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Article

Fear of Infection and Related Occupational Factors in Pre-Hospital Emergency Personnel

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Abstract

Introduction: The phenomenon of fear of infection is a significant challenge for healthcare systems, particularly among personnel working on the front lines. Pre-hospital emergency personnel, as a crucial part of the frontline healthcare workforce, experience the highest level of fear of infection among all healthcare workers worldwide. Investigating the fear of infection and its related occupational factors can be effective in managing this challenge. **Objective:** This study aims to assess the level of fear of infection and related occupational factors among personnel working in pre-hospital emergency operations. **Methods:** This cross-sectional study was conducted in Iran in 2024. The sample size consisted of 270 pre-hospital emergency operational staff selected through random sampling. Data collection tools included a demographic questionnaire and the Fear of Infection Evaluation Questionnaire (adult version of the Fear of Infection and Virus Evaluation - FIVE). SPSS software version 23 was used for data analysis. **Results:** The findings showed that the mean fear of infection score was 69, which is considered moderate. The Kruskal-Wallis statistical test revealed significant relationships between fear of infection and variables such as exposure to blood and secretions, the number of needlestick injuries, and participation in mental health and infection control courses ($P < 0.05$). In other words, Needlestick injury frequency was significantly associated with fear of infection, with the highest fear levels observed in those with 6-10 injuries. Additionally, participation in mental health and infection control courses was associated with higher mean fear scores. No significant relationships were found between fear of infection and place of service (urban or roadside base), adherence to personal protection principles, work experience, or educational level. **Conclusion:** Assessing the fear of infection and its related factors can help in planning to reduce occupational challenges among these personnel, which may ultimately lead to improved community health outcomes.

Keywords: fear of infection; pre-hospital emergency personnel; occupational factors; FIVE

Introduction

Fear, as a fundamental survival mechanism, helps individuals react in potentially life-threatening situations. Through this phenomenon, people respond to both immediate and tangible threats as well as more abstract concerns. Fear can also be acquired through past experiences or observations, leading to changes in organ function and metabolism, which ultimately result in behavioral modifications such as fleeing, freezing, or hiding from the perceived threat (1, 2). This phenomenon not only overshadows our mental health but also impairs our physical health and cognitive abilities (3, 4). Prolonged fear can deplete the body's natural resources, leading to permanent damage to the immune system. Extended periods of fear may be described as adrenal fatigue, burnout, overload, maladaptation, or dysfunction (4, 5).

Among the common types of fear is the fear of transmitting infections among healthcare providers (particularly personnel directly involved with patients), which was prominently observed during the COVID-19 pandemic, epidemics of infectious diseases such as cholera, HIV, and SARS, as well as other contagious infectious diseases. This phenomenon can lead to fear of contracting infections, fear of providing inadequate care to patients with limited support resources, fear of carrying the virus home and infecting family and friends, fear of stigmatization, and many other types of fear (6, 7).

A study on healthcare workers indicated that medical care staff experienced symptoms of depression (50.4%), anxiety (44.6%), insomnia (34%), and distress and fear (71.5%). According to the results of this study, women and individuals who had direct contact with COVID-19 patients (pre-hospital and hospital emergency personnel - intensive care unit staff) reported higher levels of these psychological symptoms (8, 9).

Among healthcare service providers, pre-hospital emergency personnel are at risk due to their presence in situations that expose them to abnormal, high-risk, and stressful behaviors in various settings such as accident scenes, traffic, public places, rivers, and even forests, and they express the highest fear of infection. In this regard, the Centers for Disease Control and Prevention (CDC), in an article titled "Caring for Patients with Infectious Diseases," has identified pre-hospital emergency personnel as being at "major occupational risk" due to their job duties. Furthermore, a study conducted by the National Institute for Occupational Safety and Health (NIOSH) in collaboration with the National Highway Traffic Safety Administration (NHTSA) regarding the assessment of injuries and illnesses among pre-hospital emergency personnel shows that, unfortunately, pre-hospital emergency service providers have higher rates of mortality and injuries compared to the general workforce. Approximately 6,000 paramedics and pre-hospital emergency personnel are annually exposed to harmful infectious complications from blood and life-threatening respiratory secretions (8, 10, 11).

