Received: 22 Mar 2024 | **Accepted:** 05 Aug 2024 **Genel Tıp Derg. Volume** 34/**Issue** 4 (August), 491-499
DOI: 10.54005/geneltip.1457311

ORIGINAL ARTICLE

Protective Factors, Stress and Anxiety Effects on the Resilience Levels of Healthcare Workers During COVID-19 Pandemic

Koruyucu Faktörler, Stres ve Anksiyetenin COVID-19 Pandemisi Sırasında Sağlık Çalışanlarının Psikolojik Dayanıklılık Düzeyleri Üzerindeki Etkileri

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How to cite ?

Türkdoğan Görgün C, Erbay E. Protective Factors, Stress and Anxiety Effects on the Resilience Levels of Healthcare Workers During COVID-19 Pandemic. Genel Tıp Derg. 2024;34(4):491-9.

ABSTRACT

Objective: This study investigated how protective factors, stress, and anxiety levels affected the resilience of healthcare workers (HCWs) during the COVID-19 pandemic. Specific aims included examining whether HCW resilience levels varied significantly according to demographic variables.
Methods: A total of 303 HCWs from two training and research hospitals completed the survey. The Protective Factors for Resilience Scale (PFRS), The Stress and Anxiety to Viral Epidemics–9 Items Scale, and Brief Resilience Scale were used as data collection tools. Confirmatory factor analysis, reliability analyses, construct validity analysis, discriminant validity analysis, structural equation modeling, t-test and ANOVA were conducted respectively.
Results: Only the impact of the individual sub-factor of PFRS on the resilience level of HCWs was positive and significant (b=.847, t= 8.670, p<.001); stress and anxiety levels of HCWs to viral epidemics on their resilience level were both insignificant (b= .039, t=-.468, p=.640; b= .095, t=1.073, p=.283). The resilience level of HCWs who were male (M=4.53, SD=.55), married (M=4.50, SD=.55), had high school graduates (M=4.87, SD=.27), had 31 years and above experience (M=5.00, SD=.00), had children (M=4.54, SD=. 53), and exercised 2-3 days a week (M=4.54, SD=.46) had significantly higher levels of resilience.
Conclusion: This study pointed out that individual protective factors (such as healthy skills and abilities) positively affect the resilience of HCWs and play a crucial for the mental health of HCWs. HCWs who were male, married, low educated, more experienced, had children and doing sports 2-3 days a week had significantly higher resilience.

Keywords: Resilience, Stress, Anxiety, Protective Factors, Healthcare Workers, Pandemics

ÖZ

Amaç: Bu çalışma, koruyucu faktörlerin, stres ve kaygı düzeylerinin COVID-19 salgını boyunca sağlık çalışanlarının psikolojik dayanıklılık düzeylerini nasıl etkilediğini araştırmıştır. Özel amaçlar arasında, sağlık çalışanlarının psikolojik dayanıklılıklarının demografik değişkenlere göre anlamlı farklılık gösterip göstermediğinin incelenmesi de yer almaktadır.
Gereç ve Yöntem: İki eğitim ve araştırma hastanesinden toplam 303 sağlık çalışanı anketi tamamlamıştır. Veri toplama araçları olarak Psikolojik Dayanıklılık için Koruyucu Faktörler Ölçeği, Viral Salgınlara Karşı Stres ve Kaygı Ölçeği ve Kısa Dayanıklılık Ölçeği kullanılmıştır. Sırasıyla doğrulayıcı faktör analizi, güvenilirlik analizleri, yapı geçerliliği analizi, ayırıcı geçerlilik analizi, yapısal eşitlik modellemesi, t-testi ve ANOVA yapılmıştır.
Bulgular: Psikolojik Dayanıklılık için Koruyucu Faktörler Ölçeği'nin sadece Bireysel alt faktörünün sağlık çalışanlarının psikolojik dayanıklılık düzeyi üzerindeki etkisi pozitif ve anlamlıdır (b=.847, t= 8.670, p<.001); sağlık çalışanlarının viral salgınlara karşı stres ve kaygı düzeylerinin psikolojik dayanıklılık düzeyleri üzerindeki etkisi ise anlamsız bulunmuştur (b= .039, t=-.468, p=.640; b= .095, t=1.073, p=.283). Erkek (M=4.53, SD=.55), evli (M=4.50, SD=.55), lise mezunu (M=4.87, SD=.27), 31 yıl ve üzeri deneyime sahip (M=5.00, SD=.00), çocuk sahibi (M=4.54, SD=. 53) ve haftada 2-3 gün egzersiz yapan (M=4.54, SD=.46) sağlık çalışanlarının dayanıklılık düzeyleri anlamlı derecede daha yüksek çıkmıştır.
Sonuç: Bu çalışma, bireysel koruyucu faktörlerin (sağlıklı beceriler ve yetenekler gibi) sağlık çalışanlarının psikolojik dayanıklılığını olumlu yönde etkilediğini ve sağlık çalışanlarının psikolojik sağlığı için önemli bir rol oynadığını göstermiştir. Erkek, evli, düşük eğitimli, daha deneyimli, çocuk sahibi ve haftada 2-3 gün spor yapan sağlık çalışanlarının psikolojik dayanıklılıkları ise anlamlı düzeyde daha yüksektir.

