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Original Article:

Measurement of Occupational Fatigue/exhaustion Recovery in Nurses Caring for COVID-19 Patients

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Abstract

Introduction: The shadow of the coronavirus phenomenon over the nursing profession is considered as a serious threat to the health of nurses and the quality of nursing care for coronavirus patients. This study intended to measure the occupational fatigue/exhaustion recovery of nurses caring for COVID-19 patients in hospitals affiliated with Mashhad University of Medical Sciences.

Materials and Methods: This descriptive-analytical cross-sectional study of 203 nurses caring for coronavirus patients was conducted in 2021 using the census method. Data were collected using a 15-item Occupational Fatigue/Exhaustion Recovery (OFER-15) scale, and were analyzed by SPSS statistical software version 22 using independent t-test, one-way analysis of variance, and Tukey's post hoc tests. The significance level was set at $\alpha = 0.05$.

Results: The majority of the nurses were female (51.2%), married (81.3%), and bachelor's degree holders (86.2%). The mean occupational exhaustion score of the nurses studied was 60.20±6.13, indicating a high level. Likewise, the average score for chronic fatigue was 22.89±5.87, representing a high level. In contrast, the mean scores for acute fatigue and inter-shift recovery were 18.36±2.76 and 18.95±2.41, respectively, suggesting a moderate level. Nurses in the special coronavirus ward had a significantly higher mean score of acute fatigue than those in the general coronavirus ward (p=0.02).

Conclusion: Since the mean occupational exhaustion score among nurses caring for coronavirus patients was high in this study, it is recommended that managers modify the conditions and variables that contribute to fatigue, implement the necessary controls to reduce fatigue, and formulate a strategy to boost the productivity of nurses and the satisfaction of COVID-19 patients.

Keywords: Acute fatigue, Chronic fatigue, Occupational Fatigue/exhaustion recovery, Nurse, COVID-19

1. Introduction

The COVID-19 disease appeared in the Chinese city of Wuhan, Hubei province, at the end of 2019. The World Health Organization declared this disease a "global health emergency" on January 30th, 2020, and a "global pandemic" on March 11th, 2020, due to its rapid spread. Several million new cases have been identified to date, and a significant number of deaths have occurred. Despite the unprecedented mobilization of people to combat this phenomenon, the identification and treatment of a large number of patients caused the health systems of many countries to endure this unprecedented strain and to struggle beyond their capacities to combat this epidemic. In the meantime, health system staff, particularly nurses, are on the front lines of this fight and have been disproportionately affected by this pandemic [1].

Nursing is a stressful profession, and nurses typically experience high levels of physical and mental workload, especially during the coronavirus era, where work pressure has become extremely intense due to special circumstances. With the continuation of the epidemic, the number of patients admitted to the wards has increased, as has the need for patient care, thereby increasing the physical and mental workload of health workers, particularly nurses in special wards. In these departments, a patient's condition may be threatened at any time by a drop in blood-saturated oxygen, necessitating immediate action; this problem doubles the nurses' workload due to time constraints (time pressure). Additionally, the inevitable characteristics of the coronavirus phenomenon, such as fear and uncertainty, have significantly impacted the nursing profession's occupational aspects during this epidemic. At the onset of the epidemic together with the rise in the number of patients hospitalized, an unpredictable situation arose in which patients or their companions were admitted to hospitals without specific symptoms, thereby exposing the medical personnel [2].

Physical and mental exhaustion, skin disorders, chronic headaches, and anxiety disorders are among the issues raised by nurses working in coronavirus wards, which require interventions [1]. Fatigue is one of the most prevalent negative effects of occupation [3] and has been regarded as one of the most prevalent issues, particularly in developed nations [4]. Special measures need to be taken to address fatigue. It is crucial because it poses a threat to occupational safety and productivity as well as public health [5, 6].

A study conducted in the United States revealed that the annual cost of occupational fatigue is greater than one hundred billion dollars [7]. In the study conducted by Asadi et al. on nurses working in hospitals affiliated with Urmia University of Medical Sciences, it was found that nurses have moderate fatigue levels in all three dimensions (functional, physical, and cognitive) [8]. In a study conducted by Yarmohammadi et al., the majority of nurses experienced moderate levels of occupational fatigue [9]. A study by Winwood et al., designed to improve and broaden the occupational fatigue questionnaire, showed a strong correlation between chronic fatigue and sleep quality and emotion. Similar to job burnout subscales, there was a strong association between energy dimension and acute fatigue [3].

