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Frontline Nurses' Stress, Sleep Quality, and Temperament During the COVID-19 Pandemic: An Intervention Study using Resilience Training and Comics Programs

Yasaman Hosseini[1*], Amir Modarresi Chahardehi[1,2], Fatemeh Hosseini[3], Mahboobeh Afzali[4]

[1] Cognitive Neuroscience Research Center, AJA University of Medical Science, Tehran, Iran
[2] Kimia Andisheh Teb Medical and Molecular Laboratory Research Co., Tehran, Iran
[3] Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran
[4] Emergency Medical Department, Paramedical Faculty, AJA University of Medical Science, Tehran, Iran

Yasaman Hosseini
Ph.D of Neuroscience

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Abstract

Introduction: There are rising worries regarding stress among frontline nurses during COVID-19 worldwide, especially in Iran. The purpose of this study, first, is to assess stress and other physiological indicators of stress. Then, we investigated the effect of cognitive intervention on the stress level of frontline nurses.

Methods: In this study, we assessed stress, depression, anxiety, temperament, PSQI, and salivary cortisol levels among 120 voluntary nurses in a military hospital in Tehran, Iran, during COVID-19 (Wave V) using a cognitive intervention, stress level changes were investigated in the following.

Results: Surprisingly, on the first and 28th day, most participants reported stress and anxiety at a normal level in ($p > 0.05$). There was a significant difference between the control and intervention groups regarding the salivary cortisol level ($p < 0.0001$) and the severity of depression in DASS-21 ($p = 0.0196$) on the 28th day. More than eighty percent of nurses reported poor sleep quality. In the general temperament, most participants showed a warm and temperate temperament, while in the brain temperament, the majority exhibited a warm and dry.

1. Introduction

As the coronavirus infection (COVID-19) pandemic spreads, worldwide healthcare organizations have become overburdened, placing significant psychological strain on nurses caring for ill COVID-19 patients [1]. One study found that about one-third of nurses suffered depression, anxiety, or stress during the COVID-19 pandemic [2]. Another study found that 10.7 to 42.8 percent of nurses had psychological problems (depression and anxiety) [3]. Workplace stress has been linked to an increase in medical mistakes and a decrease in the quality of healthcare services [4-6]. Nurses play a critical role among all healthcare workers (HCWs) when related to patient care. They are in a somewhat stressful environment due to their high perceived infectability and germ aversion [4-6] and lack of resources, such as protective equipment and the nature of their work [7]. Hence, improving the mental health of nurses is crucial in the COVID-19 setting [8]. The pandemic affects HCWs psychologically. Stress may be avoided with precautions, good behavior, and positive reinforcement [7]. One study found that about one-third of nurses suffered depression, anxiety, or stress during the COVID-19 pandemic [2]. According to another study, 10.7 to 42.8 percent of nurses had psychological problems (depression and anxiety) [3]. Lovibond created the Depression, Anxiety, and Stress Scale 21 (DASS-21) in 1995 to measure stress, anxiety, and depression [9]. Cortisol levels are also a significant indicator of physiological stress [10], released from the hypothalamus-pituitary-adrenal axis [11, 12].

When psychological stress is prolonged and sleep-wake cycles are interrupted, the adrenal glands generate excessive cortisol in an aberrant pattern [13]. Hence, the body's homeostasis is disrupted, and people's activity and health levels are decreased [14]. Numerous studies were conducted during the COVID-19 pandemic to examine nurses' psychological health in isolation wards [15]. The Pittsburg Sleep Quality Index (PSQI) is a widely used self-reported sleep questionnaire verified in healthy individuals and people with mental health conditions [16]. Zou et al. (2020) found that poor sleep quality was surprisingly low among frontline nurses during the COVID-19 pandemic in China [17]. However, poor sleep is a severe issue for frontline nurses working in Oman during the COVID-19 outbreak [18]. We aimed to determine nurses' quality of sleep during this pandemic.