Anahtar Kelimeler: Psikolojik dayanıklılık, Stres, Anksiyete, Koruyucu Faktörler, Sağlık Çalışanları, Pandemi

Introduction

Viral epidemics adversely affect people from different countries and socioeconomic groups. In addition to economic and physical challenges, people may experience fear of infection, social isolation, uncertainty and grief (1). According to a systematic review, most populations experienced relatively high rates of anxiety, stress, post-traumatic stress disorder, depression and psychological distress symptoms during the COVID-19 pandemic (2). Health care workers (HCWs) were also affected psychologically in ways similar to the rest of the population (3), and with their increased care workloads, they were among the most exposed to the impacts of the pandemic.

During the COVID-19 pandemic, HCWs had to maintain their psychological well-being while working actively. Working on the health front-line triggered anxiety and depression in HCWs, and the uncertain course of the virus, the increasing number of deaths, long working hours and fatigue became significant stressors for

Peer-Review: Double anonymized - Two External
Plagiarism Checks: Yes - intihal.net
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Selcuk University Press
Genel Tıp Dergisi | e-ISSN: 2602-3741
https://dergipark.org.tr/tr/pub/geneltip
https://yayinevi.selcuk.edu.tr/

HCWs (4). HCWs also had to manage the risk of virus exposure, increased workloads, changing practice environments, fear of bringing the virus to the home, and insufficient resting time (5). Thus, the challenges caused by the COVID-19 pandemic highlight the vital need to better understand the dynamics of resilience among HCWs.

Psychological resilience has various definitions from different perspectives, including 'the process of and capacity for successful adaptation despite challenging or threatening circumstances' (6), 'the personal qualities that enable one to thrive in the face of adversity'(7), 'a dynamic process encompassing positive adaptation within the context of significant adversity' (8) and 'protective factors which modify, improve or alter a person's response to some environmental hazard that predisposes to a maladaptive outcome' (9) — which share a core idea of being able to cope with a crisis both cognitively and emotionally.

Resilience served as a protective factor against the negative impacts of COVID-19 on the mental health of HCWs, such as incapacitating levels of depression, anxiety and stress (10). Social support and spirituality are crucial coping factors that increase resilience. Previous research has suggested HCWs' resilience is influenced by factors such as age, gender and profession, and better resilience is associated with better health status, self-care, and peer support (11). Understanding how HCWs cope with challenges such as pandemics and the factors that improve their resilience is crucial for developing effective support systems. The present study, thus, focuses on the relationship between HCWs resilience and the protective factors, stress and anxiety during the COVID-19 pandemic.

The aim of this study was to analyze the effect of protective factors (personal, family, peer dimensions) on the resilience of HCWs and their stress and anxiety levels to the viral epidemic on their resilience during the COVID-19 pandemic. The secondary objective of the study was to investigate whether there was a significant difference in the resilience level of HCWs according to the following variables: a) gender, b) age, c) working years, d) marital status, e) education level, f) occupation, g) having children, h) doing physical activity, and i) doing meditation and/or religious practices. Based on the study objectives and related literature, the following research questions were tested:

Q1 - Do protective factors for resilience a) individual, b) peer, and c) family have a positive and significant impact on the resilience levels of HCWs?