Assessing and measuring the presence of fear and the psychological impact of epidemics is essential for helping individuals and communities (especially those directly involved with diseases) face psychological challenges and overcome them (12).

Methods

This descriptive cross-sectional study was conducted in 2024 using stratified random sampling (samples were randomly selected from each stratum) on 270 operational personnel of pre-hospital emergency services in several provinces of Iran. Participants completed two questionnaires—demographic and fear of infection—in either paper-based or electronic format. Inclusion criteria included being employed in the operational section of pre-hospital emergency services, not having a life-threatening infectious disease contracted outside the work environment, and willingness to participate in the research. The exclusion criterion was unwillingness to continue participation in the study.

Data Collection Instruments

The data collection instruments in this study consisted of two questionnaires:

A) Demographic Questionnaire: This included age, gender, educational level, work experience, type of workplace (urban base or roadside base), history of exposure to blood and secretions, history of needlestick injuries, history of participation in mental health courses, and history of participation in infection control courses, which were completed in self-report form by the participants.

B) Fear of Illness and Virus Evaluation (FIVE) – Adult Report Form: This is a 35-item questionnaire, the adult version of the Fear of Infection and Virus Evaluation tool, which was validated in a study by Tounsi et al. in 2021, reporting an internal reliability of 0.81 and internal consistency of subscales ranging from 0.84 to 0.92 (13). This instrument has three versions (child, adult, and parent). The adult version evaluated in this study consists of 4 subscales and 35 items. In the first two dimensions (subscales) of this instrument, participants respond to a range of options (from "I am not at all worried about this" (1) to "I am always worried about this" (4)), and in the third and fourth dimensions, they respond to another range of options (from "I have not done this in the past week" (1) to "I have done this constantly in the past week" (4)). A higher score on the subscales of Fear of Contamination and Illness and Fear of Social Distancing indicates greater severity of fear. A higher score on the subscale of Behaviors Related to Fear of Illness and Virus indicates a higher frequency of fear-related behaviors, and a higher score on the subscale of Impact of Fear of Illness and Virus indicates a greater level of potential impairment.

SPSS software version 23 was used for data analysis.

Ethical Considerations

Ethical considerations observed in this study included obtaining informed written consent from participants after providing necessary explanations about the study and ensuring confidentiality of information. This study was approved by the Ethics Committee of Hamadan University of Medical Sciences under the code IR.UMSHA.REC.1403.638.

Results

The study population consisted of 270 pre-hospital emergency personnel in Iran. The results indicate that the majority of participants were married (68.2%) and worked in urban bases. Approximately 73% reported a history of hazardous exposure to blood and secretions, and 66.6% reported a history of needlestick injuries. Regarding training, 62.6% had a history of participation in mental health courses, and 78.5% had a history of participation in infection control courses. Furthermore, only 5.7% of participants stated that they adhered to personal protection principles to a limited extent, and over 90% of participants reported no history of psychiatric illness.

Information regarding the study population is presented in Table 1.

Table 1. Demographic characteristics.

row	characteristic type	Indicator	amount	percentage
1	Marital status	Single	87	32/3%
		Married	183	67/7%
		Separated from spouse or deceased spouse	0	.
2	Educational degree	Associate	52	19/2%
		Expert	184	68/2%
		Masters	30	11/1%
		PhD	4	1/5%
3	Emergency base location	Urban	153	56/6%
		Road	117	43/4%
4	Work history	One to five years	43	15/9%

		Six to ten years	89	33%
		Eleven to twenty years	116	43%
		More than twenty years	22	8/1%
5	History of exposure of mucous membranes and wounds to blood and secretions	None	74	27/4%
		One to five cases	108	40%
		6 to 10 cases	23	8/6%
		More than 10 cases	65	24%
6	History of needlestick	None	90	33/4%
		One to five cases	162	60%
		6 to 10 cases	9	3/3%
		More than 10 cases	9	3/3%
7	Level of compliance with personal protection principles	Good	132	48/8%
		Average	124	45/9%
		Low	14	5/7%
8	History of mental illness (depression, severe anxiety, etc.)	Not reported.	101	%37.4
		Reported.	102	%37.8

Evaluation of the level of fear of infection and illness based on the four dimensions of the questionnaire (Fear of Contamination and Illness, Fear of Social Distancing, Behaviors Related to Fear of Illness and Virus, and Impact of Fear of Illness and Virus), as well as the age of the study participants, is reported in Table 2.

