

Review Article

## Investigating the Effect of Appropriate Personal Protective Equipment on the Stress Level of Care Workers in the Covid19 Epidemic. Iran

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### Abstract

**IMPORTANCE** Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus.

**OBJECTIVE** This study aimed to investigate the effect of access to personal protective equipment on the level of stress of care workers in epidemic conditions.

**DESIGN, SETTINGS, AND PARTICIPANTS** This study is hospital-based and has been done in two stages. The first phase was performed in February 2020, when the disease had just spread and there was insufficient personal protective equipment, and the second phase was performed in February 2021, when it was more than 1 year since the outbreak. The disease was over and personal protective equipment of sufficient quality was provided to the hospital staff. The Census method was used to determine the number of participants in the study. In this study, the researchers conducted their research on all people. They gave the questionnaire to all front-line care worker second-line care workers of Jam Hospital, which was 537 people. In the first stage, 472 questionnaires were filled out. In the second stage, 342 questionnaires were filled out.



**MAIN OUTCOMES AND MEASURES** We focused on symptoms of job stress in Jam Hospital staff. The same questionnaire was used in both stages. The data collection tool is a questionnaire (ENSS) Scale is a revised version of the NSS Nursing Stress Scale developed by Gary Taft and Anderson (1981). NSS is the first tool designed to measure nursing stress instead of overall job stress. Thirty-four items of the NSS questionnaire measure the frequency and main sources of stress in the patient care situation.

**RESULTS** In the first stage of the research, the level of satisfaction with the quality and availability of personal protective equipment Was 2.9%, the stress level was high in 69.6% of employees (stress level was high in 65.3% of front line employees and 74% of second-line employees). In the second phase of the study, when the level of employee satisfaction with personal protective equipment reached 97.3%, the level of stress was high in 44.1% of employees (the level of stress was high in 57.2% of front line employees and 31.1% of second-line employees). That is, it decreased by 25.5%. In both stages of the research, the amount of stress has a significant relationship with the place of work (first stage  $p$  value=0.013, second stage  $p$  value= 0.01) and there is no significant relationship between the amount of stress, gender, shift work, and education.

## Introduction

As the coronavirus disease 2019 (COVID-19) pandemic accelerates, Preventing the spread of infection to and from health care workers (HCWs) and patients relies on effective use of personal protective equipment (PPE). PPE, formerly ubiquitous and disposable in the hospital environment, is now a scarce and precious commodity in many locations when it is needed most to care for highly infectious patients (1). Limited knowledge of the new disease has been compounded by a lack of emergency preparedness, with healthcare organizations dealing with a lack of proper medical and personal protective equipment (PPE) (2). The sheer volume of patients has necessitated the influx of nurses from non-pulmonary disciplines to help treat patients with this respiratory virus (3, 4). This has resulted in unprecedented stress on an already overburdened nursing corps (4). Nurses' primary concern was the lack of adequate PPE followed by concern for the safety of family and friends More than 85% were afraid to go to work (5). Adequate PPE could attenuate the possible adverse impact of COVID exposure on mental health by helping nurses feel safer in terms of their own health, their patients and their loved ones (2). HCWs face



enormous pressure due to work overload, negative emotions, lack of contact with their families, and exhaustion (6). The extreme preventive practices and the use of whole-body personal protective equipment (PPE) have been linked to many psychological effects (7). Stress may be compounded when HCWs are shunned because others, including family, fear that they may transmit infection (3, 8). Analysis of survey responses found anxiety levels were associated with the availability of personal protective equipment (PPE): workers who reported more unmet PPE needs also reported higher levels of anxiety (9). The aim of this study was to investigate the effect of access to personal protective equipment on the level of stress of care workers in epidemic conditions.

## Method

### Study design

This study followed the Institute for Work & Health (IWH) reporting guideline. Verbal informed consent was provided by all survey participants prior to their enrolment. Participants were allowed to terminate the survey at any time they desired. The survey was anonymous, and confidentiality of information was assured.

This study is a hospital-based and has been done in two stages. The first phase was performed in February 2020, when the disease had just spread and there was insufficient personal protective equipment, and the second phase was performed in February 2021, when it was more than 1 year since the outbreak. The disease was over and personal protective equipment of sufficient quality was provided to the hospital staff. The number of patients in the second phase of the study had reached about 119 million.