Q2 - Do the stress and anxiety levels of HCWs related to the viral epidemic a) subfactor 1-(F1) b) subfactor 2-(F2) have a negative and significant impact on the resilience levels of HCWs?

Q3 - Is there a significant difference in the resilience levels of HCWs according to their a) gender, b) age, c) working years, d) marital status, e) education level, f) occupation, g) children, h) physical activity and i) meditation and/or religious practice?

Materials and Methods

Study Model

This quantitative, one-sample, descriptive, and cross-sectional study was conducted in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Giresun University on 09.3.2022 (Decision No. E-50288587-050.01.04-80432) and informed consent was obtained from all participants included in the study.

Participants

The research population consisted of healthcare professionals serving in two hospitals, "The Training and Research Hospital" and "The Maternity and Children Training and Research Hospital". The research sample was formed using a simple random sampling method, and data were collected using face-to-face administered survey questionnaires between March 15 and May 20, 2022. The inclusion criteria for the participants to be included in the study were; being a healthcare professional, being over 18 years of age, and participate in the study voluntarily. After removing incomplete forms, 303 HCWs remained in the research sample. Although opinions on the ideal sample size vary, it is generally agreed upon that the rule of thumb should include ten participants for each research item (12-13). Based on the 30 research items, it was concluded that the sample size in this study was sufficient.

Data Collection Tools

The questionnaire constructed for the study first asked for demographic information: age, gender, marital status, education level, occupation, experience, children, physical activity (sports), and meditation/ prayer. Participants then completed the following scales:

• Protective Factors for Resilience Scale (PFRS): The original scale was developed by Harms, Pooley, & Cohen (14) and its Turkish validity and reliability study was reported by Tanko et al. (15). The scale consists of three 5-item dimensions (individual, peer and family dimensions) with a 7-point Likert response format. It has good fit values ($\chi 2/sd$= 1.99; $p < .001$; CFI= .98; NNFI = .97; SRMR = .053; RMSEA = .062) and a high alpha reliability coefficient (0.93).

• The Stress and Anxiety to Viral Epidemics–9 Items Scale (SAVE-9): This scale was originally developed by Chung et al. (16), and a Turkish validity and reliability study was also reported by Uzun et al. (17). The scale consists of 9 items and two dimensions in total, with six items (1, 2, 3, 4, 5, and 8) in the first dimension and 3 items (6,7,9) in the second dimension. A 5-point Likert response format was used. In the validity analysis, it was reported to have good fit values (TLI = 0.98, CF = 0.99, RMSEA = 0.04) and acceptable alpha internal consistency reliability (0.77).

• Brief Resilience Scale (BRS): The original scale was developed by Smith et al. (18) and its Turkish reliability validation study reported by Doğan T.(19) uses a 5-point Likert response format and consists of 6 items. Items 2, 4, and 6 were reverse coded. High scores indicate high psychological resilience. The internal consistency coefficient was high (0.83).

Data Analysis

IBM SPSS 26.0 and IBM SPSS Amos 22 were used for the analyses. First, descriptive statistics (frequency and percentage values) were used to determine the descriptive characteristics of the sample. For the normality test, the skewness and kurtosis values of the variables were examined, and it was observed that these values ranged from -1.848 to .611 for skewness, which were within the acceptable range of -+2 (20), and for kurtosis ranged from -.851 to 3.127, which were appropriate in range (21). It was concluded that parametric statistics could be used for the analyses. Confirmatory Factor Analysis (CFA) was used to assess the compatibility of the scales with the research data. The Cronbach Alpha and Composite Reliability were used for construct reliability. Construct validity was measured using both convergent validity (AVE values) and discriminant validity (Fornell-Larcker Criterion). Finally, path analysis, t-test, and ANOVA (Tukey and Dunnett's T3 for the Post-Hoc analyses) were conducted. A significance level of $p < 0.05$ was considered statistically significant.

Results

The demographic characteristics of the participants are presented in Table 1. According to the results, most of them were female (67%), aged between 18 and 30 (58%), single (60%), had a bachelor's or higher degree (64%), and the majority of them were nurses (42%) and had experience between 1 and 10 years (77%).