Changes in habits and lifestyle have altered the normal conditions of life in many cases, leading to overt and covert issues in numerous areas of personal health, family life, occupational duties, and social relationships. As one of the most common symptoms, fatigue is characterized by feelings of weakness, lack of energy, and exhaustion [10]. Researchers believe that, depending on the cause, the effects of fatigue can manifest as general, mental, or physical fatigue, reduced activity, and demotivation [11].

Due to their direct relationship with human health, the constituents of the health and treatment sectorare regarded as crucial to any nation's progress and sustainable development. Hence, fatigue in this sector has been the subject of extensive research [12]. On the basis of the findings of previous research, it is anticipated that an increase in fatigue, particularly mental one, is associated with a lack of concentration and an increase in errors [13]. Various factors, including exposure to severe diseases, high workload, role ambiguity, job stress, and organizational characteristics such as authority and support, have been cited in studies as contributing to the emergence of this condition among the medical center workforce, particularly nurses [14-18].

Fatigue is one of the primary reasons why nurses leave their jobs. In this regard, research indicates that the intensity of burnout can be mitigated by addressing fatigue among nurses [19, 20]. Long-term exposure to stress is one of the primary causes of fatigue among healthy employees [21].

In addition to the lack of equipment, there are other issues, such as the environment and job content of nurses and organizational challenges (hospital system), that have received less attention despite their significance. From this perspective, a lack of specialized and experienced nurses, an

unconventional work schedule, the involuntary transfer of staff between departments, insufficient organizational support, the quality of rest time, conflicting laws and information, and the absence of specialized training for the coronavirus are among the most significant issues nurses experience during this period [22]. At the onset of the pandemic, there was an increased demand for experienced nurses and even special nurses; however, there was a shortage of this workforce, causing several more experienced nurses to work irregular shifts and long hours. On the other hand, when a number of nurses in special departments contracted the coronavirus and a portion of this vital workforce was quarantined, the nursing shortage doubled. The problem was resolved by utilizing nurses from other departments. However, this replacement resulted in difficulties because the new nurses were unfamiliar with the specialized department [23].

Meanwhile, even though the labor shortage was an evident reality in special departments, other hospital departments were closed due to the lack of outpatients and non-emergency surgeries, resulting in a decline in the revenue of private hospitals. As a consequence, some of these hospitals did not extend contracts with short-term contract-based personnel, and this, combined with the difficult nature of the nursing profession and the upcoming situation, led to a great deal of discouragement and dissatisfaction among a great number of nurses [24]. Among other issues that went nearly unaddressed was the stress and anxiety nurses experienced while attending to their basic needs, such as eating, using the restroom, and changing clothes while on duty, often due to saving time and personal protective equipment [1, 25]; this particular issue went unaddressed.

Since the COVID-19 outbreak, healthcare professionals, particularly nurses, have been most affected by this phenomenon. It is possible to investigate and reflect on the magnitude of this phenomenon's effects on individualistic and organizational scales and even beyond the health-providing organizations. The shadow of the coronavirus phenomenon on the nursing profession is associated with numerous problems, including fear, physical and mental strain, uncertainty, and time pressure. Many nurses may develop physical and mental disorders and exhaustion as a result of these difficult and exhausting conditions, which are considered as a serious threat to nurses' health, the quality of their care, and the functioning of the health system.

Considering what went above and the fact that no previous research has been conducted in the field of occupational fatigue/exhaustion recovery in nurses caring for COVID-19 patients, the present study aims to assess occupational fatigue/exhaustion recovery in nurses caring for COVID-19 patients in hospitals affiliated with Mashhad University of Medical Sciences.

2. Materials and Methods

In 2021, 203 nurses caring for COVID-19 patients in hospitals affiliated with Mashhad University of Medical Sciences participated in this cross-sectional descriptive-analytical study using census and convenience sampling methods. Examined in this study were the hospitals of Dr. Shariati in Mashhad, Imam Reza Hospital in Mashhad, Khatam al-Anbia Hospital in Taibad, and 22nd-Bahman Hospital in Khaf. These hospitals in Mashhad or other counties were chosen because they served as referral centers for the coronavirus disease and facilitated data collection. The total number of nurses eligible to participate in this study was 430. Using Cochran's formula for calculating sample size while accounting for a 5 percent margin of error, the sample size was determined to be n=203.

Upon the project's approval by the research ethics committee of Mashhad University of Medical Sciences, the researchers received a written letter of introduction from Mashhad University of Medical Sciences and presented it to the officials in charge of the relevant hospitals.

The inclusion criteria were informed consent, at least six months of experience working with COVID-19 patients, a bachelor's degree or higher in nursing, and access to a mobile phone with the capability to receive and view electronic questionnaires. A nurse was excluded in case the questionnaire was not completed perfectly.

