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Alterations in psychophysiological responses to stress among Nurses working in COVID & General wards

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Abstract

Background: COVID-19 has meaningfully impacted the psychophysiological wellbeing of frontline healthcare workers, including nurses, midwives, doctors, technicians and ambulance drivers. This ruthless disease has created stress and fear among nurses, potentially affecting their psychological and physical wellbeing, particularly those who work directly with COVID patients. The current study was designed to identify the impact of stress and fear via alterations in psychophysiological responses among COVID and general ward nurses.

Methodology: A total of 50 nurses, 25 from the COVID ward and 25 from the general wards, were recruited from 4 tertiary care hospitals of Karachi. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), respiratory rate (RR) and Galvanic skin response (GSR) were recorded in resting state using Brain Annova® data acquisition system. The stress level of the participants was examined using the Perceived Stress Scale-10 (PSS-10) and fear of the COVID-19 pandemic was evaluated using the Fear for COVID-19 scale (FCV-19S).

Results: The mean SBP, DBP, HR, RR, PSS Score and GSR (Amp ~ K) of nurses working in the COVID ward was (135+7.86, 81+8.27, 89.76±8.08, 21+6.36, 30.23+5.98 and 875.9±284.5 respectively) which were significantly higher than the nurses working in general wards (128±7.58, 79±6.63, 81.43±9.17, 17+4.23, 17.45±2.57 and 598.8±189.2 respectively).

Conclusion: The results revealed that the stress and fear levels were significantly different among the two groups. However, both groups showed alterations in psychophysiological responses due to the uncertain COVID situation and its related threats. Therefore, the nurses working in COVID wards are at more risk of developing mental and physical health problems due to higher levels of stress and fear.

Keywords

COVID-19, SARS-Cov-2, Psychophysiology, Mental Health, Galvanic Skin Response.

Introduction

The Coronavirus Disease 2019 (COVID-19) that affected the whole world population with its deadly physical or mental health consequences, has also exclusively put the whole healthcare system under pressure. This hassle was loaded with ranged from social, economic and administrative challenges to physical and mental health threats to the human resource of the healthcare system. The most vulnerable were the medical and nursing staff working in isolation or general wards without knowing much about the disease and under extreme emotional toll with fear of contracting a disease that was expected to have great adverse effects on their mental and physical health[1]. Furthermore, all the frontline healthcare workers, including doctors, nurses, and paramedics staff worldwide, were at high risk of physical and psychological sequelae[2]; keeping in view the COVID-19 scenario, restrictive measures such as 'work from home' was introduced for people of different organizations and services. In contrast, this cannot be the case for healthcare professionals due to emergent health conditions.

Moreover, following the outbreak of COVID-19, the healthcare staff, especially nurses and doctors posted in COVID-19 wards, reported having an unprecedented level of workload, strain, fear and burnout[3]. Fear has been identified as one of the main stressors during COVID-19 times that tends to alter their work capacity and exhaustion. Increase suffocation and heat stress were also noted among these workers due to encapsulation by personal protective equipment (PPE)[4]. Studies also proposed that nurses performing their duty in COVID-19 wards seemed to fear transmitting the virus to their loved one and family or fear of seeing family or friend suffering from COVID-19[3]. Studies emphasized that as female nurses are the major part of the healthcare task force, they faced immense psychosocial pressure mainly due to unsupportive family norms and an unwelcoming working environment[5].

Adding to this misery are increase duty hours, exposure to COVID-19 patients, working in COVID wards or ICU, and less work experience are the factors that have been reported to generate concomitant anxiety, stress and despair in nurses[3]. Various studies have shown that nurses are more likely to develop symptoms of depression and anxiety significantly more than doctors[6,7]. This difference of anxiety symptoms in doctors and nurses can be due to the level of knowledge that a doctor has in general about a disease compared to nurses[8]. Pakistan is a country where more than 50% of all healthcare professionals are women in doctors, nurses, or allied health professionals and are filling their duties in all COVID19 dedicated hospitals[9]. Moreover, not only nurses posted in COVID wards but those who are not posted in COVID-19 wards or units have also sacrificed their own needs while facing psychophysiological strain, social isolation, abandonment due to health threats in combating the hospital pandemic situation[10,11].