CFA was used to evaluate the study model, and assessing goodness-of-fit indices is the first step in CFA (22). In the CFA analysis, because of low loadings (< 0.50, Hair et al. (23)), item 6 from the PFRS, item 6 from the SAVE-9, and items 3 and 4 from the BRS were omitted. The obtained model fit indices were as follows: $\chi2(279) = 762.702$ ($p<0.001$), $\chi2/df = 2.605$, RMSEA=0.073 ($p<0.05$), CFI=0.904, TLI=0.889, SRMR=0.060 and these values are within the recommended values (20, 22, 24). On the basis of these results, it is possible to conclude that CFA met the goodness-of-fit criterion.

Construct reliability assessment determines how well a variable or combination of variables measures what is supposed to be measured (25). To assess the construct reliability of the model, Cronbach's Alpha and Composite Reliability (CR) were calculated. Both Cronbach's Alpha values, which ranged from 0.745 to 0.907, and CR values between 0.767 and 0.904 were over the 0.70 limit (26). As a result, the construct reliability for each research construct was obtained (Table 2).

Construct validity assesses how effectively the items selected for the construct measure the construct. Construct validity is determined by two types of validities: convergent and discriminant. Convergent validity is the extent to which many measures of a concept that need to be connected in theory are related in practice (27). By doing so, the multiple-item structures are guaranteed to be unidimensional, and any unreliable indications are removed (28). Average Variance Extracted (AVE) was used to evaluate convergent validity. Because the relevant latent variable accounts for over half of the variance in belonging indicators, an AVE greater than 0.50 offers empirical support for convergent validity (29). Each construct of the model has AVE values higher than 0.50, indicating appropriate convergent validity (Table 2).

Table 1. Characteristics of the participants

Variables (n=303)	Frequency (n)	Percentage (%)
Gender		
Female	204	67.3%
Male	99	32.7%
Age		
18-30	175	57.8 %
31-40	88	29 %
41-50	34	11.2 %
51 and above	6	2 %
Marital Status		
Single	181	59.7 %
Married	122	40.3 %
Education level		
High school	30	10 %
Undergraduate	78	25.7 %
Bachelor's degree	157	51.8 %
Post-graduate	38	12.5 %
Profession		
Doctor	24	8 %
Nurse	127	41.9 %
Other medical staff	84	27.7 %
Administrative staff	68	22.4 %
Work experience		
1-10 years	233	76.9 %
11-20 years	49	16.2 %
21-30 years	16	5.3 %
31 years and above	5	1.6 %
Having child/children?		
Yes	114	37.6 %
No	189	62.4 %
Physical activity (sports)?		
Every day	22	7.3 %
2-3 days a week	88	29 %
1 day a week	79	26.1 %
Never	114	37.6 %
Meditate/pray?		
Yes	215	71 %
No	88	29 %

Discriminant validity, also known as divergent validity, describes how different measurements differ from one another even if they do not exhibit strong correlation. The degree to which a particular construct varies from other constructs is indicated by discriminant validity (30). It was suggested that the square root of each latent variable's (LV) of the AVE should be larger than its correlations with all other LVs in the analysis (31). Thus, the factors of the study demonstrated acceptable discriminant validity (Table 2).

Table 2. Reliability, Convergent and Discriminant Validity

Constructs	Cronbach's Alpha	CR	AVE	PFRS-F1	PFRS-F2	PFRS-F3	SAVE-F1	SAVE-F2	BRS
PFRS-F1	0.846	0.862	0.557	0.746					
PFRS-F2	0.874	0.880	0.647	0.541	0.804				
PFRS-F3	0.877	0.877	0.589	0.492	0.551	0.767			
SAVE-F1	0.907	0.904	0.655	0.132	0.111	-0.088	0.809		
SAVE-F2	0.745	0.767	0.527	0.053	-0.006	-0.202	0.704	0.726	
BRS	0.843	0.848	0.583	0.746	0.297	0.256	0.135	0.131	0.764

Note: Square roots of the AVE are indicated on the diagonal in bold. correlations below the diagonal.
PFRS: Protective Factors for Resilience Scale (F1: Individual, F2: Peer, F3: Family), SAVE: Stress and Anxiety to Viral Epidemics Scale (F1: Subfactor-1, F2: Subfactor-2), BRS: Brief Resilience Scale, CR: Composite Reliability, AVE: Average Variance Extracted.