Temperament (Mizaj) is critical to Iranian Traditional Medicine's preventative, therapeutic, and lifestyle advice [19]. It is a set of physical and mental qualities defined by considering past and present symptoms [20]. Each individual has a unique level of two qualities: warm or cold in the warmness-coldness temperament and wet or dry in the wetness-dryness temperament [21]. Mojahedi's Mizaj Questionnaire (MMQ) identification relies heavily on psychic function and the other earlier indicators [22]. As a two-dimensional spectrum, temperament is shown as a range of temperatures from warmness to coldness and wetness to dryness [23]. In the principles of temperament, warmth is a quality that creates movement and vitality. These people are livelier and more extroverted, and the rate and speed of their movements and words are high. Cold-tempered people are less active, slower, more introverted, and calmer. Dry-tempered people also have thin bodies, robust skeletons, dry, wrinkled skin, and unchangeable firm beliefs. People with a wet temperament are usually fat, have a soft bodies, have a flexible spirits, and can tolerate hardships and encounters well [20]. Each individual is predisposed to particular diseases associated with his or her temperament [24]. We hypothesize a connection between the kind of temperament and stress levels. However, no study was performed in this field.

Cognitive-behavioral therapy (CBT) effectively reduces depression and anxiety in employees [25]. CBT in a group setting provides a therapeutic advantage not found in other settings [26]. For example, nurses in the United States reported lower levels of work-related stress following completing a web-based stress management program that included cognitive-behavioral approaches [27]. This study aims to determine the level of stress in frontline nurses coping with COVID-19, to provide a solution to reduce their stress and improve their physiological health and function, and to determine if there is a correlation between their temperament and stress levels. Hence, the present study, used the DASS-21 questionnaire, salivary cortisol level, PSQI, and the MMQ test as physiological stress indicators among frontline nurses.

2. Materials and methods

2.1. Study design

A four-week cross-sectional study was performed from July to August 2021 among frontline nurses at one of the military hospitals in Tehran, Iran, during COVID -19 (Wave V). All participants were interviewed and received oral study information before enrollment. They were provided with written consent and underwent a comprehensive medical examination. Following that, the web survey link was distributed among them. Each member followed their commitments in terms of lifestyle and family norms. The research included this component since it may influence stress response. The inclusion criteria were voluntary; only women aged 25 to 50 who did not attend the other training sessions were tested; also, they were not in their menstrual cycle's late luteal phase (days 21–25). The exclusion criteria were: compulsory attendance at all training sessions (no absence was allowed), night shift, dual shift, pregnancy, having surgery in the last six months, COVID-19 infection during the last three months, family or social problems, and neurological and psychological disease.

2.2 Participants

This study included two groups of nurses (120), a control group and an educational intervention group. All participants received a $5 gift card. The volunteers completed the DASS-21 (1st and 28th days), PSQI (28th day), and MMQ questionnaires (28th day). All outcomes were assessed at baseline using an online-based self-administrated survey questionnaire. Also, salivary cortisol levels were assessed on the first and last day of the study. During these four weeks, resilience training was performed three times daily (after breakfast, lunch, and before bed) for one minute. Also, comic programs were made available online every night for one hour. Fig. 1 depicts the schematic design for our study.

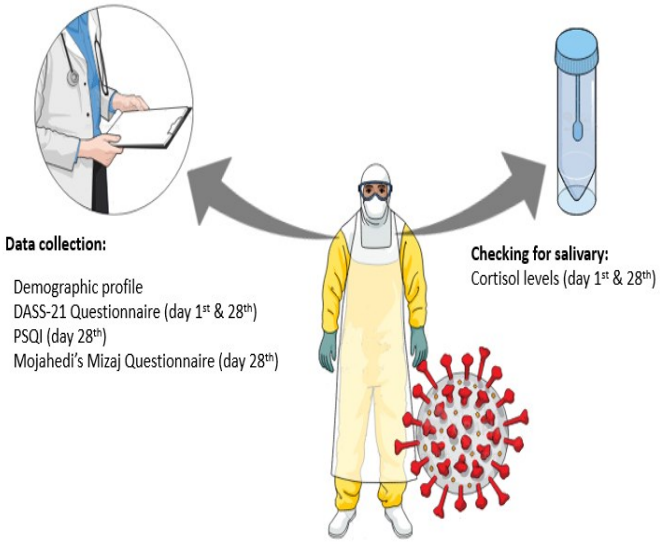

Fig. 1. Schematic design of the study for collecting data

The study protocol was approved by the ethics committee of AJA Medical University with the ethics code: IR.AJAUMS.REC.1400.103. We carried out the study following the Helsinki Declaration's standards from 1964. As an initial text to the survey, written information about the study was provided, emphasizing voluntariness and ensuring anonymity.