Female healthcare workers, including doctors and nurses, experience more problems than males due to the dual responsibility of maintaining the home and workplace[5]. Therefore, nurses from COVID or general wards have been reported to suffer from extreme stress that can lead to burnout and can cause changes in physiological vitals like blood pressure, heart rate, respiratory patterns and skin response[12,13]. This can cause aggravation of both physical and mental load11 and viciously trigger the HPA axis leading towards poor wellbeing[14].

When compared with SARS, it is identified that COVID-19 mostly affects individuals with chronic diseases, such as diabetes, hypertension, and cardiovascular disease[15]. Therefore, elderly nurses with any of such chronic conditions were already supposed to be at high risk of COVID-19 and associated[16]. The importance of studying psychophysiological indicators to evaluate stress is relevant with the fact that nurses in COVID wards were exposed to multiple stressors like wearing PPE that caused high sweat rates, heart rate and temperature changes[12,17]; fear and distress causing tachypnea or anxious thoughts, worry and loneliness causing changes in B.P., blood flow and more strain[15]. The current study aimed to detect the impact of stress and fear via alterations in

psychophysiological responses of nurses working in COVID and general wards.

Methodology

This cross-sectional study was conducted from August 2020 to January 2021 in Karachi-Pakistan. Data was collected via convenience sampling method and a total of 50 nurses were recruited from four tertiary care hospitals to participate in this study. The study was conducted in accordance with the declaration of Helsinki and Ethical approval was obtained from the Ethical review committee of Advance Educational Institute and Research Center (No. 2020/ERC/8-12).

Subjects were equally divided into two groups (Group A & Group B) based on their respective wards. Subjects working in COVID ward were kept in Group A (n=25), while subjects working in general ward were kept in Group B (n=25).

Psychophysiological responses including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DSP), galvanic skin response (GSR) and respiratory rate (RR) were recorded in resting state using Brain Annova® data acquisition system. The stress level of the participants was examined using the Perceived Stress Scale-10 (PSS-10)[18]. Nurses were asked to answer items on a five-point scale ranging from never (0) to very often (4). A score higher than 27 indicates severe perceived stress, while scores between 0 and 13 indicate low stress. Whereas, a score between 14 to 26 is considered moderate stress.

Moreover, fear of the COVID-19 pandemic was evaluated using the Fear for COVID-19 scale (FCV-19S)[19]. The FCV-19S is a seven-item questionnaire with a maximum possible total of 35 points. The nurses were instructed to choose the option that best represents their perception of the statement presented. The higher the score, the higher is the level of fear of COVID-19 in the participants. For statistical treatment SPSS version 22.0 was utilized.

Results

The mean age of the nurses who participated in this study was 36.7 ± 5.43 years. Out of 50 nurses included, 24 were males, while 26 were females. Out of all nurses included in this study, only 03 nurses have a Master's degree, while 26 had a bachelor's degree. Moreover, 17 nurses have bachelor's degrees with a diploma, while only five nurses had a diploma. Twenty-three nurses had more than ten years of experience, while the remaining 27 nurses have experience of fewer than five years of serving (Table 1).

The results of the stress profile parameters using Brain Annova suggest that the mean heart rate of nurses posted in the COVID ward (89.76 ± 8.08 bpm) was comparatively higher than the mean heart rate of nurses in the general ward (81.43 ± 9.17 bpm). Moreover, it was also assessed that nurses working in the COVID ward tend to have slightly higher blood pressure as compared to nurses working in a general ward. The SBP (135 ± 7.86 mmHg) and DBP (81 ± 8.27 mmHg) of nurses of COVID wards suggest that they get stressed for a specific period, but their blood pressure eventually stabilized once they are habitual the surrounding. Furthermore, there was a minor difference in the RR of nurses posted in both COVID and general ward, i.e., 21 ± 6.36 and 17 ± 4.23, respectively. While GSR was much higher in COVID ward nurses 875.9 ± 284.5 than nurses posted in the general ward 598.8 ± 189.2 (Table 2).

The PSS score suggests severe stress levels in COVID ward nurses with a mean score of 30.23 ± 5.98 compared to general ward nurses 17.45 ± 2.57. while there was no difference in the level of fear of COIVD-19, as suggested by the mean score of FCV-19S between nurses posted in COVID 21.11 ± 6.23 and general ward 19.24 ± 6.41 (Table 2).