Table 2. Data distribution and cross-correlations.

Variable	Maximum	Minimum	Average	Standard Deviation
Age	55	20	34.45	6.21
Fear of contamination and disease	36.00	9.00	17.86	5.84
Fear of social distancing	39.00	10.00	19.57	6.77
Behavior related to disease and fear of virus	47.00	14.00	26.49	9.25
Effect of fear of disease and virus	8.00	2.00	5.07	1.51
overall score	127.00	37.00	69.00	20.99
total number	270			

The mean age of the study participants was approximately 34 years, with the oldest participant being 55 years old and the youngest 20 years old. The average level of fear of infection based on the four dimensions of the questionnaire was approximately 69, which is reported in the moderate to high range. Furthermore, the mean scores of other dimensions of the questionnaire, considering the number of items, are also reported within the moderate range.

The correlation between the total mean score and dimensions of fear of infection with the demographic questionnaire indicators is reported in Table 3

Table 3. The correlation between the total mean score and dimensions of fear of infection.

Indicator	Fear of contamination and disease	Fear of social distancing	Behavior related to disease and fear of virus	Effect of fear of disease and virus	overall score
age spearman	.078	.276	.249	.006	.117

Marital Status	Mann-Whitney U Wilcoxon W	Single	17.40	19.69	26.26	5.02	68.39
		Married	18.06	19.51	26.59	5.09	69.27
		Asymp. Sig. (2-tailed)	.543	.496	.493	.831	.569
Education Level	Kruskal-Wallis H	Associate	16.96	18.32	25.03	4.38	64.70
		Bachelor's	18.32	20.11	27.29	5.30	71.02
		Master's	17.38	19.19	24.70	5.09	66.38
		PhD	13.50	15.50	24.50	4.00	57.50
		Asymp. Sig. (2-tailed)	.162	.291	.306	.002	.506
Emergency Base Location	Mann-Whitney U Wilcoxon W	Urban	18.03	20.05	26.96	5.05	70.10
		Road	17.63	18.92	25.85	5.09	67.50
		Asymp. Sig. (2-tailed)	.764	.181	.418	.875	.237
Work Experience	Kruskal-Wallis H	1-5 years	17.46	19.02	25.67	4.32	66.48
		6-10 years	16.92	18.80	24.23	5.00	64.96
		11-20 years	18.33	19.66	27.87	5.34	71.21
		>20 years	19.66	22.59	29.44	5.33	77.03
		Asymp. Sig. (2-tailed)	.096	.263	.024	.004	.040
Exposure to Blood/Secretions	Kruskal-Wallis H	None	16.46	18.76	24.65	4.61	64.49
		1-5 cases	17.19	18.76	24.87	4.84	65.68
		6-10 cases	22.23	23.92	33.61	6.00	85.76
		>10 cases	18.59	19.95	28.04	5.49	72.08
		Asymp. Sig. (2-tailed)	.000	.002	.000	.000	.000
Needlestick History	Kruskal-Wallis H	None	16.53	18.48	24.71	4.63	64.37
		1-5 cases	18.25	19.80	26.72	5.15	69.93
		6-10 cases	26.66	27.66	42.66	8.00	105.00
		>10 cases	17.71	20.71	29.57	6.00	74.00
		Asymp. Sig. (2-tailed)	.001	.009	.001	.000	.001
Participate in a mental health course	Kruskal-Wallis H	None	16.46	17.49	23.04	4.45	61.46
		Less than 10 hours	18.54	20.38	26.90	5.24	71.07
		11-20 hours	18.85	21.60	31.50	5.75	77.70
		More than 20	19.15	21.15	30.00	5.68	76.00
		Asymp. Sig. (2-tailed)	.006	.002	.000	.000	.000
Participate in an infection control course	Kruskal-Wallis H	None	15.70	16.12	22.31	4.37	58.51
		Less than 10 hours	18.40	20.80	26.51	5.11	70.84
		11-20 hours	18.57	20.05	28.62	5.35	72.61
		More than 20	18.42	20.21	30.60	5.71	74.96
		Asymp. Sig. (2-tailed)	.001	.000	.000	.000	.000
Compliance with PPE	Kruskal-Wallis H	Good	19.00	20.25	22.75	4.75	66.75
		Moderate	18.54	20.41	27.08	5.22	71.27
		Low	17.16	18.72	26.02	4.92	66.84

