to those not normally distributed. The Mann-Whitney U test was used to compare independent groups, the Pearson chi-square test was used for categorical data. Quantitative variables are depicted as median and interquartile range, while categorical variables are expressed as frequencies. We used a logistic regression model to identify the predictors of anxiety in children. Analysis was conducted at a 95% confidence level, with p-values less than 0.05 considered statistically significant.

Results

The participant characteristics are presented in Table I. No significant differences were found between the groups

regarding ages and living environments. However, there were significant disparities concerning parental education levels, income levels, and gender. Anxiety severity rates, compared by age, are displayed in Table II, and the participant data for those aged 6-17 years are summarized in Table III.

We conducted a logistic regression model with factors significantly associated with anxiety in children (Table IV).

The model fit was good (Hosmer and Lemeshow test, $p=0.865$). According to this regression analysis, all factors were found to impact children's anxiety. The most significant factor was change of people at home. The self-assessment data for participants aged 11-17 years are summarized in Table V. In regression analysis (Hosmer and Lemeshow Test $p=0.731$), change of people at home was the only factor detected as increasing anxiety in adolescents (Table VI).

Table I. Demographic characteristics of the participants

	HCWs parents n=118 (35.3%)	Parents with other profession n=216 (64.7%)	p value
Child age (months) [median (IQR ¹)]	112.97 (73.66)	120.34 (73.24)	0.396 ¹
Maternal age (years) [median (IQR ¹)]	40.50 (6)	40.00 (6)	0.195 ¹
Paternal age (years) [median (IQR ¹)]	42.00 (7)	42.00 (7)	0.581 ¹
Child age			
6-10 years, n (%)	76 (64.4)	123 (56.9)	0.184 ^{**}
11-17 years, n (%)	42 (35.6)	93 (43.1)	
Gender			
Female, n (%)	70 (59.3)	102 (47.2)	0.034 ^{**}
Male, n (%)	48 (40.7)	114 (52.8)	
Education level of mother			
First-degree or high school, n (%)	16 (13.6)	89 (41.2)	<0.001 ^{**}
College or higher, n (%)	102 (86.4)	127 (58.8)	
Education level of father			
First-degree or high school, n (%)	18 (15.3)	85 (39.5)	<0.001 ^{**}
College or higher, n (%)	100 (84.7)	130 (60.5)	
Place of residence			
Urban area, n (%)	112 (94.9)	199 (92.1)	0.337 ^{**}
Rural area, n (%)	6 (5.1)	17 (7.9)	
Number of children			
1 or 2 children, n (%)	112 (94.9)	192 (88.9)	0.066 ^{**}
3 children or more, n (%)	6 (5.1)	24 (11.1)	

¹Interquartile range, ^{*}Mann-Whitney-U test, ^{**}Pearson chi-square test, HCWs: Health care workers

Table II. Anxiety severity of children compared by ages (Parents' assessment and Self-Assessment)

	6-10 years (Parents' assessment) n=199 (59.6%)	11-17 years (Parents' assessment) n=135 (40.4%)	11-17 years (Self-assessment) n=135 (40.4%)
No anxiety, n (%)	90 (45.2)	67 (49.6)	80 (59.3)
Mild, n (%)	42 (21.1)	22 (16.3)	22 (16.3)
Moderate, n (%)	58 (29.1)	31 (23.0)	26 (19.3)
Severe, n (%)	9 (4.5)	15 (11.1)	7 (5.2)
Total, n (%)	109 (54.8)	68 (50.4)*	55 (40.7)*

* $p<0.001$ (Pearson chi-square test)

When comparing the anxiety of children of HCWs working in COVID-19 clinics, non-COVID-19 clinics, and other professions, it was found that 25 (65.8%) out of the 38 children of HCWs working in COVID-19 clinics exhibited anxiety symptoms. Anxiety symptoms were reported in 47 (58.8%) out of the 80 children of HCWs working in non-COVID-19 clinics, and in 105 (48.6%) out of the 216 children of other professions (Table VII). Thus, the children of HCWs working in COVID-19 clinics exhibited anxiety symptoms more frequently than others (p=0.036).