To compare the interregional differences of mental health outcomes among health care workers in Iran, all hospitals in Tehran were involved. We chose Jam Hospital as a sample. Because Tehran was most severely affected. Hospitals equipped with fever clinics or wards for COVID 19 were eligible to participate in this survey.

This research is applied research and in terms of survey method. The main tool used to collect information in this study is a questionnaire, which was also used to study the evidence to obtain human resource information.

### Participant

The Census method was used to determine the number of participants in the study. In this study, the researchers conducted their research on all people. They gave the questionnaire to all front-line care



workers (nurse, assistant nurse, secretary) second-line care workers (Services, security, chefs and hostesses, facilities) of Jam Hospital, which was 537 people. In the first stage, 472 questionnaires were filled out. In the second stage, 342 questionnaires were filled out.

### **Outcomes and Covariates**

We focused on symptoms of job stress in Jam Hospital staff. The same questionnaire was used in both stages. NSS is the first tool designed to measure nursing stress instead of overall job stress. Thirty-four items of the NSS questionnaire measure the frequency and main sources of stress in the patient care situation (10).

In 2000, French et al., In order to identify stressful situations not mentioned in the NSS, as well as to increase the scope of this scale, renewed it. They initially identified twenty stressful situations that were not assessed on the NSS test by conducting a pilot study of Canadian nurses with experience working in a variety of conditions. In the next stage of the research, five more positions were added to the previous positions, and the number of new positions was increased to twenty-five positions. The researchers then re-examined the twenty-five added stressful situations to determine conceptual fit with the seven major NSS scales. Of the twenty-five, additional positions identified, fourteen positions with five subscales out of the seven major NSS subscales showed conceptual fit. Three situations were grouped under a new scale that showed discrimination in the workplace. Five other situations were grouped under a new subscale for patients and their families. The researchers then measured fifty positions (ENSS) in a large sample (N = 2.280) and according to the obtained results, two positions were removed from the questionnaire. The final version (ENSS) therefore contains fifty-seven expressions in nine subscales. In the present study, due to the standardization of the questionnaires used, their validity is naturally confirmed. During the research of Sharifian et al. (2005), the content validity of this questionnaire has been reported as very good. Cronbach's alpha criterion was used to estimate the reliability and internal consistency of the questionnaire. Regarding the ENSS questionnaire, the results showed that the coefficient of the revised scale of nurses (0.96) is higher than the main scale (0.86). Regarding the Osipow questionnaire, its reliability was calculated by satisfactory level and its Cronbach's alpha coefficient was calculated and reported equal to (0.86). Fifty-seven questionnaire items are set on a five-point Likert scale, and the subject should choose one of the following options according to the frequency of experience of the desired situation (11).

### **The answers are:**

- 1- I do not have stress at all.
- 2- Sometimes I have stress.
- 3- I often have stress.
- 4- I am very stressed.
5. This position does not include my duties.



The Osipow Job Map Questionnaire (1987) by Osipow assess a person's stress from six dimensions:

1- Role loading, 2- Role inadequacy, 3- Role duality, 4- Role scope, 5- Responsibility and 6- Physical environment has been prepared and used. This questionnaire consists of 60 questions, each of the six dimensions of which are evaluated by ten phrases, respectively.

1- The "role role" dimension examined the situation of the person in relation to the demands of the work environment: the first 10 questions.

2- The dimension of "role inadequacy" evaluates the appropriateness of skills, education and educational and experimental characteristics of the individual with the needs of the work environment: 10-second question.

3. The "role duality" dimension assesses an individual's awareness of priorities, workplace perspectives, and evaluation criteria: 10 Third Question.

4. The "role range" dimension evaluates the contradictions that a person has in terms of work conscience and the role that is expected of him in the work environment: 10 fourth question.

5. The "responsibility" dimension measures a person's sense of responsibility in terms of work efficiency and the well-being of others in the workplace: 10 fifth question.