		Asymp. Sig. (2-tailed)	.061	.054	.724	.381	.200
History of Mental Illness	Mann- Whitney U	Yes	17.99	19.66	26.75	5.07	69.49
		No	16.75	18.82	24.25	5.00	64.82
	Wilcoxon W	Asymp. Sig. (2-tailed)	.355	.643	.127	.602	.316
History of Mental Drug	Mann- Whitney U	Yes	17.96	19.68	26.64	5.08	69.37
		No	16.14	17.57	23.78	4.78	62.28
	Wilcoxon W	Asymp. Sig. (2-tailed)	.281	.223	.225	.650	.187

Correlation between participants' age and the total mean score and dimensions of fear of infection shows that age is only correlated with the Impact of Fear of Illness and Infection dimension, with a correlation coefficient of 0.166, but it is not correlated with other dimensions or the total mean score of the Fear of Infection and Virus questionnaire. Furthermore, the Kruskal-Wallis test showed that the total mean fear score and its dimensions (except for the Impact of Fear of Illness and Infection dimension) did not differ across different educational levels; however, the lowest mean fear level was observed among personnel with doctoral degrees.

Regarding the correlation between work experience and fear, the total fear score, the Behaviors Related to Fear of Illness and Virus dimension, and the Impact of Fear of Illness and Virus dimension were significant across different levels of work experience, indicating differences. (Individuals with less than 5 years of experience showed high fear levels; after 5 years, fear levels decreased but then followed an increasing trend). Additionally, the Kruskal-Wallis test showed that the total fear score and its dimensions were significant across different frequencies of hazardous exposure to blood and secretions, such that greater exposure led to an increase in the mean fear score.

Regarding the correlation between the frequency of needlestick injuries and the total mean score and dimensions of fear of infection and virus, the results show that the total fear score and its dimensions differ significantly across different frequencies of needlestick injuries. Personnel with no history of needlestick injuries or with a high frequency of needlestick injuries expressed less fear compared to other groups.

The Kruskal-Wallis test showed that the total mean fear score and its dimensions differed significantly across different levels of participation in mental health and infection control courses, such that individuals with higher mean training hours had higher mean fear scores.

Regarding the correlation between the total mean score and dimensions of fear of infection and virus with adherence to personal protection principles, history of mental illness, workplace (urban or roadside), and marital status, no significant differences were observed.

Discussion

Pre-hospital emergency personnel, as the front line of the healthcare system, are among the most important components of health systems worldwide. In this study, due to the importance of personnel involved in the front line of exposure to diseases, pre-hospital staff were evaluated regarding their level of fear of infection and related factors. Addressing the problems and challenges faced by these personnel is of great importance due to their critical role in maintaining community health, and various studies in this area can contribute to improving public health outcomes. Although it appears that the level of fear of infectious diseases among healthcare workers has not diminished according to studies, the emergence of new diseases can lead to changes in the perspectives and performance of healthcare providers (11, 14). Infectious diseases among healthcare workers can be transmitted through various routes including: airborne, foodborne, through cuts and skin injuries

(such as bloodborne infections), and through transmission via the mouth and conjunctiva (such as splashing blood and secretions onto the face and mouth) (15).

In this study, the adult version of the Fear of Infection and Virus Evaluation (FIVE) tool was used after translation and psychometric evaluation into Persian, which has been employed in various studies including those by Çölkesen et al. in 2020 (16) and Erençan Balaban and Potas in 2024 (17). Regarding the level of fear of infection and virus, a study by ŞENOL et al. stated that although adherence to personal protection principles was generally at an acceptable level, fear and concern about transmitting an infectious disease while caring for patients was reported at approximately 59% among these personnel (14). Furthermore, according to research by KHAN et al., pre-hospital emergency personnel have a moderate level of fear of infection, with the greatest concern being about transmitting infectious diseases through respiration (approximately 71%), which is consistent with the results of the present study regarding the level of fear of infection (9).