This research utilized a demographics form that included age, gender, marital status, employment status, education level, history of caring for patients in the COVID-19 ward, and type of patient care ward (i.e., general or special). The second tool was the standard occupational fatigue/exhaustion scale. The nurses were given a link to the instruments. In each hospital, a credible intermediary was assigned to collect data. Intermediaries shared the electronic questionnaire with the target nurses via hospitals' virtual groups.

Standard Occupational Fatigue/Exhaustion Recovery Scale (OFERS-15)

OFERS was developed by Winwood et al. in 2005 to measure occupational fatigue. This scale was validated by Javadpour et al. in Iran in 2013. It contains 15 items and three factors: chronic fatigue, acute fatigue, and inter-shift recovery. The questionnaire measures

occupational fatigue on a seven-point Likert scale using items such as "I often feel at the end of my rope with my work".

Questionnaire factors

Chronic fatigue, items 1 to 5; acute fatigue, items 6 to 10; and inter-shift recovery, items 11 to 15.

The rating scale is on a seven-point Likert response scale from 0-6, ranging from completely disagree to completely agree.

Analysis (interpretation) based on the score of the questionnaire:

The lower limit of scores	Average limit of scores	The upper limit of scores
0	45	90

A score between 0 and 30 indicates a low level of occupational exhaustion. A score between 30 and 60 represents a moderate degree of occupational exhaustion. Moreover, a score above 60 denotes a high level of occupational exhaustion.

In Javadpour et al.'s study (2013), the scale's content and formal validity were evaluated as appropriate, and Cronbach's alpha coefficient for this questionnaire was calculated to be above 0.7 [26].

The data were analyzed by SPSS version 22 using the independent t-test, one-way analysis of variance, and Tukey's post hoc test. The level of significance was set at $\alpha = 0.05$.

3. Results

This study evaluated 203 nurses who cared for patients with COVID-19. The majority of the nurses surveyed were female (51,2 %), married (81,3 %), and bachelor's degree holders. A significant proportion was 30 years and younger (40.4%) and had long-term contractual employment status (41.9%). A total of 180 nurses (88.7%) had more than one year of experience caring for COVID-19 patients, with 114 (56.2%) caring for COVID-19 patients in the special COVID-19 Ward (Table 1):

Based on the results, the average occupational exhaustion score of the nurses studied was 60.20±6.13, which indicates a high level of exhaustion. In addition, the mean score for chronic fatigue was high at 22.89±5.87, while the mean scores for acute fatigue and inter-shift recovery were moderate at 18.36±2.76 and 18.95±2.41, respectively. Given that the skewness and kurtosis coefficients for all research variables fall within the interval [2, 2], the research data have a normal distribution (Table 2).

Table 1. Demographic characteristics of the studied nurses

Variable		Frequency	Percent
Gender	Female	104	51.2
	Male	99	48.8
Marital status	Single	38	18.7
	Married	165	81.3
Education level	Bachelor's Degree	175	86.2
	Master's Degree	28	13.8
Age (year)	≤ 30	82	40.4
	31-35	69	34
	> 35	52	25.6
Employment status	Official	42	20.7
	Long-term contract-based	85	41.9
	Yearly contract-based	12	5.9
	Project-based	64	31.5
History of care provision in the COVID-19 ward	6-12 months	23	11.3
	More than a year	180	88.7
Type of COVID-19 ward	Special	114	56.2
	General	89	43.8

Table 2. The mean score of occupational exhaustion in general and its components in nurses caring for COVID-19 patients

Variable	Mean	Standard deviation	Skewness	Kurtosis	Level
Chronic fatigue	22.89	5.87	-1.37	0.65	high
Acute fatigue	18.36	2.76	-0.11	-1.05	moderate

Inter-shift recovery	18.95	2.41	0.78	1.21	moderate
Overall occupational exhaustion	60.20	6.13	-1.53	1.55	high

The findings revealed that the overall mean scores of occupational exhaustion and chronic and acute fatigue components in female nurses were significantly higher than those in male nurses. The average overall scores of occupational exhaustions and inter-shift recovery in single nurses were significantly higher in single than married nurses, as well as in nurses with a bachelor's degree than those with a master's degree ($p<0.01$). The mean scores of overall occupational exhaustion and acute fatigue in nurses aged 30 and younger were significantly higher than in other nurses.

The mean score of chronic fatigue in nurses aged 30 and younger was significantly higher than that of nurses aged 31-35. Likewise, the average fatigue score of inter-shift recovery was significantly higher in nurses aged 30 and younger than in nurses above 35 years.

