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Original Article

Exploring the Relationship Between Job Stress and Allergic Rhinitis among Nurses Caring for COVID-19 Patients

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Abstract

Background and aims: Allergic rhinitis is a debilitating disease which may lead to impaired quality of life and can be related to psychological stress in nurses caring for COVID-19. This study examined the relationship between job stress and allergic rhinitis in nurses caring for COVID-19 patients in educational centers affiliated to Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Methods: This descriptive-analytical research was conducted on 230 hospital nurses caring for COVID-19 patients in the city of Ahvaz in 2021. Patient recruitment was done using stratified random sampling method. The data collection tools included a demographic questionnaire, the Score for Allergic Rhinitis (SFAR), and the Expanded Nursing Stress Scale (ENSS).

Results: This study showed that the mean occupational stress score of the nurses caring for COVID-19 was 96.017 ± 35.946, which indicates a low level of occupational stress among them. The mean allergic rhinitis score of the nurses under study was 6.13 ± 3.484, and its prevalence among nurses was 46.01%. A significant correlation was observed between nursing occupational stress and allergic rhinitis among nurses caring for COVID-19 ($P = 0.019$ and $r = 0.154$).

Conclusion: Increasing awareness of the link between job stress and allergic rhinitis among health professionals is a top priority. Further research into any causal relationship between job stress and allergic rhinitis, as well as preventative public health plans for decreasing job stress in nurses, is needed.

Keywords: Nursing occupational stress, Allergic rhinitis, COVID-19

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Introduction

At the end of December 2019, the outbreak of the new corona virus, which came to be later known as COVID-19, was reported in Wuhan, China (1). According to a previous study, more than 156 million confirmed cases of COVID-19 and more than 3.2 million deaths of COVID-19 have been reported by the spring of 2021 (2). Amidst the spread of COVID-19, countries all over the world experienced tension, anxiety, and other negative feelings, and the disease quickly spread among all members of society, putting the entire countries in a psychological crisis (3). The fatal and irrepressible nature of this disease, along with relatively high rates of infection and death among healthcare professionals, long working hours and work overload can create feelings of anxiety and stress among medical staff (4). Issues such as social stigma, lack of personal protective equipment, and heavy staff workloads can exacerbate this situation. Therefore, healthcare professionals are expected to be subject to a significant psychological impact brought about by COVID-19 (5). Under such circumstances, the nurses on the frontline of the battle against COVID-19 have experienced enormous challenges. These challenges have had great impacts on their emotional state and caused job stress (6), anxiety, depression, physical, mental, and social disorders, and burnout (3, 7). There is now reliable evidence of the adverse relationship between stress and human diseases (8, 9).

Inability to effectively manage stress can negatively affect the neuroendocrine system and disturb the antioxidant equilibrium of the body, potentially resulting in adverse physiological and psychological outcomes (10). The human body maintains a balance between oxidative processes and antioxidant defenses. Oxidative stress

occurs when this equilibrium is disrupted (11). From a physiological perspective, prolonged exposure to stress potentially leads to an exaggerated immune response that may contribute to the development of allergic conditions (12). Oxidative stress plays a key role in allergic rhinitis. The oxygen free radicals produced by oxidative stress can cause damage to cells (13). Damaged cells can release active factors, including interleukin (IL)−6, IL-1β, tumor necrosis factor-α (TNF-α), prostaglandin E2 (PGE2), and nitric oxide (NO) (14).

Allergic rhinitis (AR) is a common health problem characterized by sneezing, nasal pruritus, itching, watery rhinorrhea, and nasal congestion (15). Smoke, food, pollen, house allergens, mites, odors, and fumes are the risk factors associated with allergic rhinitis (16). AR can cause nurses to suffer consequences such as a reduction in learning and work efficiency, quality of life, social activities, lower job satisfaction, sleep disorder, and inability to do their job (17). This disorder may lead to debilitation and morbidity (18). In addition, it imposes a significant socio-economic burden on families and the health care system (19). Lee et al reported a relationship between stress and allergic symptoms in children and adolescents (12). Viral infections were also found to be associated with susceptibility to allergic rhinitis (20). Asthma, atopic dermatitis, and allergic rhinitis contribute to the exacerbation of illnesses caused by common respiratory viruses (21). Several observational studies have analyzed the impact of chronic obstructive pulmonary disease and asthma on the risk of developing COVID-19. However, there are limited data regarding AR. This study aimed to bridge this gap in the literature and investigate the relationship between job stress and allergic rhinitis in nurses caring for COVID-19 patients.