6- The dimension of "physical environment" examines the unfavorable physical conditions of the work environment to which the person is exposed: 10 Question

The scoring of the Osipow Job Stress Questionnaire based on the 5 Likert scales is as follows: For each phrase, 5 options, never equal to 1 point, sometimes = 2, often = 3, usually = 4 and most of the time equal to 5 Points are considered. The range of scores of this questionnaire varies between 60 and 300. The higher scores of the subject in this questionnaire indicate the high level of his stress. Also, the overall stress level in the four categories is described in **Table 1**.

**Table 1-** Stress Rate Scores

<b>Scores</b>	<b>Stress Rate</b>
<b>50-99</b>	<b>Low stress</b>
<b>100 - 149</b>	<b>Low to medium</b>
<b>150 - 199</b>	<b>Moderate to severe</b>
<b>200 - 250</b>	<b>Severe stress</b>



### Statistical Analysis

Data analysis was performed using SPSS statistical software version 26.0 (IBM Corp). The significance level was set at  $\alpha = .05$ , and all tests were 2-tailed. The original scores of the 4 measurement tools were not normally distributed and so are presented as medians with interquartile ranges (IQRs). The ranked data, which were derived from the counts of each level for symptoms of job stress, are presented as numbers and percentages.

The nonparametric Mann-Whitney U test and Kruskal-Wallis test were applied to compare the severity of each symptom between 2 or more groups. To determine potential risk factors for symptoms of job stress between risk factors and outcomes are presented as odds ratios(ORs) and 95%CIs, after adjustment for confounders, including sex, age, marital status, educational level, technical title, place of residence, working position (first-line or second-line), and type of section.

## Results

### Demographic characteristics

This research was conducted in two stages. 472 people participated in the first stage and 342 people participated in the second stage. In the first stage, 373 (79%) of the front line, 99(21%) people of the second line. In the first stage, most participants were women (66.5%), had an educational level of undergraduate or less (55.7%), were day working (50%) and were aged 36 to 45 (50%). In the second stage, most participants were women (68.6%), had an educational level of postgraduate (87.3%), were day working (58.2%) and were aged > 46 (34.9%).

**Table 2.** Demographic and working position Characteristics of Responders

Characteristic	Total		The first stage of research		The second stage of research	
	first stage	Second stage	Front line care worker	second line care worker	Front line care worker	second line care worker
<b>Sex</b>						
<b>Men</b>	127(33.4%)	109(31.4%)	81	46	93	16
<b>Women</b>	253(66.5%)	238(68.6%)	191	62	154	84



<b>Education level</b>						
<b>Under graduate</b>	212(55.7%)	46(12.7%)	126	86	44	2
<b>≤Post graduate</b>	168(44.2%)	316(87.3%)	146	22	218	98
<b>Shift</b>						
<b>Day</b>	189(50%)	211(58.2%)	122	67	184	27
<b>Night</b>	189(50%)	151(41.85)	148	41	78	73
<b>Age</b>						
<b>25-35</b>	99(25.3%)	133(33.4%)	78	21	106	27
<b>36-45</b>	196(50%)	126(31.6%)	138	58	107	19
<b>&gt; 46</b>	96(24.5%)	139(34.9%)	65	31	85	54

**The severity of Measurements and Associated Factors**

In the first stage of the research, the level of satisfaction with the quality and availability of personal protective equipment Was 2.9%, the stress level was high in 69.6% of employees (stress level was high in 65.3% of front line employees and 74% of second-line employees).

In the second phase of the study, when the level of employee satisfaction with personal protective equipment reached 97.3%, the level of stress was high in 44.1% of employees (the level of stress was high in 57.2% of front line employees and 31.1% of second-line employees). That is, it decreased by 25.5%. In both stages of the research, the amount of stress has a significant relationship with the place of work (first stage p value=0.013, second stage p value= 0.01) and there is no significant relationship between the amount of stress, gender, shift work and education. (Table 3)

**Table 3-** Severity categories of psychosocial factors, stress and satisfaction with personal protective equipment

		First stage				Second stage			
		Severity category (%)				Severity category (%)			
		Low	Natural	High	P value	Low	Natural	High	P value
<b>Working position</b>	<b>Front line</b>	6.6	28.1	65.3	0.013	28.6	14.2	57.2	0.03
	<b>Second line</b>	12	13.8	74		26.3	36.9	31.1	
<b>sex</b>	<b>Men</b>	55	22.7	22.3	0.29	58.5	20.2	21.7	0.3