In the HCWs group, 53.4% were doctors, 23.7% were nurses, 6.8% were technicians, and 16.1% were from other departments such as psychology and pharmacy. Among children of doctors, 66.7% reported experiencing anxiety, compared to 57.1% among nurses' children and 51.9% among children from other departments. However, these differences were not statistically significant (p=0.372).

The relationship between anxiety and screen time, physical activity duration, weight changes, and changes in sleep time were also evaluated (Table VIII).

Table III. Comparison of children 6-17 years old with anxiety and controls (According to parents' assessment)

	Anxiety 177 (53.0)	Controls 157 (47.0)	p value
Gender, n (%)			
Female	100 (58.1)	72 (41.9)	0.052*
Male	77 (47.5)	85 (52.5)	
Age, n (%)			
6-10 years	109 (54.8)	90 (45.2)	0.429*
11-17 years	68 (50.4)	67 (49.6)	
Education level of mothers, n (%)			
First-degree or high school	54 (51.4)	51 (48.6)	0.698*
College or higher	123 (53.7)	106 (46.3)	
Education level of fathers, n (%)			
First-degree or high school	51 (49.5)	52 (50.5)	0.373*
College or higher	126 (54.8)	104 (45.2)	
Place of residence, n (%)			
Urban area	169 (54.3)	142 (45.7)	0.070*
Rural area	8 (34.8)	15 (65.2)	
Profession of parents, n (%)			
Healthcare workers	72 (61.0)	46 (39.0)	0.030*
Other professions	105 (48.6)	111 (51.4)	
Having a chronic disease, n (%)	29 (44.6)	36 (55.4)	0.132*
Psychiatric disorders in parents, n (%)	17 (77.3)	5 (22.7)	0.018*
Following the news, n (%)	123 (57.5)	91 (42.5)	0.028*
Change of people at home, n (%)	18 (81.8)	4 (18.2)	0.005*
*Pearson chi-square test			

Table IV. Logistic regression model on factors associated with anxiety in children

	p value	Odds ratio	95% CI (Lower-Upper)
HCW parents	0.045*	1.616	1.010-2.586
Psychiatric disorders in parents	0.022*	3.392	1.192-9.655
Following the news	0.024*	1.713	1.073-2.734
Change of people in the house	0.021*	3.750	1.223-11.496
*p<0.005 (Binary Logistic Regression) CI: Confidence interval			

Table V. Comparison of 11-17 years aged children with anxiety and controls (According to self-assessment)

	Anxiety 55 (40.7)	Controls 80 (59.3)	p value
Gender, n (%)			
Female	28 (42.4)	38 (57.6)	0.697
Male	27 (39.1)	42 (60.9)	
Education level of mothers, n (%)			
First-degree or high school	29 (42.6)	39 (57.4)	0.650
College or higher	26 (38.8)	41 (61.2)	
Education level of fathers, n (%)			
First-degree or high school	27 (39.1)	42 (60.9)	0.643
College or higher	28 (43.1)	37 (56.9)	
Place of residence, n (%)			
Urban area	53 (44.5)	66 (55.5)	0.014
Rural area	2 (12.5)	14 (87.5)	
Profession of parents, n (%)			
HCWs	22 (52.4)	20 (47.6)	0.274
Other professions	35 (37.6)	58 (62.4)	
Having a chronic disease, n (%)	4 (17.4)	19 (82.6)	0.012
Psychiatric disorders in parents, n (%)	4 (50.0)	4 (50.0)	0.715
Following the news, n (%)	49 (47.6)	54 (52.4)	0.004
Change of people at home, n (%)	6 (85.7)	1 (14.3)	0.018
Pearson chi-square test HCWs: Healthcare workers			