Materials and Methods

Design

This research was a cross-sectional descriptive-analytical study.

Study Population

The studied population included nurses caring for COVID-19 patients in Golestan, Razi, and Sina hospitals in Ahvaz, southwest of Iran, in 2021.

Sample Size

The sample size was determined using the following formula:

$$n = \frac{\left(Z_{1-\alpha/2}\right)2\ p(1-p)}{d^2}.$$

Considering $Z_{1-\alpha/2} = 1.96$, a 95% confidence level, $P = 0.5$, d = 0.07, effect size = 0.15, and 15% dropout, the sample size was calculated to be 226.

Sampling

The participants were selected from among the three hospitals designated for COVID-19 patients in Ahvaz using convenience sampling. The participants included 114 nurses from Golestan Hospital, 76 nurses from Razi Hospital, and 36 nurses from Sina Hospital.

The inclusion criteria were: having at least one year of work experience, working in the wards designated for COVID-19 patients, having allergic rhinitis symptoms, and willingness to participate in the study. The nurses were excluded from the study if they failed to cooperate during the study or did not complete the questionnaires.

Data Collection Tools

The data were collected using a demographic questionnaire, the Score for Allergic Rhinitis (SFAR), and the Expanded Nursing Stress Scale (ENSS) developed by French et al.(22) The demographic questionnaire included information about age, gender, marital status, job position, type of work shift, level of education, history of allergies, and name of the hospital.

Score for Allergic Rhinitis (SFAR)

SAFR has been developed to diagnose allergic rhinitis and to determine its prevalence. It contains 8 questions, and its score ranges from 0 to 16. SFAR has eight components evaluating allergic rhinitis symptoms: nasal symptoms (e.g., runny nose), nasal symptoms accompanied by itchy-watery eyes, seasonal (pollen season) vs. perennial rhinitis, triggers of nasal symptoms, perceived allergic status, family history of allergy, previous positive tests of allergy, and previous medical diagnosis of allergy. Patients with an SFAR score of ≥ 7 are considered to have allergic rhinitis, and people with an SFAR score of ≤ 7 are considered to be free of allergic rhinitis. The reliability and validity of SFAR was confirmed by Annesi-Maesano et al in France with a Cronbach's alpha of 0.79 (23). In this study, a Cronbach's alpha of 0.894 was reported for this scale.

The Expanded Nursing Stress Scale (ENSS)

The ENSS was developed by French et al in 2000. It is a revised version of the Nursing Stress Index (NSI) which was developed by Gray-Toft and Anderson in 1981 and was the first tool aimed at measuring stress associated with the nursing profession as opposed to general occupational stress. This scale includes 57 questions in 9 components, including death and dying (7 items), problems with peers (6 items), conflict with physicians (5 items), uncertainty concerning treatments (9 items), inadequate emotional preparation (3 items), discrimination (3 items), problems with supervision (7 items), patients and their families (8 items), and workload (9 items). A 6-point Likert scale is used to score ENSS, and the respondent must pick one of the following options based on their frequency of experience regarding the situation described: 1- I am not stressed at all, 2- I am sometimes stressed, 3- I am stressed most of the times, 4- I am extremely stressed, 5- This is not within my duties, and 6- A zero score is given when

the situation described is not applicable to the respondent. The minimum and maximum possible scores are 0 and 285, respectively, with higher scores representing higher job stress in that particular area. Scores between 57 and 114 indicate low nursing stress, those between 114 and 171 represent moderate nursing stress, and those above 171 characterize high nursing stress (22). An inter-item correlation coefficient of 0.854 and an internal reliability of 0.92 have been reported for this scale (24). The Cronbach's α coefficient and the internal reliability obtained in this study were 0.88 and 0.91, respectively.

Statistical Analysis

Data were analyzed in SPSS version 22.0 using independent *t*-tests. Data were explained using descriptive statistics, including frequency, percentage, mean, and standard deviation. Pearson's correlation coefficient, one-way analysis of variance, and logistic regression were used to analyze the data. The Kolmogorov-Smirnov test was used to check the normality of the data. A significance level of 0.05 was set for all tests.