2.3. Outcome measures

2.3.1. DASS-21

Anxiety and depression symptoms were the primary outcomes of this RCT. Depression and anxiety were measured using the brief 21-item DASS (Depression Anxiety and Stress Scales), with seven items in each subscale for depression and seven for anxiety [28]. The depression subscale (DASS21-D) has cut-off values ranging from normal (0 to 9), mild (10 to 13), moderate (14 to 20), severe (21 to 27), and extremely severe (28 or more). The anxiety subscale (DASS21-A) has cut-off values ranging from normal (0 to 7), mild (8 to 9), moderate (10 to 14), severe (15 to 19), and extremely severe (20 or more) [8]. The total subscale score of stress was also divided into five categories: normal (0-14), mild (15-18), moderate (19-25), severe (26-33), and extremely severe (34-42) [29].

2.3.2 PSQI

The overall score for the PSQI is between 0 and 21 [17]. A PSQI score of 5 or more represents poor sleep quality [30].

2.3.3 Mojahedi's Mizaj Questionnaire (MMQ)

Participants completed the self-reported MMQ as part of the data collection process. The MMQ included general and brain Mizaj (temperament) questionnaires, comprising 10 and 14 questions, respectively [19]. In the general temperament questionnaires the first eight criteria are used to determine the hotness-coldness of temperament, with values ranging from 8 to 24, while the last two items are used to determine the dryness-wetness of temperament, with values ranging from 2 to 6 (hot ≥ 19, 15-18 as a moderate mode, and cold ≤ 14 on the hot/cold subscale, respectively, and dry ≥ 5, 4 as a moderate mode, and wet ≤ 3 on the wet/dry subscale) [19]. If someone is identified as moderate, it cannot be assessed based on the analysis of this study. The first seven questions' scale results in the brain temperament are categorized as "warm" or "cold." The second seven-question result is classed as "dry" or "wet," depending on the answers [19]. It is the first and most trustworthy and verified questionnaire with a Cronbach's alpha coefficient of 0.77–0.80 [31]

2.3.4 Salivary sampling

On the first and last days of the study (1st and 28th days), salivary samples were taken at 8 to 10 a.m. A trained technician called each participant 30 minutes before the saliva sample collection. Prior to collecting saliva samples, participants were instructed to refrain from eating, smoking, or brushing their teeth for 60 minutes [32]. Samples were kept on ice after collection before being transferred to -20°C for analysis. At the laboratory, samples were centrifuged at 2000 rpm for 10 min at 4°C [33]. The clear supernatant was separated and evaluated for cortisol levels using the Elisa immunoassay with a commercial kit, Salivette (ZellBio GmbH, Germany).

2.5 Statistical analysis

The data were quantified using means, frequencies, and standard deviations (SDs). The collected data were analyzed by GraphPad Prism version 8.3. The MMQ cutoff points were used to calculate the sensitive

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-ty and specificity of the questionnaire to assess its validity among our participants. Poor sleep quality was a dependent variable. The *t*-test was utilized to check whether the group differed in PSQI and cortisol levels. The DASS-21 score was provided as mean ± SD and numbers and proportions. Also, the total DASS-21 score was compared with cortisol levels in both groups using linear regression. The level of significance was set at $p < 0.05$. Using the questionnaire, the non-parametric chi-square coefficient ($\chi 2$) was used to compare the two single temperament statuses in the intervention and control groups. We analyzed Cohen's d (alternations in both groups) to estimate effect size in PSQI.

3.Results

3.1. The research participants' demographic and employment characteristics

A total of 176 participants were invited to participate in the study, and 44 frontline nurses did not meet the inclusion criteria for our research. Among them, only 132 frontline nurses completed the questionnaires (DASS-21, PSQI, and MMQ) for the first session of the experiment. Twelve frontline nurses regretted or avoided completing their tasks for the second session. Thus, we adjusted the sample size to 120 eligible participants (see CONSORT flowchart in Fig. 2). Table 1 summarizes the population's demographic characteristics. The mean age of frontline nurses was 41.59 ± 9.19 years old. The average duty career as a frontline nurse was 19.32 ± 2.45 years. Also, the mean years of experience were 18.59 ± 9.19 years.

