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# Job Stress of Medical Staff Working in COVID-19 and Non-COVID -19 Intensive Care Units, Iran: A Multicentre Study

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## Abstract

**Background:** The lack of any definitive treatment of COVID-19 has caused a great deal of stress in communities, especially for those fighting in the front line. In the present study, job stress of medical staff working in Intensive Care Units (ICUs) of patients with COVID-19 was evaluated and compared with staff working in non-COVID-19 ICUs.

**Methods:** This study was performed in Iran with a study population of 80 staff members including nurses, paramedics, supervisors and other medical staff working in ICUs of COVID-19 and non-COVID-19 patients. The Osipow questionnaire was used to assess the job stress level.

**Results:** The mean age of medical staff was 29.72±7.58 years old. The stress score of the male medical staff of ICUs of patients with COVID19 was significantly higher than the female staff and the average stress of employees in night shifts (190.60) was significantly higher than those in the morning and afternoon shifts. In the dimension of responsibility for COVID-19 ICU employees, working in the service department, having a history of COVID-19 infection, working in the NICU and having first-degree relatives with COVID19 caused significantly higher job stress levels. In the dimension of responsibility for non-COVID-19 ICU employees, working in the clinical ward and in the role of boundary dimension, being a supervisor caused significantly higher job stress levels compared to the rest of the staff.

**Conclusion:** It can be concluded that ICU staff are under high pressure during the COVID-19 pandemic in different hospitals of Iran and they need more support to improve their mental health.

**Keywords:** COVID-19, Intensive care unit, Job stress, Medical staff

## Introduction

COVID-19 is the third known zoonotic disease of single-stranded enveloped RNA from the Corona virus family which caused SARS-CoV-2, a new member of this family. Formerly, SARS and the Middle East Respiratory Syndrome had emerged in 2002 and 2012, respectively from this family of RNA viruses. According to WHO statistics up to May 2nd, 2020; 3272202 patients were definitively diagnosed with COVID-19, of which 230104 died with 212 countries having been affected by this disease so far (1-3). In many groups and populations, although all of them were exposed to the virus, only some of them became infected and showed clinical symptoms, and in the latter also only some of them died, therefore, this virus did not seem to behave the same in all people (4,5). It is known that one of the risk factors for this disease is stress and anxiety, which can increase the susceptibility to this disease in various ways. Evaluation of the appropriate level of stress may help us adapt to challenging circumstances; nevertheless, the elevated level may cause tension and anxiety. Since medical staff, especially those working in the Intensive Care Unit (ICU) are the mainstay of the treatment line for this disease, having low stress levels is essential to maintaining their health (6). So far, a few studies have been conducted in Iran to evaluate the stress levels among medical personnel exposed to COVID-19 (7-10), but to the best of our knowledge, this is the first study that evaluates the stress level among medical personnel of the ICU exposed to COVID-19 in Iran. This study also compares the stress of this group with medical personnel in ICUs of non-COVID-19 patients.

## Materials and Methods

The present study is a multi-centre cross-sectional study that was conducted in Iranian educational hospitals. A preliminary test was done on using questionnaire on specialist medical doctors and critical care nurses (n=5). Prior to the initiation of the test, a few changes were made to the material of three questions.

As an important rule, the minimum sample size in partial least squares structural equation modeling (PLS-SEM) should be 10 times more than that of the maximum number of inner or outer model links showing any latent variable in the model. Therefore, the number should be 10 times the largest number of paths in either the structural or formative measurement models (11).

As a result, it can confidently be stated that a sample size of 92 was acceptable for this research. Overall, due to the lack of recording important information about the variables, 12 nurses were excluded from the study. Eventually, the data of 80 nurses were analyzed. It is worth mentioning that the response rate of the questionnaire was 86.95%. In total, the response rate of the principal variables in the complete questionnaires was almost 100%; thus, it can be stated that this study was performed with complete data. In the unlikely event that any data was missing, the type of missing seemed to be at random; hence, this did not seem to create any problems in analyzing the results.