Results

A total of 226 nurses caring for COVID-19 patients participated in the present study. The majority of the participants were in the age group of 20-30 years, with 184 being female (81.4%) and 42 (18.6%) being male. Other demographic information of the patients is listed in Table 1.

According to the results of ENSS, the level of occupational stress was high in 7 nurses (3.1%), moderate in 103 (45.58%), and low in 90 (39.82%), and 26 (11.5%) of the participants were not stressed at all. The uncertainty concerning treatments had the highest mean score among the components of ENSS. Finally, the level of nursing stress in women (100.91 ± 35.83) was higher than that in men (75.50 ± 30.48) (Table 2).

According to the results of SFAR, allergic rhinitis was observed in 101 people (46%), of whom 89 (88.11%) were women and 15 (11.89%) were men, indicating a greater prevalence of allergic rhinitis among women compared with men ($P = 0.02$). The most frequent symptom of allergic rhinitis in nurses was sneezing (151 people, 66.81%), followed by runny nose (145 people, 64.15%) and nasal congestion (18 people, 7.96%) (Tables 3 and 4).

The symptoms of allergic rhinitis in autumn were the most prevalent among the nurses caring for COVID-19 patients, and they were observed in 83 nurses (36.72%) (Table 5).

The most frequent allergen that the nurses were allergic to was house dust, with 56 (24.77%) people complaining of this symptom (Table 3).

In order to investigate the relationship between nursing stress and allergic rhinitis in nurses caring for COVID-19 patients, Pearson's correlation test was used, and the results of this test indicated a significant relationship ($P = 0.019$) between the two variables, with a correlation coefficient of 0.154. Finally, due to the existence of a significant relationship between the history of seasonal allergies, runny nose, and nasal congestion, and allergic rhinitis, these three variables have a significant relationship with allergic rhinitis as a single variable, and the final regression table was obtained as described above. According to the *P*-value ($P = 0.000$) obtained for the history of seasonal allergy, it had a significant relationship with allergic rhinitis, and since OR = 13.5, the history of seasonal allergy had a 13.5-fold effect on allergic rhinitis, with 6.32 and 28.57 as its minimum and maximum values, respectively. According to the *P*-value ($P = 0.001$) obtained for the symptom of runny nose, it had a significant relationship with allergic rhinitis, and since OR = 13.88, runny nose had a 13.88-fold effect on

Table 1. Demographic Characteristics of Participants (n = 226)

Variable	Group	Frequency (percentage)
Gender	Female	184 (81.41)
	Male	42 (18.59)
Age	20-30 years	151 (66.81)
	31-45 years	69 (30.53)
	46-60 years	6 (2.66)
Married	Single	112 (49.55)
	Married	114 (50.45)
Employment status	Nurse	222 (98.23)
	Supervisor	3 (1.32)
	Head nurse	1 (0.45)
Shift	Rotating	216 (95.57)
	Fixed	10 (4.43)
Education	Bachelor's degree	207 (91.59)
	Master of science	19 (8.41)
History of allergic rhinitis	Yes	96 (42. 48)
	No	130 (57.52)

Table 2. The Mean Scores of Different Components of ENSS (n = 226)

Component	Mean	Standard deviation
Death and dying	13.30	5.022
Conflict with physicians	8.13	3.966
Inadequate emotional preparation	4.07	2.332
Problems with peers	8.34	4.085
Problems with supervisors	12.34	5.901
Workload	16.64	6.681
Uncertainty concerning treatment	17.30	6.623
Patients and their families	13.52	5.513
Discrimination	2.37	2.555
The overall score of nursing stress	96.017	35.946
The mean of overall score of nursing stress	Male	Female
	75.50	100.91
Standard deviation of overall score of nursing stress	Male	Female
	30.48	35.83
P-value	0.000	

Table 3. Prevalence of Symptoms of Allergic Rhinitis and Allergens among Nurses Caring for COVID-19 Patients (n = 226)

