Published online 2022 October 20 **Original Article**

COVID-19-Related Absenteeism and Presenteeism among Healthcare Workers

Maryam Yaghoubi[1], Mohammad Salimi[2], Mohammad Meskarpour-Amiri[3] and Sayyed Morteza Hosseini-Shokouh[3,*]

[1]Associate Professor, Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran
[2]MSc, Student Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran
[3]Assistant Professor, Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

*** *Corresponding author:*** Sayyed Morteza Hosseini-Shokouh, Health Management Research Center, Baqiyatallah University of Medical Sciences, Sheikh Bahaee street, Nosrati alley, Tehran, Iran. Tel: +982188057022; Email: hosainysh.morteza@gmail.com

Received 2021 December 25; **Revised** 2022 January 23; **Accepted** 2022 October 03.

Abstract

Background: The increase in the workload of healthcare workers during the coronavirus disease 2019 (COVID-19) pandemic has added further responsibilities for their health.

Objectives: This study was conducted to measure the amount and economic value of COVID-19-related absenteeism and presenteeism and its affecting factors among physicians, nurses, and paramedics working frontline with COVID-19 patients.

Methods: This cross-sectional study was conducted in a COVID-19 tertiary central hospital in Tehran, Iran. Totally, 250 hospital staff who were working frontline with COVID-19 patients between October to December 2020 were entered in the study. The samples included 100 physicians, 96 nurses, and 56 paramedics. The Valuation of Lost Productivity Questionnaire was used to measure job characteristics, absenteeism, and presenteeism. The human capital approach was employed for the valuation of absenteeism and presenteeism. Data were analyzed using ordered logistic regression with backward elimination and the removed value of 0.1 in Stata 14.

Results: Based on the results, the COVID-19 infection rate was 14.4% among healthcare workers, 8% among physicians, 18.6% among paramedics, and 18.7% among nursing staff. A significant association was found between the amount of absenteeism and working in intensive units (odds ratio [OR]: 3.511, P=0.000). A higher amount of absenteeism was related to first-time COVID-19 infection among all participants (OR: 4.918, P=0.000). Current smoker staff, in comparison to quitted smoking staff, was 2.995 times more likely to have a higher amount of presenteeism (OR: 2.995, P=0.030).

Conclusion: COVID-19 had a significant effect on both absenteeism and presenteeism of healthcare workers and its amount and value were unequal among physicians, nurses, and paramedics. Policymakers should do their best to minimize the productivity loss of healthcare workers.

Keywords: Absenteeism, COVID-19, Health personnel, Presenteeism

1. Background

In workplaces, the economic burden of poor health is not only associated with medical and treatment costs, but also with health-related productivity losses due to sick leave (called absenteeism) and reduced on-the-job performance due to uncontrolled diseases or health risks (called presentism) (1).

Presenteeism is the presence of an employee at the workplace while being ill and is a source of productivity loss for employers, especially in healthcare (2). It is one of the most expensive and challenging problems in the healthcare industry (3). Presenteeism, in addition to reducing interest and being expensive, affects patient safety and the quality of care results (4). Productivity loss can be one of the indicators of the burden of a disease, such as a coronavirus disease 2019 (COVID-19), which occurs as absenteeism and presenteeism both in infected and quarantined people (5-9). Presenteeism is a risk factor for the health of people and the incidence of absenteeism in the future (10). Moreover, both absenteeism and presentism also increase organizational costs (11). Infectious diseases, such as COVID-19, affect the physical and mental health of frontline healthcare workers leading to poorer clinical performance and productivity, along with elevated concerns about transmitting the infection to family members (12, 13). The increase in the workload of healthcare staff during the COVID-19 pandemic (14) has caused further responsibilities for them in addition to treating COVID-19 patients and helping to reduce disease prevalence. Some of these tasks include taking care of themselves and their families, treating non-COVID-19 patients while being fatigued, working long shifts, being at high infection risk, having the fear of family members getting infected, as well as the illness and death of friends and colleagues (15, 16). Before the COVID-19 outbreak, 24% of American nurses intended to quit their jobs, and after the outbreak, in a survey of 10,000 nurses, the tendency to quit increased (17). The effects of COVID-19 on physicians led to a high prevalence of burnout with a range of 13-86% in various departments (18).