Most participants (92.00% and 90.00% for the control and intervention groups) were married. All participants had a university degree in the related field in terms of educational level. Based on years of experience most participants had 16 years of experience or above, with 74.00% and 71.43% for the control and intervention groups, respectively. Figure 2 shows the CONSORT flow chart of our study.

Table 1. Demographic profile of the participants (n = 120)

Indicator	Control (n = 50)	Intervention (n = 70)
	n (%)	n (%)
Gender		
Female	50 (100)	70 (100)
Male	-	-
Age (in years)		
20-25	0 (0)	0 (0)
26-30	9 (18.00)	13 (18.57)
31-35	2 (4.00)	4 (5.71)
36 and above	39 (78.00)	53 (75.71)
Marital Status		
Single	4 (8.00)	6 (8.57)
Married	46 (92.00)	63 (90)
Divorced	-	-
Education		
Diploma	-	-
University	50 (100.00)	70 (100.00)
Years of Experience		
1-5	9 (18.00)	13 (18.57)
6-10	2 (4.00)	4 (5.71)
11-15	2 (4.00)	3 (4.29)
16 and above	37 (74.00)	50 (71.43)

3.2. Sleep quality measurement

The mean PSQI total and component scores for the entire sample are displayed in Table 2, split into control and intervention groups for their sleep quality. The PSQI total score for the control and intervention groups were 9.63 ± 0.8 and 9.09 ± 1.04, respectively (p = 0.2973). A total of 120 frontline nurses were included in this study, of which 100 (83.33%) reported poor sleep quality (PSQI total scorer of ≥ 7). The hours of real sleep for the control and intervention groups were 6.31 and 6.41 h, respectively. Based on our findings, we found low sleep duration and quality in both control and intervention groups, and they were not significantly different on the first and last day.

We calculated the effect size for PSQI in this study. The effect sizes indicated that the alternations in both groups were comparable. The within-group effect size was moderate based on Cohen's d effect size (d = 0.59).