In the path analysis, the impacts of each sub-factor of Protective Factors for Resilience and Stress and Anxiety levels of HCWs in response to viral epidemics on their resilience level were analyzed (Table 3). According to the results, only the impact of the Individual sub-factor of Protective Factors for Resilience on the resilience level of HCWs was positive and significant (b=.847, t= 8.670, p<.001), supporting Q1a. Other sub-factors of Protective Factors for Resilience on the resilience level of HCWs were both negative and insignificant (b=-.110, t=-1.560, p=.119; b=-.084, t=-1.193, p=.233); hence, Q1b and Q1c were not supported. All sub-factors of stress and anxiety levels of HCWs to viral epidemics on their resilience level were negative and positive but both insignificant (b= .039, t=-.468, p=.640; b= .095, t=1.073, p=.283); thus, Q2a and Q2b were not supported.

Table 3. Path Analysis Results

Hypothesized Relationship	Standardized Estimates	t-values	p-values	Decision
PFRS-F1-> BRS	.847	8.670	.000*	Q1a: Accepted
PFRS-F2-> BRS	-.110	-1.560	.119	Q1b: Rejected
PFRS-F3-> BRS	-.084	-1.193	.233	Q1c: Rejected
SAVE-F1-> BRS	-.039	-.468	.640	Q2a: Rejected
SAVE-F2-> BRS	.095	1.073	.283	Q2b: Rejected

R2= 0.58, **p<0.001*
PFRS: Protective Factors for Resilience Scale (F1: Individual, F2: Peer, F3: Family), SAVE: Stress and Anxiety to Viral Epidemics Scale (F1: Subfactor-1, F2: Subfactor-2), BRS: Brief Resilience Scale

An independent sample t-test was performed to compare the resilience levels of HCWs according to gender (Table 4). There were significant differences (t(223.586)=-3.285, p=.001) in the scores, with the mean score for males (M=4.53, SD=.55) being higher than for females (M=4.29, SD=0.65); thus, Q3a was supported. In the second analysis, the resilience levels of HCWs differed significantly according to age (F3, 299 =5.396, p<.01). For the Post-Hoc test, Tukey's test was conducted as the variances were assumed to have been equally distributed, and the results showed that the mean score of 18-30 years (M=4.25, SD=.65) was significantly different from 31-40 years (M=4.49, SD=.59) and 41-50 years (M=4.56, SD=.48) at the p<.05 level. Therefore, Q3b was accepted. However, no significant differences were observed between 51 and 65 years and other groups. The resilience levels of HCWs differed significantly according to working years (F3, 299 =1.682, p< .05). For the Post-Hoc test, Dunnett's T3 test was conducted as the variances were not assumed to be equally distributed, and the results showed that the mean score of the age group of 31 and above (M=5.00, SD=.00) was significantly higher from 1 to 10 years (M=4.32, SD=.65), 11-20 years (M=4.56, SD=.45) and 21-30 years (M=4.25, SD=.58) at the p<.05 level. Therefore, H3c was accepted. The resilience level of HCWs differed significantly according to their marital status (t(286.524)=-3.116, p=.002). Married HCWs' resilience level (M=4.50, SD=.55) was higher than single HCWs (M=4.28, SD=.66); thus, Q3d was supported. According to the educational level of HCWs, their resilience level differed significantly (F3, 299 =10.441, p<.001). Dunnett's T3 test was used for the post-hoc test because equal variance was not assumed. The test indicated that the mean score of resilience for high school graduates (M=4.87, SD=.27) was significantly higher than undergraduate (M=4.42, SD=.56), bachelor's degree (M=4.22, SD=.65), and post-graduate (M=4.48, SD=.63) at the p<.05 level, therefore, Q3e was supported. The resilience level of HCWs did not significantly differ according to profession (F3, 299 =1.682, p=.171), thus, Q3f was not supported.