With this background in mind, we expected the prevalence of absenteeism and presenteeism to augment during the COVID-19 pandemic (19). In a study conducted in a university setting, absenteeism

was reported in 7% of staff and 10% of students, while presenteeism prevalence rates among staff and students were 26% and 40%, respectively (20). Absenteeism and presenteeism due to COVID-19 were found in 36% and 30% of the population in Belgium and 19% and 35% in the Netherlands, respectively (21). In another study, the prevalence rates of absenteeism and presenteeism during the COVID-19 period were 11.5% and 38.9%, respectively (22). Among the other effects of COVID-19 on healthcare workers of hospitals, we can mention its economic effects (23). In Italy, the value of lost productivity due to absenteeism during the COVID-19 period was estimated to be about €100 million (7). COVID-19 affects distinct groups of healthcare workers, such as urologists who were reported to have high stress, psychological complications, and low productivity, leading to quitting their job due to COVID-19 (24). Absenteeism in healthcare workers with higher exposure to COVID-19 was about 1.9 and 3.5 times more common, in comparison to middle- and low-risk ones (25). In a study, 254 infected healthcare workers and 3,332 healthcare workers at risk of direct exposure to COVID-19 were evaluated. The mean period of absenteeism in the first group was reported at 25.8 days (99.2% of the group) and in the second group was 7.5 days (40% of the group). In addition, it was shown that COVID-19 was associated with an elevation in the rate and time of absenteeism (26).

Work absenteeism and presenteeism lead to a decrease in organizational productivity. In healthcare organizations, this issue is of great importance due to the obvious role of human resources in providing healthcare services, and health policymakers always seek to adopt the right strategies. During the COVID-19 pandemic, due to the high volume of patients, healthcare organizations faced a severe shortage of human resources (23). In this situation, it is necessary to make a proper policy, because the lack of the right strategy will lead to non-proper access to services for patients, especially those with COVID-19. Therefore, it is highly important to address this issue and know the causes and consequences from the perspective of health policy.

Countries are moving toward vaccination with the priority of healthcare workers and high-risk groups. Therefore, there is an opportunity to measure the impacts of COVID-19 on healthcare staff and analyze the amount and value of lost productivity.

2. Objectives

The present study was conducted to measure the prevalence of, amount of, value of, and influencing factors on the absenteeism and presenteeism related to COVID-19 among frontline physicians, paramedics, and nurses in a hospital in Iran.

3. Methods

3.1. Setting

This cross-sectional study was conducted between October to December 2020, in the middle of the third wave of COVID-19 infection in the country beginning from September 2020 (27), 8-11 months after the first identified case of COVID-19 and before the onset of the vaccination of healthcare workers in a large, tertiary central hospital of COVID-19 treatment in Tehran, Iran. This study was approved by the national ethics committee of the Ministry of Health and Medical Education in Iran with the approval code of IR.BMSU.REC.1399.411.

3.2. Samples

The study population included all physicians, paramedics, and nurses of the hospital. The samples were selected using a stratified sampling method with the probability of selection proportional to size; accordingly, 100 physicians, 96 nurses, and 54 paramedics were entered into the study. Sampling within the groups was performed using convenience sampling methods based on inclusion and exclusion criteria. Verbal consent was obtained from the participants. The inclusion criteria were a full-time job in a hospital and working since the first days of the COVID-19 outbreak. On the other hand, the staff with a part-time job, working in personal centers or other hospitals, and those who left the hospital were excluded from the study.

3.3. Variables and measurement

Data collection was performed using a three-part questionnaire. The first part included job and demographic data, such as age, gender, marital status, householder, work experiences, department, education, income, and COVID-19 infection. The information in the second part consisted of lifestyle variables, including smoking, nutrition, physical activity, chronic disease, and body mass index, and was gathered using the valid and reliable Persian version of the non-communicable disease risk factors of the WHO STEPwise questionnaire (28). Obtaining job characteristics, absenteeism, and presenteeism was done using the valid and reliable Valuation of Lost Productivity Questionnaire (VOLP) that was designed by Zhang (2012) (29). This questionnaire was adjusted to COVID-19 by the research team.

The focus of many productivity questionnaires is on the measurement of productivity inputs. However, the VOLP is one of the best questionnaires to measure changes in productivity output due to health.

To measure absenteeism, the number of absent days from work and the number of hours of late attendance in the past 3 months that were related to COVID-19 were calculated and evaluated based on their income. In the presentation, participants were first asked if the presence of COVID-19

prolonged their activities, and if so, the amount of extra spent time by staff was calculated for a week. Then, evaluated and reported on a quarterly basis based on their working days and hours per week.

Before filling out the questionnaire, the subject, objectives, and rights of the study participants were explained to the participants by the researcher to answer the questions. The questionnaire was completed through face-to-face interviews. To ensure the quality of data, daily monitoring and auditing of completed questionnaires were performed.

3.4. Statistical analysis

The valuation of absenteeism and presenteeism was done using the human capital approach and the calculation of the amounts of absenteeism and presenteeism multiplied by each person's hourly income. This phase was performed using Microsoft Excel 2010. Afterward, four dependent variables, including the amount of absenteeism (hours in 3 months), amount of presenteeism (hours in 3 months), value of absenteeism (USD in 3 months), and value of presenteeism (USD in 3 months), were defined for every participant and each staff and categorized in four groups of low, middle, high, very high based on quartile. To analyze data, four regression models were performed and all demographic information and lifestyle and COVID-19 infection variables were entered into the model as predictors. Ordered logistic regression was performed using a backward elimination approach with the removal value of 0.1 in Stata 14. In each model, variables with the highest p-value took out of the model and the model was run again. If collinearity was recognized, the variables were replaced with each other. These steps continued until no variable with a p-value of higher than 0.1 remained in the model. The findings were reported in odds ratio (OR) and p-value.