A total of 80 staff members of the ICU were selected and randomly divided into two groups of 40 people. Of the 40 ICU staff of COVID-19 patients, 20 were selected from Al-Zahra hospital, 10 were working in Emam-Hossein hospital and 10 were selected from Amin Hospital. Inclusion criteria included: employment in the ICU, at least one year of working experience and informed consent to participate in the study. The Osipow questionnaire was utilized to assess job stress. The questionnaire consists of 60 questions, which includes 6 sections of 10 questions. In addition, it is a 5-point scale with the following choices: never [1], sometimes [2], often [3], usually [4], and most of the time [5]. In this regard, the job stress is also divided to 4 levels; *i.e.*, low (from 60 to 99), low to medium (from 100 to 149), medium to severe (from 150 to 199), and severe (from 200 to 300) with the low scores indicating low levels of stress (6.7). If the total score is between 50 and 99, it is considered to be low stress, 100 to 149, low to medium stress, 150 to 199, moderate to severe stress and 200 to 250 are signs of severe stress. The validity and reliability of this questionnaire was reported to be very desirable by Sharifian *et al* (12) and its Cronbach's alpha coefficient was calculated to be 0.89.

Dimensions and components of the Osipow Job Stress Questionnaire are as follows:

1. The role workload dimension examines a person's

situation in relation to the demands of the work environment.

2. The incompetence role dimension evaluates the appropriateness of skills, education and educational and experimental characteristics of the individual with the needs of the work environment.

3. The role ambiguity dimension evaluates the individual's awareness of priorities, work environment expectations and evaluation criteria.

4. The role boundary dimension evaluates the contradictions that a person encounters in terms of work consciousness and the role that is expected of him in the work environment.

5. The responsibility dimension measures a person's sense of responsibility in terms of efficiency and the relationship to well-being of others in the workplace.

6. The physical environment dimension examines the unfavourable physical conditions of the work environment to which the person is exposed.

For statistical analysis, the independent t-test, Mann-Whitney and Pearson tests were used. The significance level of the test was considered less than 0.05. All the analyses were performed by SPSS 26 software.

## Results

Overall, 80 employees of the ICU were selected. The highest level of work experience among employees was 22 years and the lowest was 1 year. Out of this statistical population, 40 were involved with COVID-19 patients, 24 had contracted COVID-19 and 23 had witnessed the infection of one of their first-degree relatives. There were 30 who worked in the morning shifts, 27 worked in the evening shifts and 23 in the night shifts. Job stress score according to the Osipow in the nurses of patients with COVID-19 was 20.23±175.6 and in the ward staff of non-COVID-19 patients, it was 27.11±178.78 with no significant difference between them being observed. The mean of job stress score between the group of staff working in the ICU of patients with COVID-19 and those without COVID-19 has been listed and compared in terms of gender, working shifts, working hours, responsibility, age, work experience, unit, background disease, history of COVID-19 infection and first-degree relatives with COVID-19 infection. It can be observed that the mean of stress score varies significantly between male and female staff working in ICUs of patients with COVID19 so that the stress score of the men was significantly higher than the women. The stress score of women was higher than men in ICUs of non-COVID-19 patients but it was not meaningful. Also, the average stress of employees working in ICUs of patients with COVID19 was significantly different in terms of staff shift times. The average stress of employees who were working in the night shifts was significantly higher than those working in the morning shifts and afternoon shifts. A difference was observed between staff working in ICUs of patients with COVID-19 in terms of working hours and having a history of COVID-19 infection but both were not significant. There was no significant difference between the mean stress score between the group of staff working in the intensive care units of patients with COVID-19 in terms of age, work experience and working hours, responsibility, history of background disease, type of units and first-degree relatives with COVID19. All the evaluated parameters were not significant for non-COVID-19 ICU staff (Table 1).