The resilience levels of HCWs according to having children and not having children had a significant difference (t(276.403)=3.944, p=.000), and HCWs who had children (M=4.54, SD=.53) had significantly higher resilience levels than those who had no children (M=4.26, SD=0.66); consequently, Q3g was supported. According to doing physical activity (sports) and not doing it, the HCWs' resilience level differed significantly (F3, 299 =5.388, p<.01). Dunnett's T3 test was used for the post-hoc test because equal variance was not assumed. The test indicated that those who did sports 2-3 days a week (M=4.54, SD=.46) had significantly higher resilience levels than those who did not do (M=4.21, SD=.72); thus, Q3h was supported. The resilience level of HCWs did not significantly differ according to doing meditation/praying (t(301)=.387, p=.699); so Q3i was not supported.

Table 4. Comparison of groups of participants on mean scores of the resilience level of HCWs

		Mean	SD	t/F	df	Sig.
Gender	Female	4.29	.65	-3.285	223.586	.001
	Male	4.53	.55			
Age	18-30*	4.25	.65	5.396		
	31-40*	4.49	.59			
41-50* 4.56 .48					3 299	.001
	51-65	4.83	.41			
Marital Status	Single	4.28	.66	-3.116	286.524	.002
	Married	4.50	.55			
Educational Level	High school*	4.87	.27	10.441	3 299	.000
	Undergraduate*	4.42	.56			
	Bachelor's deg.*	4.22	.65			
	Post-graduate*	4.48	.63			
Profession	Doctor	4.34	.71	1.682	3 299	.171
	Nurse	4.28	.64			
	Other medical staff	4.47	.51			
	Administrative staff	4.42	.68			
Work experience	1-10 years*	4.32	.65	3.867	3 299	.010
	11-20 years*	4.56	.45			
	21-30 years*	4.25	.58			
	31 and above*	5.00	.00			
Having children?	Yes	4.54	.53	3.944	276.403	.000
	No	4.26	.66			
Physical activity (sports)?	Each day	4.52	.49	5.388	3 299	.001
	2-3 days a week*	4.54	.46			
	1 day a week	4.37	.63			
	Never*	4.21	.72			
Meditate/pray?	Yes	4.38	.63	.387	301	.699
	No	4.34	.62			

T-test and ANOVA were performed. Tukey and Dunnett's T3 tests were used for post-hoc analyses.

Discussion

In this section, the research questions and their results are analyzed.

The relationship between protective factors and HCWs resilience

In this study, different dimensions of psychological resilience -individual, peers and family- were analyzed, and a positive and significant impact of HCWs' individual resilience was determined. Individual protective factors for resilience, such as healthy skills and abilities, can influence resilience level (32) and play crucial roles in promoting the well-being and mental health of HCWs. Therefore, HCWs with higher levels of individual resilience may handle stressors and challenges in their work environment (33). Higher resilience levels among HCWs are partially mediated by individual resilience. Individual resilience prevents the negative impact of stress on mental symptoms. Moreover, it decreased anxiety symptoms, especially among individuals experiencing higher levels of stress related to COVID-19 (34).

Relationship between HCWs stress and anxiety levels and resilience levels

The current study investigated the impact of stress and anxiety levels on HCW resilience during COVID-19. Despite the initial research question positing a negative, significant impact, the findings indicated that the relationships between stress, anxiety and resilience were both negative and positive but were statistically insignificant. In addition, there was no significant difference in the resilience levels of HCWs who were infected with COVID-19 and those who worked in a COVID-19 department. Several studies have consistently highlighted the negative correlation between psychological resilience and various stressors such as depression, anxiety, and COVID-19-related stress (5, 10). Higher resilience levels appeared to be associated with more positive stress responses, enhanced well-being, and reduced risk of burnout and distress, particularly during the COVID-19 pandemic (35). The literature highlighted the importance of resilience in mediating the effects of stress and anxiety on the mental health and quality of life of HCWs. Therefore, higher psychological resilience was associated with fewer mental disorders and better coping mechanisms among HCWs (36). Resilience not only plays a vital role in mediating the effects of stress and anxiety but also plays a crucial role in coping with the harmful effects of epidemic outbreaks (37). Previous studies have found that frontline HCWs experienced higher stress levels during the COVID-19 pandemic (38), and anxiety and fear of infection were negatively correlated with HCWs' resilience (39). While some studies have emphasized resilience as a protective factor against psychological stress and emotional exhaustion (10), others have underlined the role of specific resilience factors, such as perception of the future and self-perception, in influencing stress and anxiety levels (40). However, the present findings did not replicate this trend. There are also studies reporting insignificant relationships between resilience and anxiety, or COVID-19-related stress, and resilience (41). A possible explanation for this might be that the extreme, widespread, and complex nature of the pandemic and its effects on healthcare settings and staff may have weakened the observed relationships between stress, anxiety and resilience.