4. Results

Eight physicians out of 100 (8%), 10 paramedics out of 54 (18.6%), and 18 nurses out of 96 (18.7%) reported COVID-19 infection. A total of 5 (3.7%) staff, including 3 nurses, had reinfection with COVID-19.None of the participants reported chronic disease or unhealthy nutrition status (Table 1).

All physicians, nurses, and paramedics reported presenteeism. Absenteeism was reported in 99.2% of all participants (all physicians and paramedics and 97.91% of nurses). The total values of absenteeism and presenteeism were estimated at 96,381.14 and 372,263.13 USD in 3 months, respectively. The mean and standard deviation of absenteeism and presenteeism value were estimated at 385.52±369.01 and 1489.05±1143.15 USD in 3 months. Nurses had more hours and days of absenteeism, while the value of absenteeism and presenteeism was higher among physicians (Table 2). Nurses were 1.473 times more likely to have a higher amount of absenteeism; however, this association was not significant. Paramedics were 2.258 times more likely to have a higher amount of absenteeism (OR: 2.258, P=0.012). A significant association was found between the amount of absenteeism and working in intensive units (OR: 3.511, P=0.000). Higher amount of absenteeism was related to first-time COVID-19 infection among all participants (OR: 4.918, P=0.000) (model 1, Table 3). Current smoker staff, in comparison to quitted smoking staff, were 2.995 times more likely to have higher amount of presenteeism (OR: 2.995, P=0.030) (model 2, Table 3). Higher values of absenteeism were more likely higher in staff working in intensive units, in comparison to non-intensive staff (OR: 2.044, P=0.017), in staff with the first infection with COVID-19, compared to non-infected ones (OR: 17.911, P=0.000), and in staff in the third (OR: 9.471, P=0.000) and fourth (OR: 74.668, P=0.000) income quartiles, in comparison to the first quartile (model 3, Table 3). Middle age staff, in comparison to senior staff, were 11.189 times more likely to have a higher value of presenteeism (OR: 11.189, P=0.046). Higher values of presenteeism were related to the first-time COVID-19 infection (OR: 6.816, P=0.000) and two-time infection with COVID-19 (OR: 24.023, P=0.001), compared to non-infected staff. Furthermore, staff in the third (OR: 6.958, P=0.000) and fourth (OR: 22.051, P=0.000) income quartiles had higher values of presenteeism, in comparison to the first quartile (model 4, Table 3).

Table 1. Demographic, lifestyle, and job characteristics of hospital staff

Variable & Groups		Physicians (n=100)	Paramedic (n=54)	Nurses (n=96)	Variable & Groups		Physicians (n=100)	Paramedic (n=54)	Nurses (n=96)
		n (%)	n (%)	n (%)			n (%)	n (%)	n (%)
Gender	Male	74 (74%)	32 (59.3%)	52 (54.2%)	Marital status	Married	100 (100%)	44 (81.5%)	82 (85.4%)
	Female	26 (26%)	22 (40.7%)	44 (45.8%)		Single	0	10 (18.5%)	14 (14.6%)
Family size	Low	0	16 (29.6%)	23 (24%)	Household	Yes	75 (75%)	32 (59.3%)	52 (54.2%)
	Extended	100 (100%)	38 (70.4)	73 (76%)		No	25 (25%)	22 (40.7%)	44 (45.8%)
Age	Young	39 (39%)	39 (72.2%)	71 (74%)	Work experiences	1st decade	21 (21%)	27 (50%)	33 (34.4%)
	Middle	58 (58%)	15 (27.8%)	25 (26%)		2nd decade	70 (70%)	18 (33.3%)	54 (56.3%)
	Old	3 (3%)	0	0		3rd decade	9 (9%)	9 (16.7%)	9 (9.4%)