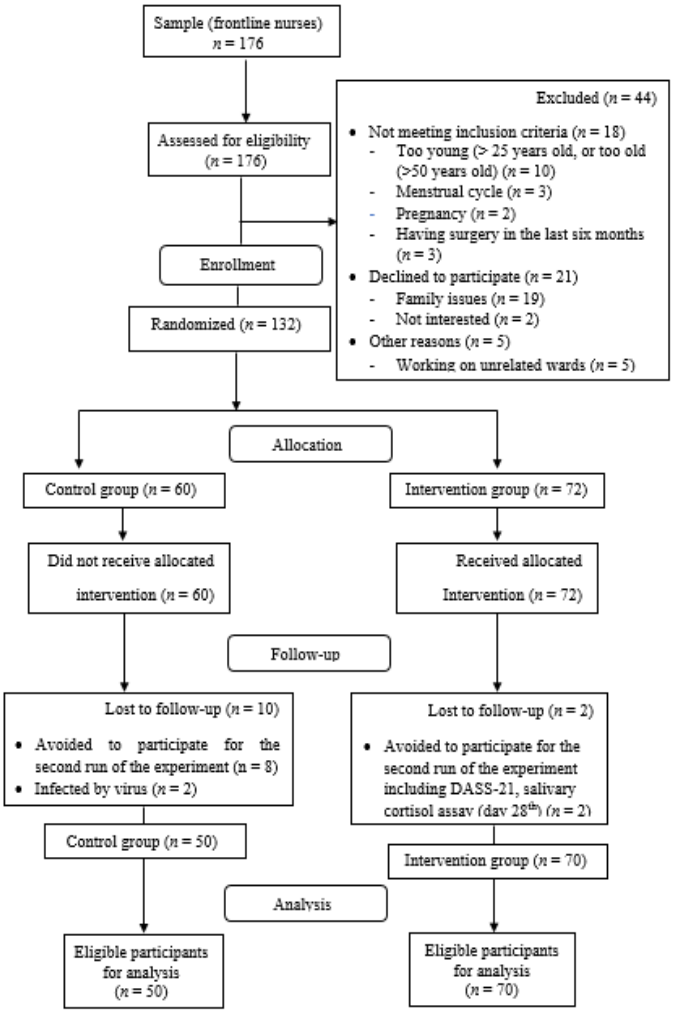

Fig. 2. CONSORT flow chart

3.3. Mojahedi's Mizaj Questionnaire (MMQ)

Table 3 shows the proportion of individuals with wet or dry and warm and cold temperament in the control and intervention groups in the general and brain categories. Among 120 nurses, most participants in the control and intervention groups were categorized in warm and dry temperament (for general and brain, respectively). However, according to the chi-squared test, in the general temperament, ($\chi2$ = 1.483, p = 0.2234), there was no significant difference between frontline nurses with warm and cold temperament in control and intervention groups. Also, based on the chi-square result in the brain temperament ($\chi2$ = 0.5936), there was no significant difference between the control and intervention groups in comparing warm and cold temperament (p = 0.05528). In the wet and dry classification, most individuals were classified as dry for the general (36.0% and 35.7%) and brain (84.0% and 97.1%) temperament, the control and intervention groups, respectively. Nevertheless, there was no significant difference between the control and intervention groups. Based on the chi-square results ($\chi2$ = 0.9423) in comparing wet or dry in the general category, there were no significant differences between control and intervention groups in comparing two particular temperament aspects (p = 0.3317). However, based on Table 3, most participants in the intervention group indicated dryness in their brain temperament (97.1%).

3.4. Stress, anxiety and depression measurement

According to DASS-21, we observed depression in 18 (15%), anxiety in 30 (25%), and stress in 2 (1.7%) of the research participants during the COVID-19 pandemic (Table 4). DASS-21's depression subscale had a mean score of 6.683 ± 4.937 and 3.423 ± 3.501 for the control and intervention groups, respectively. Seven (5.9%) of the 120 frontline nurses who tested positive for depression had only moderate depression in the control group without showing any severe and extremely severe. The anxiety subscale of the DASS-21 scored 5.346 ± 4.289 and 5.024 ± 4.053 for the control and intervention groups, respectively. Among 30 participants who screened positive for anxiety, 9 (7.5%) scored moderate to severe. The mean DASS-21 stress subscale scores were 7.439 ± 4.478 and 6.462 ± 4.022 for the control and intervention groups, respectively. Only two respondents who tested positive for stress were classified as having mild stress in the control group.

There was a significant difference between control and intervention groups in terms of the severity of depression (p = 0.0196), while no significant difference was found in anxiety and stress among control and intervention groups (p > 0.05; Table 2). However, for comparison between days 1 and 28, we used boxplot diagrams (Fig. 3). Boxplots 1A-D exhibit a solid and consistent statistical relationship between the depression, anxiety, and stress scores on the first and last days of the experiment.

The total DASS-21 score did not show significant differences between the control and intervention groups (p > 0.05).

Table 2. Pittsburgh Sleep Quality Index (PSQI) total and component scores in all participants

	Control group (n = 50) Mean ± SD	Intervention group (n = 70) Mean ± SD	p value	Cohen's d effect size
PSQI total score	9.63 (0.8)	9.09 (1.04)	0.2973	0.59
Subjective sleep quality	0.82 (0.77)	1.27 (0)	0.0856	
Sleep latency	1.21 (0.89)	0.91 (1.14)	0.3680	
Sleep duration	1.40 (1.12)	1 (0.77)	0.2852	
Sleep efficiency	3 (0)	3 (0)	-	
Sleep disturbance	1.24 (0.66)	1.33 (0)	0.2355	
Daytime dysfunction	1.12 (1.41)	0.64 (0.81)	0.2938	
Use of sleep medication	0.85 (0.75)	1.27 (0.65)	0.1028	

Values are presented as mean (SD). The p value is based on a t-test.

Table 3. Prevalence of control and intervention groups in two fields of warmness-coldness and Wetness-dryness of Mizaj.

Field of Mizaj	Mizaj (Temperament)	General				Brain			
		Control	Intervention	$\chi 2$	p value	Control	Intervention	$\chi 2$	p value
Warmness-coldness	Warm	24 (48.0)	33 (47.1)	1.483	0.2234	35 (70. 0)	44 (62.90)	0.5936	0.05528
	Temperate	20 (40.0)	21 (30.0)			4 (8.0)	8 (11.4)		
	Cold	6 (12.0)	16 (22.9)			11 (22.0)	18 (25.7)		
	Total	50 (41.7)	70 (100)			50 (100)	70 (100)		
Wetness-dryness	Dry	18 (36.0)	25 (35.7)	0.9423	0.3317	42 (84.0)	68 (97.1)	-	-
	Temperate	20 (40.0)	35 (50.0)			8 (12.0)	2 (2.9)		
	Wet	12 (24.0)	10 (14.3)			-	-		
	Total	50 (100)	70 (100)			50 (100)	70 (100)		

Values are expressed as n (%).