Symptom/allergen	Frequency (percentage)
Symptoms of allergic rhinitis	
Sneezing	151 (66.81%)
Runny nose	145 (64.15%)
Nasal congestion	18 (7.96%)
Allergen	
House dust	56 (56%)
Pollens	42 (42%)
Animals	2 (2%)

Table 4. Prevalence of Allergic Rhinitis by Gender

Variable	Gender	Prevalence		*P*-value
		Yes (percentage)	No (percentage)	
Allergic rhinitis	Male	12 (11.89)	30 (24)	0.02
	Female	89 (88.11)	95 (76)	

Table 5. Prevalence of Allergic Rhinitis in Different Seasons of the Year among Nurses Caring for COVID-19 Patients (n = 226)

Season	Allergic rhinitis	Frequency (percentage)
Summer	Yes	44 (19.46)
	No	182 (80.54)
Autumn	Yes	82 (36.28)
	No	144 (63.72)
Winter	Yes	8 (3.53)
	No	218 (96.47)
Spring	Yes	53 (23.45)
	No	173 (76.55)

Table 6. Relationship between the Studied Components among Nurses Caring for COVID-19 Patients (n = 226) Using Logistic Regression Analysis

Step 1	B	S.E.	Sig	OR (Exp(β))	95% confidence intervals for OR	
					Lower	Upper
Allergy (1)	-2.606	0.387	0.000	13.5	6.329	28.57
Runny nose (1)	-2.635	0.813	0.001	13.88	2.83	66.66
Congestion (1)	-2.687	0.856	0.002	14.7	2.74	76.92
Constant	4.079	0.860	1000	59.070		

allergic rhinitis, with 2.83 and 66.66 as its minimum and maximum values, respectively. According to the *P*-value ($P = 0.002$) obtained for the symptom of nasal congestion, it had a significant relationship with allergic rhinitis, and since OR = 14.7, nasal congestion had a 14.7-fold effect on allergic rhinitis, with its minimum and maximum values being 2.74 and 76.92, respectively (Table 6).

Discussion

According to our results, the average level of occupational stress was low. A previous study investigated the level of stress, fatigue, and depression among 705 front-line nurses battling against COVID-19. Their results indicated a high level of stress among these nurses, which is contrary to our results (25). This difference in results could be due to differences in sample size, different working conditions, and stress measurement tools for nurses.

There was a statistically significant correlation between nursing occupational stress and job position, and there was also a statistically significant correlation between nursing occupational stress and gender, indicating a higher level of occupational stress among women compared to men. Zhan et al studied the factors related to insomnia among nurses on the front line of the fight against COVID-19 in Wuhan, China. The results showed that female nurses caring for COVID-19 patients were more stressed and depressed (25). However, there was no statistically significant relationship between nursing stress and other demographic variables.

The prevalence of allergic rhinitis among these nurses was 46%. In a study conducted in 2018 in Pakistan, Siddiqui et al investigated the prevalence of allergic rhinitis among healthcare professionals and its effects on their job (26). The prevalence of allergic rhinitis among healthcare workers was 19%, and 13 nurses missed their work in the past week. After a comparison was made with the actual hours they worked, it was found that 35.9% of their work was impaired due to this condition. Allergic rhinitis is an annoying disease which has a negative effect on the work productivity of healthcare workers. They also found that the prevalence of allergic rhinitis in women was 48.4%, which was higher compared to men (28.9%) who had this condition. Siddiqui et al showed that women were 2.2 times more susceptible to allergic rhinitis than men were (28.8% among women vs. 12.9% among men) (26).

Another finding of this research was related to the prevalence of allergic rhinitis in different seasons, where 83 people (35.7%) had symptoms in the fall season and 53 people (23.6%) in the spring season. Passali et al studied people in 4 different geographical regions of Asia, Europe, America, and Africa. They reported that the prevalence of allergic rhinitis was highest in spring (51.92%) and autumn (28.85%) (27).

In this study, we aimed at investigating the association of allergic rhinitis with occupational stress in nurses. According to the results of the present study, there was a significant relationship between allergic rhinitis and occupational stress in nurses ($P = 0.019$, $r = 0.154$).