Table 1. Continued

Education	BSc	0	49 (90.7%)	83 (86.5%)	Smoking	Current smoker	9 (9%)	5 (9.3%)	2 (2.1%)
	MSc and GP	0	5 (9.3%)	13 (13.5%)		Quitted	24 (24%)	13 (24.1%)	19 (19.8%)
	PhD	100 (100%)	0	0		Never used	67 (67%)	36 (66.7%)	75 (78.1%)
Department	Intensive units	13 (13%)	0	50 (52.1%)	Nutrition	Healthy	100 (100%)	54 (100%)	96 (100%)
	Non-intensive units	87 (87%)	54 (100%)	46 (47.9%)		Unhealthy	0	0	0
Chronic disease	Yes	0	0	0	Physical activity	Adequate	54 (54%)	17 (31.5%)	26 (27.1%)
	No	100(100%)	54 (100%)	96 (100%)		Inadequate	46 (46%)	37 (68.5%)	70(72.9%)
Body mass index	Underweight	3 (3%)	2 (3.7%)	6 (6.3%)	Job characteristic	Sit/low mobility	2 (2%)	5 (9.3%)	9 (9.4%)
	Normal	67 (67%)	42 (77.8%)	67 (69.8%)		Stand/walk	98 (98%)	49 (90.7%)	87(90.6%)
	Overweight	23 (23%)	10 (18.5%)	18 (18.8%)		Lift light loads	0	0	0
	Obese	7 (7%)	0	5 (5.2%)		Lift heavy loads	0	0	0
Income quartile	1st quartile	0	29 (53.7%)	63 (65.6%)	COVID-19 infection	No	92 (92%)	44 (81.4%)	78(81.3%)
	2nd quartile	0	24 (44.4%)	33 (34.4%)		1st time	7 (7%)	9 (16.7%)	15 (15.6%)
	3rd quartile	41 (41%)	1 (1.9%)	0		2nd time	1 (1%)	1 (1.9%)	3 (3.1%)
	4th quartile	59 (59%)	0	0					

Table 2. COVID-19-related absenteeism and presenteeism among physicians, paramedics, and nurses

Variables		Physicians (n=100)	Paramedic (n=54)	Nurses (n=96)	All (n=250)
Absenteeism over 3 months	Total hours (% of sum)	2035.6 (31.9%)	1542.3 (24.19%)	2798.8 (43.8%)	6376.8
	Hours (Mean±SD)	20.3±16.3	28.5±27.45	29.1±28.3	25.5±24.3
	Total days (% of sum)	337.1 (36.9%)	202.5 (22.20%)	372.9 (40.8%)	912.6
	Days (Mean±SD)	3.37±2.4	3.7±3.59	3.8±3.69	3.6±3.2
	Total value-US$ (% of sum)	58472.5 (60.6%)	13549.4 (14.06%)	24359.1 (25.2%)	96381.14
	Value-US$ (Mean±SD)	584.7±435.5	250.9±246.53	253.7±236.0	385.5±369.0
Presenteeism over 3 months	Total hours (% of sum)	8710 (40%)	4368 (20.06%)	8697 (39.9%)	21775
	Hours (Mean±SD)	87.1±32.6	80.89±37.5	90.5±43.32	87.1±38.1
	Total days (% of sum)	1501.6 (46.16%)	585.3 (17.99%)	1166.3 (35.8%)	3253.34
	Days (Mean±SD)	15.01±5.84	10.8±5.5	12.1±6	13±6
	Total value-US$ (% of sum)	256186.5 (68.82%)	39380.1 (10.58%)	76696.4 (20.6%)	372263.1
	Value-US$ (Mean±SD)	2561.8±1057	729.2±384.3	798.9±396.6	1489.0±1143.1

Table 3. Factors affecting productivity losses during the COVID-19 outbreak

Model	Variable	Groups	Coefficient	Odds ratio	Z	P	95% Confidence interval	
Model 1: Absenteeism (H/3months)	Job	Nurses	0.38	1.4	1.3	0.1	-0.183	0.95
		Paramedics	0.81	2.2	2.5	0.01	0.19	1.44
	Department	Intensive units	1.25	3.5	3.9	0.00	0.63	1.87
	COVID-19 infection	1st infection	1.59	4.9	3.7	0.00	0.76	2.42
		2nd infection	16.56	1.5	0.0	0.98	-1331.5	1364.6
Model 2: Presenteeism (H/3months)	Work experience	1st decade	0.47	1.6	1.8	0.05	-0.01	0.97
		3rd decade	-0.05	0.9	-0.1	0.88	-0.80	0.69
	Smoking	Current smoker	1.09	2.9	2.1	0.03	0.10	2.08
		Never used	0.23	1.2	0.8	0.38	-0.29	0.76
Model 3: Absenteeism (US$/3 months)	Department	Intensive units	0.715	2.04	2.4	0.01	0.13	1.30
	COVID-19 infection	1st infection	2.885	17.9	5.8	0.00	1.91	3.85
		2nd infection	18.098	7.2	0.0	0.97	-1130.07	1166.2
	Income	2nd quartile	0.005	1	0.0	0.98	-0.61	0.62
		3rd quartile	2.248	9.4	5.4	0.000	1.43	3.06
		4th quartile	4.313	74.6	9.8	0.000	3.45	5.17
Model 4: Presenteeism (US$/3 months)	Gender	Male	0.4	1.6	1.8	0.062	-0.02	0.97
	Age	Young	2.1	8.6	1.7	0.075	-0.21	4.52
		Middle	2.4	11.1	2.0	0.046	0.04	4.78
	COVID-19 infection	1st infection	1.9	6.8	4.7	0.000	1.12	2.70
		2nd infection	3.1	24	3.3	0.001	1.31	5.04
	Income	2nd quartile	0.1	1.1	0.4	0.637	-0.46	0.75
		3rd quartile	1.9	6.9	4.7	0.000	1.13	2.74
		4th quartile	3	22	8.2	0.000	2.35	3.82