Table 4. DASS-21 results for several categories during COVID-19 (day 28th)

Grades of symptoms	Overall, *n* (%)	Groups		$\chi 2$	*p* value
		Control (*n* = 50)	Intervention (*n* = 70)		
Depression					
Normal	102 (85.0)	38 (76.0)	64 (94.4)	5.445	
Mild	11 (9.1)	5 (10.0)	6 (86)		
Moderate	7 (5.9)	7 (14.0)	-		0.0196*
Severe	-	-	-		
Extremely severe	-	-	-		
Anxiety					
Normal	90 (75.0)	35 (70.0)	55 (78.6)	2.414	
Mild	21 (17.5)	12 (24.0)	9 (12.8)		
Moderate	5 (4.2)	2 (4.0)	3 (4.3)		0.1203
Severe	4 (3.3)	1 (2.0)	3 (4.3)		
Extremely severe	-	-	-		
Stress					
Normal	118 (98.3)	48 (96.0)	70 (100.0)	2.847	
Mild	2 (1.7)	2 (4.0)	-		
Moderate	-	-	-		0.0915
Severe	-	-	-		
Extremely severe	-	-	-		

The chi-square test was used to measure the difference in severity of each distress between control and intervention groups.

$\chi 2$ chi-squared value

*Significant at $p < 0.05$

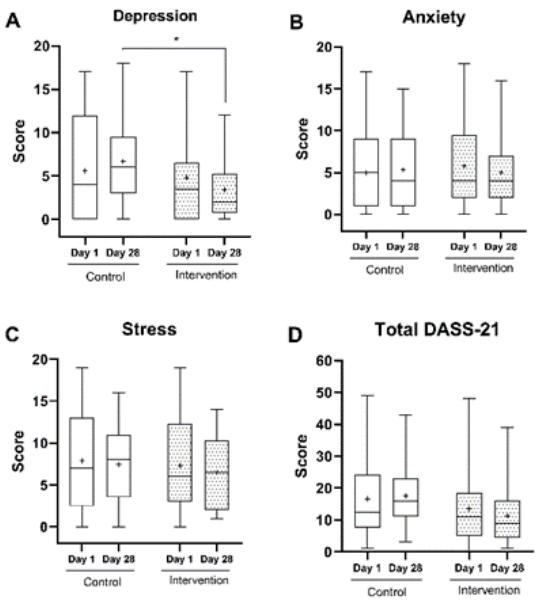

Fig. 3. Boxplots of the scores obtained in the Depression, Anxiety, and Stress Scale-21 to evaluate depression, anxiety, and stress in the day 1st and 28th.

The "+" corresponds to the mean value, * represents significant difference at $p < 0.05$.

3.5. Correlation between cortisol levels and total DASS-21 score

The cortisol level assessed by the stress-related biomarker in this investigation is depicted in Fig. 4. First of all, surprisingly, all the participants presented low cortisol levels compared to the reference ranges provided by the hospital's clinical analysis laboratories. When the relationship between the control group on day one and day 28 was further investigated, no significant difference was found ($p > 0.05$) between these two groups. However, a significant difference was found between the control and intervention groups on day 28 ($p < 0.0001$) using Student's *t*-test (Fig. 4A). Based on the salivary cortisol test results, and cortisol level is low. However, this is far from our expectations obtained from DASS-21 results.