The difference in the resilience levels of HCWs according to their a) gender, b) age, c) working years, d) marital status, e) education level, f) occupation, g) children, h) physical activity, i) meditation and/or religious practice.

The difference between demographic variables in terms of resilience scores was analyzed, and for gender, it was found that male HCWs were more resilient. In contrast, some studies (42, 43) found that female HCWs were more resilient. It has also been

stated that women with higher educational levels or more work experience were more resilient (42). Other studies have found that females are more likely to report mental health problems and discomfort (40, 44). On the other hand, some studies (45, 46) did not find statistically significant differences in resilience scores according to gender. A previous study has pointed out that this relationship may not be applicable in all situations (45). Thus, further research is required to investigate the relationships among additional variables to better understand the differences in resilience between genders among HCWs.

In the current study, high school graduates HCWs were more resilient than those with undergraduate, bachelor's and post-graduate degrees. This finding is contrary to previous studies that have suggested that HCWs with higher educational levels are more resilient (45-47). Higher resilience levels among high school graduates may be attributed to the fact that the majority of high school graduates are administrative staff. Administrative staff or HCWs with managerial duties have previously been found to report lower resilience levels (48).

The findings also revealed a significant difference in resilience levels among the age groups. HCWs with 31 years or more of work experience had higher resilience scores than those with 1–10, 11–20, and 21–30 years of work experience. A comparison of the findings with those of other studies confirmed a positive correlation between older age and higher resilience levels (11, 34, 39, 45-49). A positive correlation was reported between longer working years in the profession and institution and better resilience scores (45). It seems that length of working experience emerges as a potential influencing factor, and older HCWs exposed to a wide range of difficult circumstances may become more resilient (46). However, some research found that there was no significant relationship between resilience levels and years of employment (35, 48). The relationship between resilience and experience can be moderated by personality characteristics, coping techniques and organizational support.

This study also found that married HCWs were more resilient on average. Contrary to previous findings in the literature, no statistically significant correlation was found between resilience scores and marital status (45, 46). Cultural and social factors may influence the relationship between resilience and marital status. Furthermore, resilience among HCWs was significantly related to parenthood. The results revealed that HCWs with children reported higher resilience levels. This result corresponds to a study finding that having children is positively correlated with higher resilience levels (34). Being a parent can provide a sense of drive and purpose that may contribute to resilience. HCWs with children may experience an additional level of stress because of their children's concerns about their parents' health and safety during difficult circumstances such as the pandemic. However, the responsibility of raising and protecting their children may serve as a powerful source of motivation for HCWs, helping them overcome subsequent challenges. HCWs may be motivated to increase their resilience against fear-induced stress.

Contrary to expectations, this study did not find a significant difference between the resilience scores of HCWs based on professional affiliation. It was pointed out that healthcare professionals differ in many ways and that clinical professionals, on average, report lower resilience levels than administrative staff and those with managerial duties (48). Nurses may report elevated levels of anxiety, sadness and PTSD symptoms, especially in difficult circumstances (11, 49, 50). Another study found that nurses report lower average resilience levels than physicians and ambulance technicians (51). It was found that doctors and nurses reported higher resilience levels than other medical professionals, such as paramedics and laboratory personnel (43). The significance of expertise and the possibility that through their extensive and varied training experiences physicians were more resilient than healthcare assistants and rehabilitation specialists (39). There was also a substantial difference in average levels of resilience among nurses compared with respiratory therapists, healthcare technologists and anesthetists. Thus, resilience in the healthcare workforce can be a complex and multidimensional concept. Distinct resilience traits may be advantageous for different professional affiliations (52). Such differences can be attributed to the diverse demands, stressors, obligations and technical skills associated with different healthcare professions. It is important to acknowledge that the present study may have some limitations because it examined several healthcare professions and may have overlooked differences within particular roles.