5. Discussion

Overall, 36 out of 250 participants (14.4%) had a history of COVID-19 in the present study. In addition, 8%, 18.6%, and 18.7% of physicians, paramedics, and nurses were found to have a history of COVID-19, respectively. Five (3.7%) of all participants, 1% of physicians, 1.9% of paramedics, and 3.1% of nurses had reinfection with COVID-19. In a study by Stubblefield et al. (2020), the infection rate of nurses/paramedics was reported at 7.6% out of 249 samples (30). Based on the results of a study by Gheysarzadeh et al. in Iran, 4% of the nursing staff had COVID-19 (31). The findings of research by Celebi et al. (2020) in Turkey revealed high infection rates among nurses with the highest COVID-19 rate of 8% for nurses preceded by 9.1% for cleaning staff (32). The studied hospital in the present study was one of the COVID-19 referral hospitals, and according to the statistics of the Deputy of Education of the hospital, 10,000 patients were hospitalized because of COVID-19 until February 8, 2021, which increased the exposure of personnel to COVID-19. It was observed that 3.7% of the participants in the current research had reinfection with COVID-19. In another study, the rate of reinfection with COVID-19 among healthcare workers was 1.8% (33). It has been reported that antibodies reduce the possibility of COVID-19 reinfection for up to 6 months by 83% (34). The present research was conducted 8-11 months after the identification of the first COVID-19 case, and data collection was carried out in the middle of the third wave in Iran. These factors made reinfection with COVID-19 possible among hospital staff.

All physicians, paramedics, and nurses reported presenteeism related to COVID-19. All physicians and paramedics had absenteeism due to COVID-19, while the prevalence of absenteeism among nurses was 97.91%. Although nurses had a higher share in the amount of absenteeism during 3 months, the amount of presenteeism and the value of both absenteeism and presentism were higher among physicians. The COVID-19 occurrence was associated with the increased prevalence and loss cost of absenteeism. According to the results of a study and in a three-year follow-up, the cost associated with absenteeism augmented by 40.3% and its incidence among different occupational groups elevated from 1.22% to 6.78% (35). In addition, the risk of exposure to COVID-19 can increase the prevalence of absenteeism. The findings of a study by Maltezou et al. showed that absenteeism was 3.5 times more common in healthcare workers with higher exposure risk than their counterparts with lower exposure risk (25). The prevalence rates of absenteeism and presenteeism were high in the current study and reported by almost all staff (except absenteeism in two nurses). The reason for the high prevalence of absenteeism and presenteeism in the present investigation was the risk of exposure. Consequently, in studies conducted in other settings, the prevalence was lower. In the university setting, absenteeism was reported in 7% of staff and 10% of students, and presentism was noted in 26% of staff and 40% of students (20). The results of another study reported absenteeism and presenteeism related to COVID-19 at 36% and 30% in Belgium and 19% and 35% in the Netherlands, respectively (21). The latter reports are much lower than our findings in the hospital setting with a high exposure risk.

The absence of employees from the workplace will affect productivity and in the long term the capital and financial issues of the organization. In research by Nurchis et al., the burden of the disease of COVID-19 in Italy was calculated using the DALY index and with the human capital approach, in which the rate of death and disability caused by COVID-19 was investigated. Based on the obtained results, the total permanent lost productivity was estimated to be around 300 million euros and the temporary lost productivity was estimated to be around 100 million euros (36).

In a study by Gianino et al. (2019), 5,041 healthcare workers were examined, and the total number of hours lost due to absenteeism was 11,000 working days during the year, whose monetary value was estimated at 1.7 million euros per year. In other words, the monetary value of absenteeism per person was calculated as 327 euros per year (37). In a study in Turkey and among healthcare workers, the monetary value of lost productivity due to presenteeism was estimated at 19.92 Turkish lira per hour and 315.57 Turkish lira during 2 weeks (38).

According to the results of the present study, the first-time infection with COVID-19 was associated with an increase in the amount of absenteeism (4.918 times), the financial value of absenteeism (17.911 times), and the value of presenteeism (24.023 times), compared to non-infected participants. These results supported the relationship between COVID-19 infection and elevated absenteeism and presenteeism. The relationship between the risk of exposure and the higher prevalence of absenteeism among healthcare workers has been shown in the study by Maltezou et al. (25) and the present investigation. The findings of another study by Maltezou et al. revealed that exposure to and infection with COVID-19 accounted for a large part of indirect costs, especially the absenteeism of healthcare workers (26). The risk of exposure is likely to be higher among the personnel of the Intensive Care Unit during the COVID-19 outbreak, which is mostly filled with COVID-19 critically ill patients. The

results of the present study demonstrated that the latter result could lead to a higher amount and value of absenteeism among the active personnel of these departments.