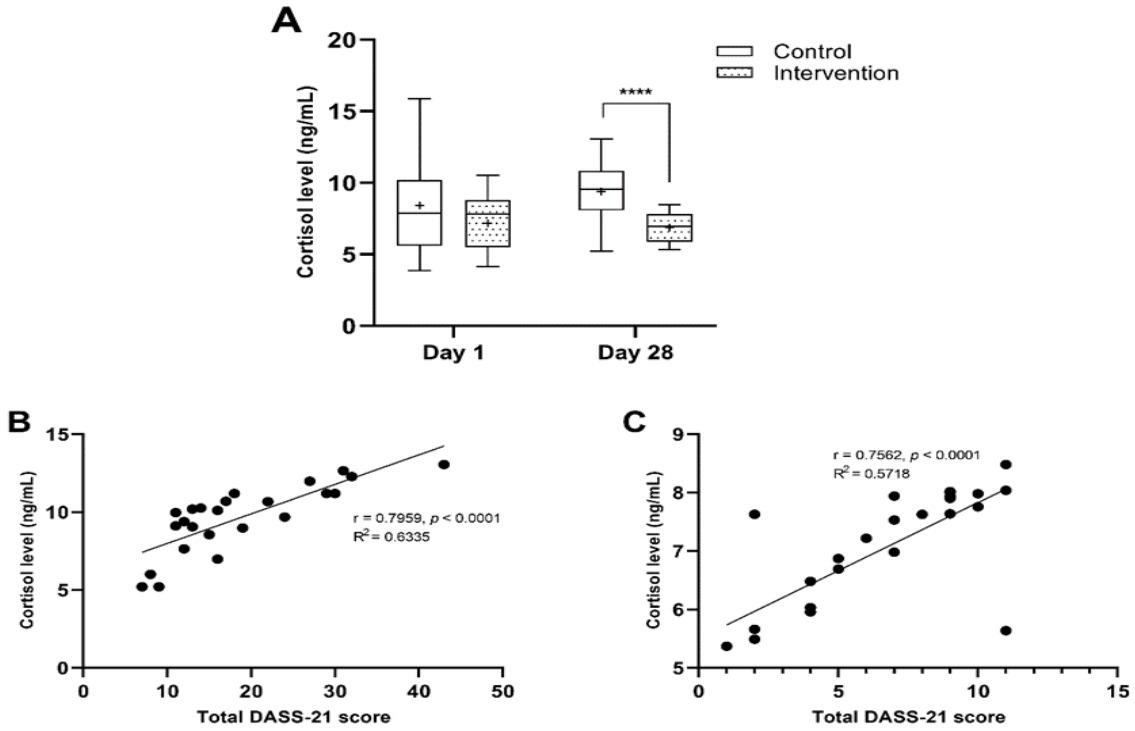

Fig. 4. A) Box diagram of the pattern followed by salivary cortisol. The white box corresponds to the control group, and the white-black dot pattern boxes to the intervention group. The "+" corresponds to the mean value. *P*-value: ****A significant difference was found between the control and intervention group on day 28 ($p < 0.0001$); B) Correlation in total DASS-21 score and salivary cortisol levels for the control group ($R^2 = 0.6335$); and C) Correlation in total DASS-21 score and salivary cortisol levels for the intervention group ($R^2 = 0.5718$).

There was a positive correlation between salivary cortisol levels and total DASS-21 score in the control group, with $R^2 = 0.6335$ and a significant regression $p < 0.0001$ (Fig. 4B). As shown in Fig. 4C, a significant positive correlation for linear regression between salivary cortisol levels and the total DASS-21 score was also observed in the intervention group, with $R^2 = 0.5718$ and $p < 0.0001$. According to the figure, it can be concluded that the intervention group reduced the total DASS-21 compared to the control group.

4. Discussion

The present study evaluates the general and brain temperament, stress level, and sleep quality of military nurses in Iran during the COVID-19 pandemic. It assesses whether a stress-management intervention program using comic clips and resilience training may reduce depression, anxiety, and stress among them. At the beginning of the study, stress, anxiety, and depression were not observed in the subjects, generally. Following the intervention session, a significant difference was observed in depression mood between the control and intervention groups ($p = 0.0196$). While we noticed a decreased anxiety and stress in participants, no significant change in anxiety or stress levels was observed.