Regarding the correlation between fear of infection and other factors and components, Qin et al. 2023 (18) stated that there is a correlation between the level of fear of infection and somatic problems (anxiety, depression, obsession, etc.). However, in the present study, the correlation between fear of infection and history of psychiatric illnesses was not significant, which could be due to differences in the target population as well as the type of patient care provided in the pre-hospital emergency setting. Additionally, a study by Hançerlioglu and Toygar 2023 (19) indicated that fear of infection is effectively related to nurses' low knowledge levels, while in the present study, there was no significant difference between educational level and fear of infection except in the fear of infection dimension, across other questionnaire dimensions and the total score. Regarding the correlation between fear of infection and participation in infection control and mental health courses, it was found that these courses were associated with higher levels of fear of infection, which could be due to the non-specialized nature of these courses, access to news and data that increase fear levels, or the absence of relevant courses in postgraduate educational curricula.

One of the most notable findings of this study was the positive association between participation in mental health and infection control courses and higher fear scores. At first glance, this may seem counterintuitive, as such courses are typically designed to reduce fear and enhance preparedness. However, a reverse causality explanation is more plausible: it is likely that individuals with inherently higher levels of fear, or those who have experienced more frequent hazardous exposures, self-select into participating in these educational programs. In other words, rather than courses increasing fear, fearful individuals seek out more training to cope with their concerns. This interpretation is consistent with health behavior theories suggesting that perceived threat often motivates information-seeking behavior (23). Due to the cross-sectional design of this study, we cannot determine the direction of causality. Longitudinal studies are needed to clarify whether training programs actually reduce fear over time or merely attract more fearful participants.

Tan et al. 2021 (20) associated fear of infection with gender and disease experience, stating that females and those without disease exposure or experience feel more fear. However, in the present study, there was a significant difference between fear of infection and hazardous exposure to blood and secretions, as well as history of needlestick injuries, with greater exposure corresponding to higher mean fear scores.

Meanwhile, Parchini et al. 2021 (21) reported that healthcare personnel experienced the highest levels of fear and concern regarding harm to their close ones, which is consistent with the results of Tayyib NA, Alsolami FJ 2020 (22). However, in the present study, there was no difference in fear of infection based on family structure (married or single).

Furthermore, in the present study, no significant difference was observed between fear of infection and participants' workplace (urban or roadside base), nor with work experience, and differences in these areas were not significant. It is also important to note that fear and concern about the possibility of contracting these diseases can effectively negatively impact healthcare workers' performance, and in many cases, lead to an increase in medical errors, unintentional harm to patients, and an increase in missed nursing care, ultimately jeopardizing patient safety as one of the important

issues in the healthcare field (11, 17, 7). Fear of infection is a complex phenomenon influenced by numerous cultural, social, economic, and political factors, and conducting studies using different methods and in various communities, especially regarding personnel and individuals with direct exposure to diseases, can be important.

Conclusion

Based on the results obtained from the present study, the level of fear of infection among pre-hospital emergency operational personnel was reported as moderate to high. These personnel are classified by the Centers for Disease Control and Prevention (CDC) as being at major risk. Investigating occupational factors related to the level of fear, including work experience, level of exposure to risk factors, participation in mental health and infection control courses, and examining the level of adherence to personal protection principles among these personnel, can be helpful in planning and shaping a comprehensive model for care and management of fear of infection in this workforce.

Limitations

This study has several limitations. First, its cross-sectional design prevents us from establishing causal relationships; this is particularly relevant for the observed association between training participation and fear levels, where reverse causality cannot be ruled out. Second, the use of self-report questionnaires may introduce recall bias and social desirability bias. Third, the study was conducted only in several provinces of Iran, which may limit the generalizability of findings to other regions or countries. Fourth, we did not measure potential confounding variables such as general stress levels, organizational support, or access to personal protective equipment. Future longitudinal studies with larger and more diverse samples are recommended to confirm these findings.

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Conflicts of Interest: The authors of this study report no conflict of interest.

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