Project-based nurses had a significantly higher average occupational exhaustion score than official and long-term contract-based nurses. In addition, the average chronic fatigue score of long-term contract-based and project-based nurses was significantly greater than that of official nurses ($p<0.05$).

However, there was no significant difference in the average score of occupational exhaustion in general and its components in the studied nurses as per the history of caring for patients in the COVID-19 ward. Likewise, there was no significant difference in the mean occupational exhaustion score, chronic fatigue score, or inter-shift recovery score of nurses based on the type of ward ($p>0.05$). Acute fatigue among nurses in the special coronavirus ward was significantly greater than that of nurses in the general coronavirus ward ($p=0.02$) (Table 3).

Table 3. Comparison of the mean score of occupational exhaustion in general and its components in the studied nurses as per demographic characteristics

Variable		Chronic fatigue	Acute fatigue	Intershift recovery	Overal occupational exhaustion
		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Gender	Female	24.63±63.60	19.2±37.67	18.1±68.32	62.4±68.10
	Male	21.7±6.14	17.2±30.44	19.3±19.3	57.6±59.81
P-value for independent t-test		<0.001	<0.001	0.11	<0.001
Marital status	Single	24.5±53.90	18.2±16.92	19.2±82.57	62.4±50.15
	Married	22.5±52.82	18.2±41.72	18.2±75.33	59.6±67.40
P-value for independent t-test		0.06	0.62	0.01	0.01
Education level	Bachelor's	23.5±21.33	18.2±42.83	19.2±22.11	60.4±85.68
	Master's	20.8±93.38	17.2±96.24	17.3±21.32	56.10±11.96
P-value for independent t-test		0.06	0.42	<0.001	<0.001
Age (year)	≤30	24.2±60.83	19.2±26.93	18.0±93.77	62.3±78.02
	31-35	20.7±58.11	18.2±12.57	19.3±81.16	58.5±51.73
	>35	23.6±27.68	17.2±27.25	17.2±82.53	58.8±37.51
P-value for ANOVA test		<0.001	<0.001	<0.001	<0.001
Employment Status	Official	22.6±83.86	16.2±69.63	19.2±57.04	59.6±10.55
	Long-term contract-based	21.7±64.05	18.2±40.40	18.3±60.33	58.7±64.28
	Yearly-contract-based	25.0±25.87	18.2±25.01	18.0±83.39	62.2±23.02
	Project-based	24.2±16.96	19.2±42.91	19.00±2.81	62.3±59.24
P-value for ANOVA test		0.03	<0.001	0.20	<0.001
History of care provision in the COVID-19 ward	6-12 months	24.1±4.02	18.1±74.25	19.0±43.59	62.1±22.41
	More than a year	22.6±74.21	18.2±31.89	18.2±88.54	59.6±94.45
P-value for independent t-test		0.32	0.49	0.30	0.09
Type of COVID-19 ward	Special	22.5±90.72	18.3±76.02	19.2±16.22	60.5±82.63
	General	22.6±87.10	17.2±84.29	18.2±67.61	59.6±39.67
P-value for independent t-test		0.97	0.02	0.16	0.10

4. Discussion

Nursing is one of the most significant and indispensable professions in a nation's health care system [27]. Nurses constitute the majority of the health care workforce in most nations, and in some healthcare systems, they represent up to 80 percent of the workforce [28]. On the other hand, nurses, as primary members of the medical care team, are at the forefront of providing medical services, and their performance determines the quality of medical care to a substantial degree [29].

COVID-19's extensive spread has posed numerous challenges to society and healthcare providers, particularly nurses. Numerous nurses have developed physical and mental disorders and occupational fatigue as a result of these difficult and exhausting conditions, which is considered a serious threat to their health, the quality of care they provide, and the performance of the health system. According to what has been stated, the objective of this study was to measure the occupational fatigue-exhaustion recovery of nurses caring for COVID-19 patients in hospitals affiliated with Mashhad University of Medical Sciences.

The present study found a high mean score of occupational exhaustion among the studied nurses. In addition, the average score for chronic fatigue was high, while scores for acute fatigue and inter-shift recovery were moderate. In explaining this research finding, we should highlight the unique and challenging conditions under which nurses provide care to coronavirus patients. High levels of occupational stress are caused by the fear of coronavirus infection and its spread to other family members, caring for patients with changing and deteriorating clinical conditions, being away from family, working in isolated conditions, and caring for patients while wearing special clothing (masks, shields, gowns, and special clothing for the care of respiratory patients). Other contributing factors to high occupational stress include sleep disorders, irregular shifts, an increased number of patients in coronavirus wards, shortage of personal protective equipment, and limited ability to meet the physiological needs in the COVID-19 wards. In addition, the persistence of this trend for several months with a nursing staff shortage and increased workload has resulted in a rise in chronic fatigue and occupational exhaustion among nurses.