Nurses exposed to the COVID-19 pandemic are likelier to witness patient and hospital staff fatalities, resulting in increased rates of depression, anxiety, and suicidal thoughts [34]. As with medical staff professionals interviewed by Wu *et al*., this healthcare personnel expressed worry and anxiety about the COVID-19 pandemic because they could not secure themselves and were unqualified to treat patients; therefore, they

could not manage standard hospital levels [35]. Indeed, excessive workload, worry about infecting family members, and the loss of medical personnel are all examples of stress and sources of anxiety [36]. On the other hand, according to the study's findings, younger nurses experienced higher stress levels and mental tiredness than their senior counterparts [37]. Our study showed that more than 70% of our nurses had more than 16 years of experience. Furthermore, among various aspects of the mental health of COVID-19, depression and sleep disturbance were identified as the most severe symptoms. However, no significant stress and anxiety were reported among the frontline nurses (except for depression). Compared to the general population, the percentage of research participants with dysfunctional levels of COVID-19 anxiety was lower (37.8%) [38, 39]. We used a questionnaire and a check of salivary cortisol levels to support our data, and both showed low stress. It is possible that the COVID-19 vaccination, the ongoing COVID-19 pandemic, and the military's crisis management training have alleviated this medical personnel's stress. However, the lessons learned during COVID-19 and other epidemics, such as the Middle East Respiratory Syndrome, imply that stress and psychosocial changes among employees should be heavily supervised during and after the pandemic since long-term mental health implications is likely [40, 41]. The conventional technique of CBT used in our study may boost participants' understanding of the CBT skills and lead to a considerable reduction in depressive, anxiety, and stress symptoms compared to the control. Furthermore, when nurses perceived more substantial organizational support (mentally), they were more motivated and satisfied and experienced less stress while performing their jobs [39].

A recent study examined the effects of sleep quality and duration on the cortisol response to acute stress in 73 younger individuals. Their study discovered that while sleep length did not affect cortisol stress responses, sleep quality did [42]. Although 83.33% of participants identified poor sleep quality, salivary cortisol levels were not significantly linked with sleep quality. These findings supported the current study's conclusions.

Temperament may significantly affect job satisfaction [31]. Temperament is typically defined to refer to nature, mood, and personality qualities [22, 43]. In the current study, among 120 nurses, the majority were categorized in warm temperament (47.10% and 62.90% for general and brain, respectively). Based on the chi-square test, there was no significant difference in the warmness-coldness and wetness-dryness in general temperament. However, in brain temperament, most participants were warm and dry in this study. Due to the lack of reports of severe stress, there may be a significant relationship between low stress and a warm and dry brain temperament. Because the psychic function is focused on brain temperament, and the brain is a crucial organ for general temperament [22]. Also, temperament may significantly affect job satisfaction [31]. Considering the science of temperament [20] and the low stress of the people under study, we expected that most people would have a warm and wet temperament because the vitality and collaboration in the research demonstrate their warmth and friendliness. However, due to their tolerance and adaptation to the stressful conditions of the COVID-19 pandemic, we expected them to be wet and temperamental. However, the majority showed a dry temperament, which indicates the need for more research. However, this is the only study to discuss this further.

Based on our results, we successfully reduced stress significantly in the intervention group (with cortisol levels) after 28 days using resilience training and comics programs ($p < 0.0001$). Cortisol is a corticosteroid hormone that affects the human brain's ability [32], and cortisol levels in the body are constantly checked to maintain homeostasis [44]. Studies have shown that salivary cortisol levels rise during emergency room shifts [45, 46]. Also, some studies have shown that stress levels are constantly related to increased cortisol levels, as our findings show. Research has found that nurses' cortisol levels and stress levels in nurses are not

statistically significant [47, 48]. According to our research, this CBT program positively impacted our research. We suggest that future research standardizes CBT programs` cultural adaption techniques from the perspective of a country's unique cultures, occupational groupings, and other sociodemographic variables. Also, future research should examine the relationship between stress and different kinds of temperament.

4.1. Study limitations

There were certain limitations in our study. First, we cannot draw causal inferences since the data are cross-sectional. Longitudinal research is better to understand the psychosocial effects of stress on nurses. Second, because participants included only frontline nurses from one of the military hospitals, the findings may not be generalizable to other regions or the entire country.

5. Conclusion

The COVID-19 pandemic may result in frontline nurses experiencing abnormally high stress and anxiety levels. Nevertheless, participants in this study had low stress, low anxiety, and warm and dry temperaments, which may indicate a correlation. Aside from lowering cortisol levels, sleep quality was poor, and CBT only positively affected stress. Hence, hospital administrators must consider interventions (such as COVID-19's mental health protective measures) for all nurses, regardless of where they currently work.

Disclosure statement

The authors declare that they have no conflict of interest

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