Table VI. Logistic regression model on factors associated with 11-17 aged children's anxiety (According to self-assessment)

	p value	Odds ratio	95% CI (Lower-Upper)
Place of residence (Urban area)	0.100	2.120	0.865-5.198
Following the news	0.064	1.545	0.976-2.447
Change of people at home	0.017*	3.911	1.280-11.950
Having a chronic disease	0.140	0.656	0.374-1.148
CI: Confidence interval			

Table VII. Comparison of anxiety according to parents' professions

	Anxiety n=177 (53.0)				Controls n=157 (47.0)	p value
	Mild	Moderate	Severe	Total		
HCWs (COVID-19 clinics), n (%)	9 (23.7)	11 (28.9)	5 (13.2)	25 (65.8)	13 (34.2)	0.036*
HCWs (non-COVID-19 clinics), n (%)	24 (30.0)	19 (23.8)	4 (5.0)	47 (58.8)	33 (41.3)	
Other professions, n (%)	31 (14.4)	59 (27.3)	15 (6.9)	105 (48.6)	111 (51.4)	
*Pearson chi-square test HCWs: Healthcare workers, COVID-19: Coronavirus disease-2019						

Table VIII. Children's daily habits related to anxiety

	Anxiety			Controls, n (%) 157 (47.0%)	p value*
	Mild, n (%) 64 (19.1)	Moderate, n (%) 89 (26.6)	Severe, n (%) 24 (7.1)		
Screen time					
<1 hour	1 (1.6)	3 (3.4)	0 (0.0)	19 (12.1)	0.005*
1-3 hours	22 (34.4)	19 (21.3)	4 (16.7)	44 (28.0)	
>3 hours	41 (64.1)	67 (75.3)	20 (83.3)	94 (59.9)	
Change in sleep time					
Same	36 (56.3)	48 (53.9)	5 (20.8)	107 (68.2)	<0.001*
Increased	20 (31.3)	23 (25.8)	10 (41.7)	23 (14.6)	
Decreased	8 (12.5)	18 (20.2)	9 (37.5)	27 (17.2)	
Change in weight					
Same	26 (40.6)	37 (41.6)	6 (25.0)	71 (45.2)	0.081*
Increased	30 (46.9)	49 (55.1)	13 (54.2)	68 (43.3)	
Decreased	8 (12.5)	3 (3.4)	5 (20.8)	18 (11.5)	
Physical activity time					
<1 hour	33 (51.6)	43 (48.3)	17 (70.8)	77 (49.0)	0.588*
1-3 hour	24 (37.5)	34 (38.2)	6 (25.0)	60 (38.2)	
>3 hours	7 (10.9)	12 (13.5)	1 (4.2)	20 (12.7)	

*Pearson chi-square test

We identified a correlation between increased screen time and anxiety ($p=0.005$). Moreover, when comparing changes in sleep duration-increased, decreased, or unchanged-we observed that individuals with higher anxiety levels reported no change in sleep duration ($p<0.001$).

Discussion

During COVID-19, children faced heightened psychological distress due to factors such as school closures, reduced physical activity, altered daily routines, and social isolation. Children of HCWs also grappled with fears of losing their parents and heightened separation anxiety. Our study, seemingly the first of its kind, compared anxiety in HCWs' children to those of other professionals during the pandemic, finding a higher anxiety prevalence in HCWs' children. Contributing factors included the parents' job, their history of psychiatric disorders, news exposure, and caregiver changes (13,14).

Comparing age groups (6-11 and 12-17), we observed slightly higher anxiety levels in the 6-11 age group, though the difference is not statistically significant. In contrast, another research reported greater psychological distress

in high school students (15). Also, in one review, it was found that there were higher prevalence rates of psychiatric disorders in adolescents than in children (16). However, in our research, adolescents reported less anxiety than their parents perceived. This discrepancy could be due to adolescents' tendency to avoid reporting internalizing symptoms.