Table 2 shows the dimensions and components of the Osipow Job Stress Questionnaire of staff working in the ICU of patients with COVID19. The mean of stress score in the incompetence role dimension was significantly different between male and female staff so that the stress score of men was higher than women. The mean of stress score in the dimension of role incompetence and role responsibility was significantly different in terms of staff shifts as they were higher for employees who were working in the night shifts than those working in the morning and afternoon shifts. The mean stress score in the role responsibility dimension was significantly different for the staff working in the ICU of patients with COVID19 in terms of staff responsibility in that nurses had the lowest stress score and the employees working in the service department had a significantly higher stress score in the dimension of responsibility. Also, the mean stress in the role responsibility dimension varied for employees with a history of COVID-19 which was significantly higher than those with no history of the disease. In terms of different units, the staff in the NICU had a significantly higher job stress score compared to staff of other wards (p=0.005). The mean of job stress in terms

**Table 1**. The mean of stress score between the staff working in the ICU of COVID-19 and those N-COVID 19

| Variable | | N-COVID Mean ± SD | COVID Mean ± SD | P1 | P2 |
|---|---|---|---|---|---|
| Age | ≥30 y | 182.34±25.30 | 174.96±22.06 | 0.362 | 0.595 |
| | <30 y | 175.21±26.13 | 179.33±16.91 | | |
| Working experience | ≥5 y | 182.42±23.55 | 172.39±19.04 | 0.474 | 0.423 |
| | <5 y | 175.38±31.43 | 178.85±13.72 | | |
| Working hours | ≥10 h | 179.70±26.02 | 169.81±22.79 | 0.967 | 0. 056 |
| | <10 h | 179.37±5.37 | 183.69±16.10 | | |
| Gender | Female | 180.97±26.37 | 173.73±19.86 | 0.278 | 0.031* |
| | Male | 168.66±18.07 | 200.33±10.78 | | |
| Working shifts | morning | 179.0±24.36 | 172.46±11.99 | 0.998 | 0.018* |
| | afternoon | 184.13±28.91 | 166.50±22.75 | | |
| | night | 173.83±24.04 | 190.60±21.14 | | |
| Unit | Emergent | 180.66±17.47 | 172.0 | 0.592 | 0.281 |
| | ICU | 179.18±29.84 | 170.55±19.65 | | |
| | NICU | 178.80±25.76 | 192.33±13.80 | | |
| | Ward | 179.60±16.41 | 181.27±22.37 | | |
| Responsibility | Nurse | 179.0±26.30 | 173.29±21.19 | 0.191 | 0.560 |
| | Supervisor | 204.50±29.22 | 172.0 | | |
| | Paramedic | 179.0±8.54 | 162.0 | | |
| | Paramedic assistant | 176.50±4.95 | 179.50±2333 | | |
| | Service | 169.25±13.30 | 191.0±18.05 | | |
| | Other | 136.0 | 197.0 | | |
| Disease | | 175.50±3.53 | 185.66±33.83 | - | 0.567 |
| History of COVID | | 179.09±23.41 | 185.25±21.68 | 0.972 | 0.054 |
| FDRI corona | | 174.25±29.25 | 179.70±23.16 | 0.428 | 0.523 |

N-COVID, without COVID-19; P1, p-value Non COVID-19; P2, p-value COVID-19; FDRIWC, First-degree relatives' infection with corona.