Thompson et al investigated the quality of life of patients with allergic rhinitis and found that people with allergic rhinitis had symptoms such as sneezing, eye problems, rhinorrhea or nasal congestion, and itching. Moreover, there was a decrease in their quality of life, emotional well-being, and social functioning. In addition, clinical trial data show that a variety of drug treatments can significantly improve the quality of life and health in patients with allergic rhinitis (28).

In another study conducted at Suez Canal University Hospital in Egypt by El Hennawi et al, the relationship between psychological stress and persistent allergic rhinitis

was confirmed with the aim of improving treatment and quality of life. It was shown that allergic rhinitis is heavily influenced by psychological stress. Moreover, when combination therapy with imipramine and levocetirizine was used to control stress, allergic rhinitis symptoms improved and quality of life was enhanced (29).

We found a statistically significant correlation between allergic rhinitis and seasonal allergy. In the last 6 months during the COVID-19 pandemic, 40.26% of people had seasonal allergies and symptoms of allergic rhinitis, and only 5 people (2.21%) did not experience symptoms of allergic rhinitis, indicating that the use of masks and protective coverings during the COVID-19 pandemic does not have a significant impact on the prevalence of allergic rhinitis symptoms, which is not consistent with the results of the study conducted by Dror et al (30). Dror et al examined the relationship between allergic rhinitis symptoms and using a face mask during the COVID-19 epidemic among nurses with allergic rhinitis in Israel. The results showed a significant reduction in the symptoms of allergic rhinitis in nurses wearing a face mask (N95 or surgical mask). The use of masks based on specific allergen profiles can be considered as a preventive measure to minimize the exposure of the respiratory tract to irritating allergens in crowded environments. Airborne allergens such as pollen (10-100 mm), fungal spores (2-50 μm), and house dust mite feces (10–40 μm) are major contributors to IgE-mediated immune reactions that cause common symptoms of allergic rhinitis. While standard surgical masks can filter out particles larger than 3 μm, N95 respirators are capable of filtering particles as small as 0.04 μm (30). Masks made of tightly woven fabric fibers (such as N95 respirators) can make breathing more difficult and create greater negative pressure during inhalation. This can result in significant pressure drops across the mask, potentially causing unfiltered air to enter through gaps in the mask seal (31). Moreover, face masks raise both the temperature and humidity of the air being inhaled in the space between the mask and the airways, which may suppress nasal reactions to allergen exposure (32). In addition to their direct filtration ability, masks might help alleviate allergic rhinitis symptoms by modifying the moisture and warmth of inhaled air. Even allergens that are not fully blocked by the mask may trigger less severe allergic reactions when a mask is worn (30).

The prevalence of the COVID-19 disease was one of the main limitations of our study, which made it difficult to have access to these nurses, and their high workload also made it difficult for them to complete the questionnaires during the COVID-19 disease outbreak.

Future studies could explore how the use of masks and personal protective equipment correlates with the prevalence of allergic rhinitis. They may also examine the impact of nurses' workplace environments on the onset of allergic rhinitis, identify additional contributing factors among nurses, and assess the link between occupational stress and allergic rhinitis in other healthcare professionals.

Conclusion

Our results offer a deeper insight into how COVID-19 pathogenesis relates to respiratory allergic conditions, indicating that healthcare professionals should recognize the heightened susceptibility and severity of COVID-19 associated with such diseases throughout the pandemic. Therefore, considering the prevalence and wide spread of allergic rhinitis in these nurses, the relationship this disease has with stress and long-term use of masks and protective covering in these nurses, as well as the side effect it has had on their professional lives, comprehensive programs should be designed and implemented to reduce the nurses' stress and prevent the occurrence of allergic rhinitis.

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Authors' Contribution

Conceptualization: Mahsa Elahi, Shahram Molavynejad, Nasrin Elahi, Amir Hooshang Bavarsad, Mohammad Hossein Haghighizadeh.
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Competing Interests

The authors declare that they have no conflict of interests.

Data Availability statement

The datasets generated and analyzed during the current study are not publicly available to protect the participants' confidentiality. However, they are available from the corresponding author on reasonable request.

Ethical Approval

All participants or their legal guardians signed the written informed consent. They understand that their names and initials will not be published and due efforts will be made to conceal their identity. Additionally, all methods were carried out in accordance with relevant guidelines and regulations. All protocols were approved by the Research Ethics Committee of Ahvaz Jundishapur University

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