Our study found that the children of HCWs, those with parents having psychiatric disorders, those exposed to pandemic news, and those with changes in caregivers showed higher anxiety rates. Changes in the household were the most significant factor contributing to anxiety. Many HCWs were separated from their families to minimize infection risks, leading to increased household shifts for their children. The critical role of a stable family environment in maintaining mental health is well-documented (16). Changes in caregivers within households lead to feelings of isolation among children of HCWs.

Studies show higher psychiatric symptom rates in females, aligning with our findings of increased anxiety in girls during the pandemic (15-18). Prior research highlights urban living, a history of psychiatric disorders, and female

gender as anxiety risk factors (19). Our study also noted raised anxiety levels in urban children, especially evident in self-reports from those aged 11-17.

Studies investigating the mental health of HCWs during the pandemic reported anxiety rates ranging from 20% to 60.2% (5,20-23). A positive correlation was found between the anxiety scores of the HCWs and their children (20). Consistent with this, we found a higher rate of anxiety among children of HCWs compared to others. Moreover, our findings showed a higher prevalence of anxiety in the children of HCWs than in a previously reported study (20). These results align with the notion that frontline HCWs and their children are at increased risk of psychiatric disorders (5,18,21,24). We observed more common anxiety, particularly moderate and severe cases, in the children of frontline HCWs compared to second-line HCWs and other professions.

Sleeping problems and changes are common among children during the pandemic (9). Previous studies have reported sleep disorders and decreased social interaction during the pandemic (25-27). However, we found that children with higher levels of anxiety reported no change in their sleep duration. Interestingly, pandemic-related home refinement was reported to improve sleep quality (9), suggesting that pandemic-induced anxiety symptoms might not be associated with changes in sleep patterns.

Study Limitations

While our study contributes to the literature, it has limitations. Our results rely on self-reported data, potentially compromising objectivity. The small sample size further restricts our findings. Social distancing measures necessitated an online survey, possibly limiting participant numbers. Using online recruitment due to COVID-19 might also have affected our ability to carry out objective psychiatric evaluations.

Conclusion

Our research underscores the need to support HCWs' children's mental health, as they are especially vulnerable during the COVID-19 pandemic. Clinicians should recognize that these children are a particularly vulnerable group and may require special attention in terms of mental health support. Healthcare providers should screen for these risk factors when assessing children's mental health during and after the pandemic. Clinicians should consider age and gender when assessing and addressing anxiety in children, tailoring interventions accordingly. This study emphasizes

that changes in the household, particularly related to HCWs separated from their families to minimize infection risks, had a significant impact on children's anxiety. Clinicians should discuss screen time and sleep habits with children and their parents, providing guidance on healthy routines and strategies to manage anxiety-related sleep disturbances. Given the challenges of conducting in-person assessments during the pandemic, clinicians should continue to explore and utilize online mental health services to reach and support children who may be experiencing anxiety.

This study's surprising finding of heightened anxiety in adolescents in rural areas suggests that mental health services should be accessible and tailored to the specific needs of rural communities. A multidisciplinary approach involving healthcare providers, psychologists, educators, and community support services may be necessary to address the complex mental health needs of children during and after the pandemic.

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Ethics

Ethics Committee Approval: Ethics committee approval was obtained from the Ege University Faculty of Medicine Clinical Research Ethics Committee (approval no.: 20-7T/51, date: 08.07.2020).

Informed Consent: Written informed consent was obtained from all participating children and their legal guardians, either via email or in writing.

Authorship Contributions

Concept: E.B.D., B.Ş., Z.Ş.B., Design: E.B.D., B.Ş., Z.Ş.B., Data Collection or Processing: E.B.D., B.Ş., Z.Ş.B., Analysis or Interpretation: E.B.D., B.Ş., Z.Ş.B., Literature Search: E.B.D., B.Ş., Z.Ş.B., Writing: E.B.D., B.Ş., Z.Ş.B.

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