**Table 2.** The dimensions and components of the OJSQ of staff working in the ICU of patients with COVID

| SW ICU COVID | | PC Mean ± SD | RD Mean ± SD | RB Mean ± SD | RI Mean ± SD | RW Mean ± SD | RR Mean ± SD |
|---|---|---|---|---|---|---|---|
| **Gender** | Female | 28.83±6.98 | 28.70±5.00 | 29.63±6.25 | 27.33±5.17 | 29.37±6.42 | 29.87±9.61 |
| | Male | 33.0±7.94 | 30.33±2.30 | 30.67±9.71 | 35.00±6.93 | 31.33±3.21 | 40.0±8.66 |
| | p-value | 0.336 | 0.584 | 0.796 | 0.023* | 0.608 | 0.422 |
| **Working shifts** | Morning | 29.0±8.03 | 29.0±4.18 | 32.54±5.39 | 26.54±3.73 | 28.31±5.82 | 27.08±6.65 |
| | Afternoon | 26.80±6.39 | 27.60±5.46 | 27.70±7.71 | 25.50±6.09 | 30.40±7.02 | 28.50±12.86 |
| | Night | 31.90±5.89 | 29.90±5.15 | 28.10±5.46 | 32.50±5.13 | 30.30±6.16 | 37.90±6.26 |
| | p-value | 0.274 | 0.575 | 0.127 | 0.008* | 0.665 | 0.029* |
| **Unit** | Emergent | 35.0 | 26.00 | 25.00 | 24.0 | 26.00 | 36 |
| | ICU | 29.94±8.21 | 29.89±4.17 | 31.17±6.41 | 26.39±4.93 | 27.78±5.44 | 25.39±8.44 |
| | NICU | 28.33±2.30 | 25.33±3.51 | 30.67±3.21 | 35.67±4.93 | 32.67±4.93 | 39.67±6.81 |
| | Ward | 27.7±36.00 | 28.36±5.97 | 27.55±7.00 | 29±5.64 | 31.91±7.18 | 36.73±7.94 |
| | p-value | 0.723 | 0.425 | 0.445 | 0.094 | 0.250 | 0.005* |
| **Responsibility** | Nurse | 28.29±6.58 | 29.46±4.79 | 31.08±6.26 | 27.71±5.53 | 29.54±6.18 | 27.21±8.80 |
| | Supervisor | 35.00 | 26.00 | 25.00 | 24.00 | 26.00 | 36.00 |
| | Paramedic | 22.00 | 25.00 | 22.00 | 25.00 | 31.00 | 37.00 |
| | Paramedic assistant | 30.50±12.02 | 29.00±1.41 | 30.50±0.70 | 27.50±6.36 | 25.50±6.36 | 36.50±2.12 |
| | Service | 31.25±7.18 | 25.75±6.50 | 23.75±6.99 | 32.75±7.32 | 32.00±8.83 | 45.50±1.00 |
| | Other | 12.00 | 33.00 | 32.00 | 25.00 | 30.00 | 35.00 |
| | p-value | 0.333 | 0.614 | 0.250 | 0.638 | 0.887 | 0.018* |
| **Disease** | | 28.00±0.20 | 22.50±9.19 | 21.00±5.66 | 26.50±2.12 | 31.50±14.85 | 46.00±1.41 |
| | p-value | | 0.522 | 0.740 | 0.512 | 0.983 | 0.099 |
| **History of COVID** | | 28.67±4.83 | 29.17±5.81 | 28.83±6.53 | 29.92±5.74 | 32.00±6.48 | 36.67±6.03 |
| | 0.154 | 0.742 | 0.780 | 0.555 | 0.152 | 0.085 | 0.003* |
| | | 27.90±7 | 27.70±6.55 | 31.30±5.63 | 29.20±5.81 | 31.70±6.93 | 37.10±8.61 |
| **FDRI corona** | p-value | 0.489 | 0.375 | 0.030 | 0.444 | 0.192 | 0.013* |

OJSQ: Osipow Job Stress Questionnaire; SW ICU COVID: Staff working in the ICU of patients with COVID-19; PC: Physical Conditions; RD: Role duality; RB: Role boundary; RI: Role incompetence; RW: Role workload; RR: Role responsibility.

of role boundary and role responsibility varied for employees with a first-degree family with a history of COVID-19 in that they had a higher average stress level. Table 3 shows that the job stress of staff was significantly different in terms of role boundary and role responsibility compared to the type of ward and staff responsibility. Employees in the NICU had the lowest mean stress and those in the general ward had the highest mean stress in the responsibility dimension. Also, supervisors had a significantly higher mean stress score compared to others in the role boundary dimension. For those who were working in non-COVID-19 ICUs, parameters such as gender, working shift, history of underlying diseases, history of COVID-19 infection, or first-degree relatives did not have a significant effect on employee job stress score differences in all the dimensions.

## Discussion

The strengths of this research were that it included the ICU which is the most critical unit in the hospital, especially during the COVID-19 infection and comprised the most exposed groups in the front line such as nurses, paramedic, service and supervisors. Also, we compared the results with the ICU staff working with non-COVID-19. According to the present study, there was a significant difference in job stress level between staff working in ICUs of patients with COVID-19 and those in non-COVID-19 in terms of working hours, working shifts, gender, and having a history of COVID-19 infection. The stress level for staff of ICUs of patients with COVID-19 showed to be higher in male staff, those working in the night shifts, service department workers, those with a history of COVID-19 infection and also in staff with no first-degree family history of COVID-19 infection. The stress level for staff of ICUs of non-COVID-19 patients proved to be higher in supervisors and those working in the general ward.