Other findings indicated that the values of absenteeism and presenteeism were higher in the upper-income quartiles. This group of staff is probable to lose more values of absenteeism and presenteeism due to their higher wage rates. A total of 58% and 60% of the amount of absenteeism and presenteeism were observed in nurses and paramedics, respectively. However, the financial values of absenteeism and presenteeism were higher in physicians because the mentioned groups of staff have lower incomes than physicians.

In the VOLP approach, the basis for calculating absenteeism is the number of absent days in the last 3 months, and the presenteeism is prolonging daily activities in the past week. One of the limitations of this study was the existence of some degree of recall bias study due to the self-report of data by the participants.

6. Conclusion

COVID-19 had a significant effect on both absenteeism and presenteeism of healthcare workers and its amount and value were unequal among physicians, nurses, and paramedics. The amount of absenteeism was higher among nurses, while the values of absenteeism and presenteeism were higher in physicians. Policymakers should do their best to minimize the productivity loss of healthcare workers. A comparison of the amount and value of absenteeism and presenteeism after vaccination could more clearly show the effects of COVID-19.

Finally, it is suggested that due to the high rates of absenteeism and ineffective attendance at the workplace, a special unit for psychological training and counseling should be set up to reduce the effects of work pressure and possible injuries from COVID-19. Reducing the exposure of personnel to different people can decrease the effects of COVID-19; therefore, it is suggested to develop the use of remote services (telehealth and telemedicine) in situations that do not lead to damage to the treatment process. Being aware of effective protective strategies against new types of diseases based on reliable research can reduce stress and pressure on healthcare providers. In this regard, it is suggested that a specific communication path be designed and implemented to send information messages and, if available, be developed.

Acknowledgments

The authors would like to thank the Clinical Research Development Center of Baqiyatallah Hospital, Tehran, Iran, for their kind cooperation.

Footnotes

Conflicts of Interest: All authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions: M.M.A and M.Y developed the concept and design of the study, M.S acquiesced data, and M.M.A and M.S. analyzed the data. M.M.A, M.Y, and S.M.H.S contributed to the drafting and the final version of the manuscript. M.Y and S.M.H.S revised the manuscript. All authors read and approved the final version.

References

1. Nagata T, Mori K, Ohtani M, Nagata M, Kajiki S, Fujino Y, et al. Total health-related costs due to absenteeism, presenteeism, and medical and pharmaceutical expenses in Japanese employers. *J Occup Environ Med.* 2018;**60**(5):273-80. doi: 10.1097/JOM.0000000000001291. [PubMed: 29394196].
2. Rantanen I, Tuominen R. Relative magnitude of presenteeism and absenteeism and work-related factors affecting them among health care professionals. *Int Arch Occup Environ Health.* 2011;**84**(2):225-30. doi: 10.1007/s00420-010-0604-5. [PubMed: 21140162].
3. Challener DW, Breeher LE, Frain J, Swift MD, Tosh PK, O'Horo J. Healthcare personnel absenteeism, presenteeism, and staffing challenges during epidemics. *Infect Control Hosp Epidemiol.* 2021;**42**(4):388-91. doi: 10.1017/ice.2020.453. [PubMed: 33100247].
4. Letvak SA, Ruhm CJ, Gupta SN. Nurses' presenteeism and its effects on self-reported quality of care and costs. *Am J Nurs.* 2012;**112**(2):30-8. doi: 10.1097/01.NAJ.0000411176.15696.f9. [PubMed: 22261652].
5. Forslid R, Herzing M. Assessing the consequences of quarantines during a pandemic. The European journal of health economics. *Eur J Health Econ.* 2021;**22**(7):1115-28. doi: 10.1007/s10198-021-01310-3. [PubMed: 33956249].
6. Griffin M, Sohrabi C, Alsafi Z, Nicola M, Kerwan A, Mathew G, et al. Preparing for COVID-19 exit strategies. *Ann Med Surg (Lond).* 2021;**61**:88-92. doi: 10.1016/j.amsu.2020.12.012. [PubMed: 33391762].
7. Nurchis MC, Pascucci D, Sapienza M, Villani L, D'Ambrosio F, Castrini F, et al. Impact of the burden of COVID-19 in Italy: results of disability-adjusted life years (DALYs) and productivity loss. *Int J Environ Res Public Health.* 2020;**17**(12):1-12. doi: 10.3390/ijerph17124233. [PubMed: 32545827].
8. Filipovic I, Walker D, Forster F, Curry AS. Quantifying the economic burden of productivity loss in rheumatoid arthritis. *Rheumatology.* 2011;**50**(6):1083-90. doi: 10.1093/rheumatology/keq399. [PubMed: 21245074].
9. Lofland JH, Pizzi L, Frick KD. A review of health-related workplace productivity loss instruments. *PharmacoEconomics.* 2004;**22**(3):165-84. doi: 10.2165/00019053-200422030-00003. [PubMed: 14871164].
10. Xi X, Lu Q, Lu M, Xu A, Hu H, Ung COL. Evaluation of the association between presenteeism and perceived availability of social support among hospital doctors in Zhejiang, China. *BMC Health Serv Res.* 2020;**20**(1):1-11. doi: 10.1186/s12913-020-05438-5. [PubMed: 32616033].
11. Tangchareonsamut J, Wongrathanandha C, Khamsee S,