As nurses are on the front lines of combating infectious diseases and COVID-19, they are the first to be exposed to this virus. In a survey of physicians and nurses in a hospital in Wuhan, China, conducted during the COVID-19 epidemic, nurses reported high levels of burnout, anxiety, insomnia, and pain. Consistent with the current research findings, these results indicate fatigue and poor work performance [30]. Similarly, Abbasi et al. [31] found a positive and significant relationship between job conditions and nurses' occupational fatigue, such that the greater a person's perception of job-related stress and the more stressful their work environment, the more exhausted they become over time. In addition, consistent with the present study's findings, the results of other studies indicate a relationship between nurses' working conditions and their physical and mental health and that nurses' working conditions can lead to occupational fatigue [31-33].

In contrast, Wu et al. (2020) reported findings that are inconsistent with ours, in that the level of occupational fatigue in health care workers who work on the front lines of the fight against COVID-19 in Wuhan is lower than in normal departments. Wu et al. (2020) justified this finding by mentioning the sense of control and increased knowledge of frontline caregivers during the COVID-19 epidemic, as well as the possibility of using more reliable personal protective equipment. Additionally, cultural, environmental, and occupational differences between the two studies may help explain this discrepancy with the current study's findings.

The present study revealed that the average fatigue score of nurses working in the special coronavirus ward was significantly higher than that of nurses working in the general coronavirus ward. For certain reasons, including the demanding nature of caring for critically ill patients, caring for patients whose clinical conditions are constantly changing and deteriorating, working with advanced devices to manage the airways of coronavirus patients, and care provision in stressful situations, the nurses of the coronavirus special care units are considered to be a group that is at high risk of occupational fatigue. Moreover, their occupation is characterized by high expectations and immediate readiness to provide care.

In conformity with this finding, Mohammadnahal et al. [34] found that nurses caring for COVID-19 patients in special wards have a higher level of burnout and a lower level of productivity than their peers in other wards. In compliance with this finding, related studies indicate that physical symptoms, anxiety, and depression in different working conditions play a crucial role in occupational fatigue and that health care providers in special coronavirus wards experience a higher level of burnout [35, 36].

The present study revealed that the mean scores of overall occupational exhaustion and chronic and acute fatigue were significantly higher among female nurses than male nurses. The significant correlation between gender and the type of job, which is a factor affecting mental health and occupational fatigue, may explain this research finding. As a result, it can be stated that women are more susceptible to psychological disorders and occupational fatigue than men, and this can be attributed to the structure of women's personalities. This research finding is consistent with those of other studies, which demonstrate that women working with health care facilities during the COVID-19 epidemic were more vulnerable to mental health issues than men were due to the nature of their personalities as well as their mental, psychological, and physical conditions, leading to greater levels of fatigue and burnout among them [34, 37-39].

5. Conclusion

The mean occupational exhaustion score of nurses caring for COVID-19 patients was high, according to the findings of this study. The high occupational exhaustion experienced by nurses is the outcome of the nature of their occupation, which involves longer shifts, stressful work settings, direct contact with the virus, a shortage of personal protective equipment and supplies, threats to their health, and fear of contracting the disease and spreading it to other family members. Managers and policymakers of healthcare services should plan for alterations in the conditions and variables that affect fatigue and implement the necessary controls to reduce fatigue, hence improving nurses' productivity and the satisfaction of COVID-19 patients. Accordingly, nurses, the largest care-providing group to COVID-19 patients, would be enabled to provide patients with high-quality care. In addition, managers and policymakers of healthcare services are recommended to implement protective measures, such as adapting shifts to have shorter working hours and the rotation of nurses in different hospital departments, considering higher salaries and special benefits for this group of nurses, providing regular rest and an appropriate place for nurses to rest, and considering incentive and motivational plans. Additionally, hospital administrators must identify individuals suffering from occupational exhaustion and prioritize mental health and occupational fatigue training programs.

Ethical Considerations

Compliance with ethical guidelines

The cross-sectional nature of the study, the small sample size, and the physical and mental condition of the nurses participating in the study during the COVID-19 pandemic were among the study's limitations. Future research could evaluate occupational exhaustion through observation over a longer period and with larger sample sizes.

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Author's contributions

The authors equally contributed to preparing this article.

Conflict of interest

The authors have no conflict of interest to declare.

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