From the initial time of COVID-19 diagnosis in Chinese citizens in December 2019 (13), the disease rapidly spread worldwide and changed the treatment system of all countries which resulted in increased capacity and share of emergencies. These changes led to a lack of manpower and, as a result, more co-operations between health workers and emergency departments and special wards (14). A recent study by Hong *et al* demonstrated that the anxiety of informing the relatives of the patient about the news of death increased the stress and depression levels of the hospital staff. On the other hand, the physical activity and meditation time of the health staff also has been decreased (5). Undoubtedly, the increased level of stress was expected in all staff related to COVID-19 patients. To adequately perform their function during this pandemic, it is fundamental for medical staff to preserve their mental and emotional health (15,16), but studies indicated that the rise of COVID-19 has significantly affected the mental health of medical staff, for example depression, job stress and anxiety (10,16,17). Nurses and paramedics in general are the most exposed groups to COVID-19 patients and are the front line in COVID-19 care units. A study on fear level of nurses during COVID-19 reported the a high mean scale score for the fear of COVID-19 (above the midpoint) in nurses (18); however, a study on mental health and depression of nurses in Torbat-e-Heydariyeh city of Iran, showed that stress in nurses working in COVID-19 units was moderate and could be improved by training them on how to deal with critical situations (19). According to a study conducted in Turkey, the rate of depression and anxiety in physicians has increased significantly and anxiety symptoms have been observed in majority of the physician population followed by the recent COVID-19 outbreak (20). Another study showed that problems such as not finishing work on time or conflict with the patient's family increased the stress of nurses; however, they mentioned that the age of nurses had no meaningful effects on their job stress which is consistent with the results of our study (21). However, another study by Kaveh *et al* suggested that age was an effective factor for stress and anxiety in medical staff of COVID-19 related sections (22). They also reported that gender and working responsibility had the most significant relation with anxiety (22). Our results also showed a meaningful association on gender and work resposibility with stress in COVID-19 related staff but according to their results, female staff had more stress while our results represented more stress in male workers. A recent study in China showed that the level of job stress of employees was directly associated with having a child which was not related to gender or shift time,