Aekplakorn W. Association of work performance with absenteeism and presenteeism among support workers in a medical school hospital, Thailand. *J Health Res.* 2021:1-12. doi: 10.1108/JHR-01-2021-0045.
12. Abu-Elenin MM. Immediate psychological outcomes associated with COVID-19 pandemic in frontline physicians: a cross-sectional study in Egypt. *BMC Psychiatry.* 2021;**21**(1):1-9. doi: 10.1186/s12888-021-03225-y. [PubMed: 33910544].
13. Edwards CH, Tomba GS, de Blasio BF. Influenza in workplaces: transmission, workers' adherence to sick leave advice and European sick leave recommendations. *Eur J Public Health.* 2016;**26**(3):478-85. doi: 10.1093/eurpub/ckw031. [PubMed: 27060594].
14. Shoja E, Aghamohammadi V, Bazyar H, Moghaddam HR, Nasiri K, Dashti M, et al. Covid-19 effects on the workload of Iranian healthcare workers. *BMC Public Health.* 2020;**20**(1):1-7. doi: 10.1186/s12889-020-09743-w. [PubMed: 33138798].
15. Mehta S, Machado F, Kwizera A, Papazian L, Moss M, Azoulay É, et al. COVID-19: a heavy toll on health-care workers. *Lancet Respir Med*. 2021;**9**(3):226-8. doi: 10.1016/S2213-2600(21)00068-0. [PubMed: 33556317].
16. Shreffler J, Petrey J, Huecker M. The Impact of COVID-19 on healthcare worker wellness: a scoping review. *West J Emerg Med*. 2020;**21**(5):1059-66. doi: 10.5811/westjem.2020.7.48684. [PubMed: 32970555].
17. Fauteux N. COVID-19: Impact on Nurses and Nursing. *Am J Nurs*. 2021;**121**(5):19-21. doi: 10.1097/01.NAJ.0000751076.87046.19. [PubMed: 33872253].
18. Amanullah S, Ramesh Shankar R. The Impact of COVID-19 on physician burnout globally: a review. *Healthcare*. 2020;**8**(4):1-12. doi: 10.3390/healthcare8040421. [PubMed: 33105757].
19. Siami Z, Dehghan D, Khavandegar A, Lak M, Bakhtiyari M. Efficacy and Safety of Atazanavir/Ritonavir versus Lopinavir/Ritonavir in Hospitalized COVID-19 Patients: A Randomized Clinical Trial. *Iran Red Crescent Med J*. 2022;**24**(5): e1576.
20. Van Der Feltz-Cornelis CM, Varley D, Allgar VL, de Beurs E. Workplace stress, presenteeism, absenteeism, and resilience amongst university staff and students in the COVID-19 lockdown. *Front Psychiatry*. 2020;**11**:1-15. doi: 10.3389/fpsyt.2020.588803. [PubMed: 33329135].
21. van Ballegooijen H, Goossens L, Bruin RH, Michels R, Krol M. Concerns, quality of life, access to care and productivity of the general population during the first 8 weeks of the coronavirus lockdown in Belgium and the Netherlands. *BMC Health Serv Res*. 2021;**21**(1):227. doi: 10.1186/s12913-021-06240-7. [PubMed: 33712010].
22. Jacobson KB, Rao M, Bonilla H, Subramanian A, Hack I, Madrigal M, et al. Patients with uncomplicated COVID-19 have long-term persistent symptoms and functional impairment similar to patients with severe COVID-19: a cautionary tale during a global pandemic. *Clin Infect Dis.* 2021;**73**(3):826-9. doi: 10.1093/cid/ciab103. [PubMed: 33624010].
23. Nasiri T, Shams L, Hosseini-Shokouh S. The economic effects of COVID-19 on the hospital industry in Iran and the world. *Ann Ig*. 2021;**33**(1):103-4. doi: 10.7416/ai.2021.2412. [PubMed: 33354700].
24. O'Kelly F, Sparks S, Seideman C, Gargollo P, Granberg C, Ko J, et al. A survey and panel discussion of the effects of the COVID-19 pandemic on paediatric urological productivity, guideline adherence and provider stress. *J Pediatr Urol.* 2020;**16**(4):1-10. doi: 10.1016/j.jpurol.2020.06.024. [PubMed: 32680626].