Table 1: Demographic characteristics of study participants

Characteristics		n(%)
Gender	Male	24(48)
	Female	26(52)
Marital Status	Single	16(32)
	Married	31(62)
	Other	3(6.0)
Education	Diploma	5(10)
	Bachelor's degree	26(52)
	Bachelor's degree with diploma	17(34)
	Master's degree	3(6.0)
Work Experience	Less than 5 years	27(54)
	>10 years	23(46)
Type of Healthcare Facility	Primary care	14(28)
	Secondary care	17(34)
	Tertiary care	19(38)
Age	Mean±SD	36.7±5.43

Table 2: Comparison of psychophysiological responses to stress among COVID and General ward Nurses.

Stress profile parameter	COVID Ward	General Ward	p-value
	Mean±SD		
Heart rate (beat/minute)	89.76±8.08	81.43±9.17	0.000*
SBP (mmHg)	135+7.86	128+7.58	0.000*
DBP (mmHg)	81+8.27	79+6.63	0.032*
RR (BPM)	21+6.36	17+ 4.23	0.037*
GSR (Amp ~ K)	875.9±284.5	598.8±189.2	0.000*
Perceived stress Scale Score	30.23+5.98	17.45+ 2.57	0.000*
Fear of COVID-19 Scale Scores	21.11+6.23	19.24+6.41	0.061

*p<0.05 is considered significant

Discussion

The study results indicated significant to moderate changes in the psychophysiological responses to stress in the nurses posted at COVID wards compared to nurses posted at general wards. It was observed that nurses appointed in the COVID-19 ward tend to have higher SBP, DBP, heart rate, RR and GSR when compared with nurses in the general ward (Table 2). This can be due to the high incidence rate of burnout among these participants. Supported by a study that indicated that nurses in the COVID-19 unit had an elevated burnout incidence of around 81.6%, while nurses giving their services in the general ward had a lower incidence rate of almost 49.15%[4]. It has been evidenced in the literature that burnout can be an extremely dangerous condition of overstrain that can cause physical and mental ailments like high blood pressure, chronic fatigue syndrome, anxiety disorders, depression etc[20].

Several other studies discussed the use of personal protective equipment (PPE) as a major stressor for nursing staff because of its high evaporative

resistance around the skin that can lead to evaporative heat loss capacity and increase in heat stress levels[21,22]. This may justify that nurses posted in isolation wards are shown to have a progressive increase in the temperature[23] and have elevated GSR with extensive use of PPE for prolonged periods[13]. Still, more work is needed to find out the relation between GSR and COVID-19 burnout along with its correlation with other physiological biomarkers and psychological symptomatology.

In the current study, there was a notable increase in the heart rate of nurses working in the COVID ward 89.76 ± 8.08 as compared to the nurses working in the general ward 81.43 ± 9.17 (Table 2), even though there was an elevation in heart rate it is concepted that once the nurses are habitual to the surrounding, it eventually get back to normal. A study conducted by de Korte and his colleague researchers proposed that there is a progressive increase in the temperature of the nurses using PPE; however, the heart rate remains the same or is usually lower[23]. All these psychophysiological changes, including increased heart rate, blood pressure, fear, temperature and altered respiratory rate in the nurses working in the COVID ward, are generally the result of stress, anxiety and depression that all nurses face all around the world[24].

The current study results show higher perceived stress among nurses appointed in the COVID ward 30.23 ± 5.98 compared to nurses in general wards (Table 2). Like the results of our study, Murat M and his team proved that frontline nurses have higher stress levels and burnout and a moderate level of depression[25]. This supports the notion that our health system and management need to take steps toward preventive and promotive intervention in order to save the frontline nurses from an extreme case of stress and depression[26]. Moreover, the FCV-19S indicated the same level of fear of COIVD-19 among the nurses in COVID and the general ward might be due to the same level of chaos and anxieties after getting overloaded with COVID19 fright. Findings also explain how most healthcare workers, especially nurses, face extreme psychological pressure and negative effect on their physical wellbeing that have a significant potential to lead to phobias, restlessness, chronic illnesses, and social anxieties[13].

Our results finally substantiated that both groups of nurses (COVID and general ward) faced unique challenges apart from their prior experiences that cause vicissitudes in their psychophysiological responses. However, there is a dire need to identify interventions and protocols to help these frontline workers cope with their stresses and ease their working tasks during such a plague.

Conclusion

It is concluded from the results that the stress and fear levels were significantly different among the two groups. However, both groups showed alterations in psychophysiological responses due to the uncertain COVID situation and its related threats. However, those nurses working in COVID wards were identified at a higher risk of developing physical and mental health ailments due to higher levels of stress and fear.

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