**Table 3.** The dimensions and components of the O JS Q of staff working in the ICU of patients with N-COVID-19

| SW ICU COVID | | PC Mean ± SD | RD Mean ± SD | RB Mean ± SD | RI Mean ± SD | RW Mean ± SD | RR Mean ± SD |
|---|---|---|---|---|---|---|---|
| **Gender** | Female | 28.97±6.35 | 30.95±5.99 | 30.13±6.95 | 30.31±6.22 | 30.33±8.25 | 30.28±9.38 |
| | Male | 30.67±3.39 | 29.17±5.34 | 28.50±3.21 | 29.00±3.16 | 26.00±7.92 | 25.33±6.12 |
| | p-value | 0.529 | 0.496 | 0.578 | 0.618 | 0.236 | 0.220 |
| **Working shifts** | morning | 28.89±6.23 | 29.78±5.86 | 30.17±7.16 | 30.28±3.86 | 30.61±7.31 | 29.28±9.05 |
| | afternoon | 31.80±6.05 | 30.80±5.93 | 29.93±5.80 | 31.33±7.85 | 28.20±10.84 | 32.07±9.05 |
| | night | 26.42±4.66 | 32±6.12 | 29.50±7.09 | 28.42±5.66 | 30.42±5.96 | 27.08±9.30 |
| | p-value | 0.065 | 0.607 | 0.965 | 0.448 | 0.679 | 0.370 |
| **Unit** | Emergent | 25.33±4.62 | 27.00±6.24 | 30.00±5.29 | 33.00±4.36 | 31.67±3.21 | 33.67±3.21 |
| | ICU | 29.56±6.13 | 30.56±6.35 | 30.63±6.76 | 29.81±6.50 | 30.93±8.10 | 27.70±8.43 |
| | NICU | 31.60±5.86 | 35.00±6.40 | 33.00±4.64 | 29.00±6.16 | 26.80±6.98 | 23.40±8.73 |
| | Ward | 28.20±6.36 | 30.10±3.25 | 26.40±6.53 | 30.70±4.74 | 27.50±10.20 | 36.70±8.46 |
| | p-value | 0.510 | 0.269 | 0.236 | 0.797 | 0.568 | 0.013* |
| **Responsibility** | Nurse | 29.61±5.68 | 31.23±5.74 | 29.81±5.61 | 30.03±6.20 | 29.42±8.60 | 28.90±8.54 |
| | Supervisor | 35.75±3.50 | 33±8.29 | 36.50±4.04 | 32.50±8.18 | 37±7.87 | 29.75±6.29 |
| | Paramedic | 23.67±7.50 | 29±7 | 35±12.12 | 32±6.24 | 31±3 | 28.331±4.43 |
| | Paramedic assistant | 28.50±4.95 | 32±5.65 | 29.50±3.54 | 29.50±0.7 | 30.50±0.7 | 26.50±9.19 |
| | Service | 25±6 | 25.50±3.87 | 21.75±4.35 | 28±3.46 | 28±4.55 | 41±6.05 |
| | Other | 25 | 29 | 25 | 28 | 13 | 16 |
| | p-value | 0.070 | 0.510 | 0.018* | 0.909 | 0.181 | 0.102 |
| **Disease** | | 33.33±1.53 | 31.33±7.57 | 31.33±5.13 | 33.67±7.09 | 29.00±8.18 | 27.00±8.54 |
| | p-value | 0.596 | 0.396 | 0.929 | 0.495 | 0.145 | 0.652 |
| **History of COVID** | | 29.03±5.59 | 30.91±6.22 | 29.26±5.98 | 30.09±5.96 | 30.32±8.15 | 29.79±8.17 |
| | 0.154 | 0.743 | 0.692 | 0.250 | 0.929 | 0.424 | 0.827 |
| | | 29.58±6.19 | 31.48±5.98 | 30.18±6.92 | 29.85±6.20 | 30.39±8.29 | 29.70±9.74 |
| **FDRI corona** | p-value | 0.495 | 0.145 | 0.652 | 0.596 | 0.396 | 0.929 |

OJSQ: Osipow Job Stress Questionnaire; SW ICU COVID: Staff working in the ICU of patients with COVID-19; PC; Physical conditions; RD: Role duality; RB: Role boundary; RI: Role incompetence; RW: Role workload; RR: Role responsibility.

while the results of our study proved the association of job stress with gender and shift time. They also indicated that the association between job stress and working hours per week was significant (16), which is consistent with our results. In a study of physicians and nurses in Turkey, 64.7% of staff suffered from depression and anxiety during the COVID-19 outspread, and their level of job stress was directly related to gender, being single, low work experience and working in COVID-19 units. On the other hand, having a child showed a reverse association in their study (19). In addition, a study conducted in Italy on 155 anaesthesiologists demonstrated 71.1% of high job stress; which was significantly associated with the degree of contact with a patient with unprotected COVID-19 but was not significantly associated with age, sex, working experience, having a child and working hours (14). These differences in the results of the mentioned studies is probably due to the differences in sample size, difference in workload hours, difference in studied populations and also the facilities of the medical centre according to the welfare level of different countries. It seems that medical staff of ICUs experienced a high level of job stress in the COVID-19 outbreak compared to staff of ICUs of non-COVID patients. Moreover, one of the important steps in each pandemic is providing supportive care to maintain the mental well-being of medical staff, especially those in the front line of fighting with the diseases who are higher risk groups. Our results showed that service staff are also under high pressure even more than nurses, paramedics, paramedic assistants and supervisors. Contrary to what many studies reported and what might be expected, our results indicated that men are under more stress, which may be due to what was stated previously that the service staff bear a lot of pressure, and most of the service staff in Iran are men. Working hours more than 10 hours/day and working the night shifts also showed to increase job stress and therefore working hours should be adjusted and reduced in order to decrease the stress level.

## Conclusion

It can be concluded that ICU staff working in different units with COIVD-19 patients are under high pressure and as a result, the management department should pay more attention to support and recovery of their mental health. Due to the inconsistency in the findings of different studies in various countries, it seems that more high-quality researches are still needed in this regard.

### *Ethical approval*

The protocol of this study was approved by the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.MED.REC.1399.588)

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