Another factor that may contribute to higher average resilience levels among HCWs is participating in sporting activities. HCWs who engaged consistently in sports were found to have higher average resilience levels, which is consistent with previous research reporting a beneficial relationship between resilience and sports involvement (53, 54). Studies in various contexts have highlighted the potential protective function of exercise against anxiety (54, 55). Our results support this finding, namely, that HCWs who practiced sports for two or more days a week demonstrated much higher average resilience levels than those who never played sports.

The results of the current study did not reveal any significant difference between the resilience levels of HCWs according to their meditation or praying habits. This outcome is not consistent with earlier studies' findings that so-called distraction coping activities, such as meditation, have a beneficial effect on the coping strategies used by HCWs (6, 35, 56, 57). Self-care strategies, such as such as mindfulness, gratitude, and kindness, have been identified as crucial elements in mitigating the negative effects of stress and promoting resilience (38). The literature supports the notion that mindfulness contributes to resilience (57). Although our study did not find a significant difference in resilience

levels based on whether or not participants reported meditation/praying practices, this question may well have failed to capture the multifaceted nature of spirituality.

Results

The main purpose of the current study was to examine how resilience protective factors, stress, and anxiety levels are related to HCW resilience during the COVID-19 pandemic. The findings revealed that individual resilience protective factors were associated with higher resilience levels among HCWs. The secondary aim of the study was to determine whether resilience levels among HCWs differed according to demographic variables, parental status, doing sports, meditation, and/or religious practices. The results suggest that having more experience and engaging in sports positively impact resilience levels. These results add to the rapidly expanding field of exploring resilience among HCWs.

This study offered valuable insights into relevant issues, such as the impact of protective factors on HCW resilience during the COVID-19 pandemic. In addition, comprehensive demographic variables such as gender, marital status, parental status, education level, experience and physical activity enriched the study by providing a better understanding of HCW resilience levels.

Limitations & Recommendations

There are some limitations in this study that need to be recognized. The small sample that contains 303 HCWs, which might make it a non-representative sample, relies on self-report questionnaires, which can introduce response biases, and the cross-sectional design of the study limits the ability to draw causal inferences about the relationships between protective factors, stress, anxiety, and resilience, cultural context and unexamined variables such as organizational support, which may affect generalizability. Finally, the study did not account for all possible variables that may influence resilience.

Despite attempts to ensure sample diversity, the findings may not be widely applicable. In this study, nurses were the dominant group in the sample. It would be beneficial to conduct future research with a larger, more diversed sample to validate and expand on these results. Additionally, the study was conducted within a specific geographical region and cultural context; thus, the findings may not be applicable to other settings or populations with different cultural norms or socio-economic backgrounds. Future research should aim to reproduce these findings in diverse contexts to enhance the external validity of the results. Finally, the cross-sectional design of the study limits our ability to establish causal relationships between variables. Longitudinal or experimental designs are necessary to explore the temporal relationships and causal mechanisms underlying the observed associations.

Based on the findings of this study, several recommendations can be made to enhance HCWs' resilience in future crises. Institutions should invest in stress management, problem-solving, and adaptive coping strategies. Encouraging physical activity through fitness facilities and group exercises is crucial for HCWs. Tailored support programs should address demographic factors such as gender, marital status, education level, and years of experience, and tailored support programs should be developed to offer additional support to individuals at greater risk. Family support programs and workplace physical well-being promotion can further increase resilience among HCWs.

Ethical Approval: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Giresun University on 09.3.2022 with decision number E-50288587-050.01.04-80432.

Conflict of Interest: The authors report there are no competing interests to declare.

Peer-review: Externally peer-reviewed.

Acknowledgment

The authors would like to thank Prof. Jim McLennan for his careful language editing the full article and to Asst. Prof. İlknur Koçak Şen for her help in data collection.

Author Contributions: Conceptualization: CTG; Methodology: CTG; Formal analysis and investigation: CTG; Writing - original draft preparation: EE and CTG; Writing - review and editing: EE and CTG.

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