25. Maltezou HC, Dedoukou X, Tseroni M, Tsonou P, Raftopoulos V, Papadima K, et al. SARS-CoV-2 infection in healthcare personnel with high-risk occupational exposure: Evaluation of 7-day exclusion from work policy. *Clin Infect Dis*. 2020;**71**(12):3182-7. doi: 10.1093/cid/ciaa888. [PubMed: 32594160].
26. Maltezou HC, Giannouchos TV, Pavli A, Tsonou P, Dedoukou X, Tseroni M, et al. Costs associated with COVID-19 in healthcare personnel in Greece: a cost-of-illness analysis. *J Hosp Infect.* 2021;**114**:126-33. doi: 10.1016/j.jhin.2021.04.018. [PubMed: 33894306].
27. Abdoli A. Iran, sanctions, and the COVID-19 crisis. *J Med Econ.* 2020;**23**(12):1461-5. doi: 10.1080/13696998.2020.1856855. [PubMed: 33249954].
28. Nasehi MM, Moosazadeh M, Amiresmaeili M, Zakizadeh R, Mirzajani M. Prevalence of five main risk factors of non-communicable diseases in Mazandaran province: a population based study. *J Mazandaran Univ Med Sci*. 2012;**21**(86):193-202.
29. Zhang W, Bansback N, Boonen A, Severens JL, Anis AH. Development of a composite questionnaire, the valuation of lost productivity, to value productivity losses: application in rheumatoid arthritis. Value in health. *Value Health.* 2012;**15**(1):46-54. doi: 10.1016/j.jval.2011.07.009. [PubMed: 22264971].
30. Stubblefield WB, Talbot HK, Feldstein L, Tenforde MW, Rasheed MAU, Mills L, et al. Seroprevalence of SARS-CoV-2 among frontline healthcare personnel during the first month of Caring for COVID-19 patients - Nashville, Tennessee. *Clin Infect Dis*. 2021;**72**(9):1645-8. doi: 10.1093/cid/ciaa936. [PubMed: 32628750].
31. Gheysarzadeh A, Sadeghifard N, Safari M, Balavandi F, Falahi S, Kenarkoohi A, et al. Report of five nurses infected with severe acute respiratory syndrome coronavirus 2 during patient care: case series. *New Microbes New Infect.* 2020;**36**:1-3. doi: 10.1016/j.nmni.2020.100694. [PubMed: 32405418].
32. Çelebi G, Pişkin N, Bekleviç A, Altunay Y, Keleş AS, Tüz MA, et al. Specific risk factors for SARS-CoV-2 transmission among health care workers in a university hospital. *Am J Infect Control.* 2020;**48**(10):1225-30. doi: 10.1016/j.ajic.2020.07.039. [PubMed: 32771498].
33. Dimeglio C, Herin F, Miedougé M, Martin-Blondel G, Soulat JM, Izopet J. Protection of healthcare workers against SARS-CoV-2 reinfection. *Clin Infect Dis.* 2021;**73**(7):1323-4. doi: 10.1093/cid/ciab069. [PubMed: 33503228].
34. Stokel-Walker C. What we know about covid-19 reinfection so far. *BMJ*. 2021;**372**:1-10. doi: 10.1136/bmj.n99. [PubMed: 33468457].
35. Calvo-Bonacho E, Catalina-Romero C, Fernández-Labandera C, Fernández-Meseguer A, González-Quintela A, Martínez-Muñoz P, et al. COVID-19 and Sick Leave: An Analysis of the ibermutua cohort of over 1,651,305 Spanish workers in the first trimester of 2020. *Front Public Health.* 2020;**8**:1-6. doi: 10.3389/fpubh.2020.580546. [PubMed: 33194983].
36. Amoli HA, Mahmoudabadi HZ, Ghorbani S, Hajebi R, Rahimpour E, Davari FV. Exclusion of Anastomosis Leakage after Colorectal Surgery using C-reactive protein: a retrospective study. *Iran Red Crescent Med J*. 2022; **24**(2):e1467.
37. Gianino MM, Politano G, Scarmozzino A, Stillo M, Amprino V, Di Carlo S, et al. Cost of sickness absenteeism during seasonal influenza outbreaks of medium intensity among health care workers. *Int J Environ Res Public Health.* 2019;**16**(5):1-11. doi: 10.3390/ijerph16050747. [PubMed: 30832264].
38. Aysun K, Bayram Ş. Determining the level and cost of sickness presenteeism among hospital staff in Turkey. *Int J Occup Saf Ergon*. 2017;**23**(4):501-9. doi: 10.1080/10803548.2016.1274159. [PubMed: 28004987].