	<b>Women</b>	49	26.5	24.5		42.2	23.5	33.3	
<b>Shift</b>	<b>Day</b>	25	35.4	39.6	0.07	39	22.7	38.3	0.08
	<b>Night</b>	18.9	39.6	41.5		49.6	17.6	32.8	
<b>Satisfaction with personal protective equipment</b>		95.1	2	2.9		1.5	1.2	97.3	

### Risk Factors of Mental Health Outcomes

Risk Factors of Mental Health Outcomes analysis showed that Employees who, in care workers, the level of stress has a significant relationship with the level of satisfaction with personal protective equipment. It was higher. The amount of stress also depends on the place of work. Those who were in the front line and in direct contact with patients with covid19 had a higher level of stress than the staff of the second line.

### Discussion

This cross-sectional survey enrolled 472 respondents in the first stage and 342 respondents in the second stage and revealed a high prevalence of mental health symptoms among health workers treating patients with COVID-19 in Iran. Overall, in the first stage, 69.6% of all participants reported symptoms of job stress and in the second stage, 44.1 % of all participants reported symptoms of job stress. In the first phase, when Covid19 disease had just started to spread and the personal protective equipment was not sufficiently available to the medical staff, compared to the second phase of the study, which was one year after the spread of the disease and the personal protective equipment was sufficiently available to the staff, The rate decreased by 25.5%. In both stages of the research, most of the participants were female. In the first stage, most of the participants had Undergraduate education and were equally equal in the day and night shifts, and most of the participants were between 36 to 45 years old. In the second stage, most of the participants had a university education, were night shifts, and were over 45 years old. In both stages, there was no significant relationship between age, sex of work shift and employee stress level. At both stages, the stress was greater on the secretaries and facilities. In both phases, there was a significant relationship between where employees serve and the amount of stress.

Other studies show Preventing the spread of infection to and from health care workers (HCWs) and patients relies on effective use of personal protective equipment (PPE) (12). We expected to see



heightened anxiety and depression during this pandemic, but we didn't expect to see levels this high,". "What's notable is that, if PPE protection and infection control policies and practices are adequate, then this mental health burden can be reduced." (13). Limited knowledge of the new disease has been compounded by a lack of emergency preparedness, with healthcare organizations dealing with a lack of proper medical and personal protective equipment (PPE) (14). The sheer volume of patients has necessitated the influx of nurses from non-pulmonary disciplines to help treat patients with this respiratory virus<sup>3</sup>. This has resulted in unprecedented stress on an already overburdened nursing corps (15). Nurses' primary concern was the lack of adequate PPE followed by concern for the safety of family and friends More than 85% were afraid to go to work (5). Adequate PPE could attenuate the possible adverse impact of COVID exposure on mental health by helping nurses feel safer in terms of their own health, their patients and their loved ones (16). HCWs face enormous pressure due to work overload, negative emotions, lack of contact with their families, and exhaustion (17). The extreme preventive practices and the use of whole-body personal protective equipment (PPE) have been linked to many psychological effects (16, 18). Stress may be compounded when HCWs are shunned because others, including family, fear that they may transmit infection (1, 7, 19-21).

It is true that nurses are in direct contact with the patient and the symptoms of stress are high in them, but the present study shows that secretaries and staff of the second line are at high risk of stress which is usually ignored.

### Limitations

This study has several limitations. First, it was limited in scope. All participants were from Jam hospital in Tehran. Second, not all employees were interested in completing the questionnaire. Third, due to a large number of questionnaire questions, participants may not have completed a number of questions accurately. Fourth, due to the prolongation of the epidemic period, the psychological symptoms of the employees may have worsened and it is not possible to follow up.

### Conclusions

It study showed that the level of stress is significantly associated with satisfaction with personal protective equipment. At the beginning of Corona, when the means of personal protection were low, the level of stress in the treatment staff was high. After 1 year, when the means of personal protection were abundant and of good quality, the level of stress in the staff was significantly reduced. The amount of stress also depends on the place of work. Those who are at the forefront and in direct contact with patients with covid19 have higher levels of stress.

Support for front-line and second-line staff seems necessary.



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