

COVID-19 Infection among Healthcare Workers

Bengü Şaylan¹, Hatice Erdoğan², Füsün Afşar¹, Sena Melike Taşçı^{3*}, Özlem Köksal¹

¹Sultan Abdülhamid Han Training and Research Hospital, İstanbul, Turkey

²Maltepe University, School of Nursing, İstanbul, Turkey

³Departments of Surgical Nursing, Hamidiye Faculty of Nursing, University of Health Sciences, İstanbul, Turkey

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*For Correspondence

Sena Melike Taşçı, Departments of Surgical Nursing, Hamidiye Faculty of Nursing, University of Health Sciences, İstanbul, Turkey.

Tel: +5531406156

Email: ozdamarsenameli@gmail.com

Abstract

Objective: In this study, it is aimed to evaluate the COVID-19 infection, health status and the effectiveness of the protective measures taken in healthcare workers.

Method: 1103 hospital employees who had PCR test between 12.03-12.05.2020 was included in the study. PSPP package program was used in the evaluation of the data obtained from the research.

Results: Of the 118 healthcare workers who underwent PCR testing and were infected with COVID-19, 16% were assistant healthcare professionals, 11% were nurses, 8% were physicians or pharmacists, and 7% were anaesthesia technicians. It was determined that all of the physicians infected with COVID-19, 90% of the nurses and 35% of the allied health personnel were in close contact with COVID-19 patients. It was determined that 33% of doctors, 39% of nurses, 28% of allied health personnel diagnosed with COVID-19 received inpatient treatment.

Conclusion: It was seen that the majority of health or allied health personnel with positive PCR results were technical team and data entry personnel. It has been determined that the most transmission of physicians and nurses is in COVID-19 clinics. In patient treatment status of intensive care workers respectively physician's assistant health personnel and nurses treatment.

Keywords: Primary health care, Mental disorders, COVID-19.

INTRODUCTION

The outbreak of severe acute respiratory syndrome Coronavirus 2 (SARS-COV 2, previously known as 2019-nCoV) that emerged in early December 2019, can be transmitted from person to person with an incubation period and is highly contagious up to 24 days^[1,2]. According to WHO, the current basic reproduction number (the number of people an infected person can spread the virus; R₀) is estimated to be between 1.4-2.5^[3,4]. In line with the reported cases in Wuhan between January 1 and January 15, 2020, Zhao H, et al. estimated R₀ to be between 2.49 and 2.63^[5]. In the studies of Shen K et al. R₀ for Wuhan was estimated to be between 4.50 and 4.92 in the first period of the epidemic on December 12, 2019 and dropped to 1.99-2.18 as of January 22, 2020^[6]. The decline is thought to have been caused by other measures such as quarantine, travel restrictions, contact tracing and the use of protective equipment. On March 11, 2020, it was declared a global epidemic by the World Health Organization. The first case of COVID-19 in Turkey was identified on March 11th, 2020. On April 1, 2020, the Minister of Health, Dr. Fahrettin Koca announced that the coronavirus had spread all over Turkey^[7]. Rapid diagnosis; quarantine and integrated interventions are thought to have a great impact on the spread of the epidemic^[8]. COVID-19 infection is spread through droplets during coughing and sneezing in symptomatic cases, but the presence of asymptomatic individuals should also be noted^[9]. The virus can survive for days under favourable environmental conditions and on favourable surfaces and is destroyed in less than a minute when disinfectants are used^[10]. In this case, the use of personal protective equipment is very important. The World Health Organization has also made many recommendations on preventing the spread of COVID-19, noting basic measures such as avoiding travel to high-risk places, maintaining social distance, washing hands frequently, and using personal protective equipment such as face masks^[4].

In addition to the necessary measures taken for the protection of the healthcare workers who care for COVID-19 patients which

Research & Reviews: Journal of Nursing & Health Sciences

start with the admission of the patient to the hospital and cover the whole process, measures to reduce the risk of transmission among healthcare workers should also be taken. Despite all the measures taken, healthcare workers also get COVID-19^[14]. During the implementation of the necessary measures to control the COVID-19 epidemic, the experiences of healthcare workers who are both trying to protect themselves as an individual and fighting for the protection and treatment of the patients have undoubtedly become very valuable^[12]. Our hospital accepted the first suspicious contact case from abroad on 12 March 2020 and opened the first COVID-19 clinic on this date. 9 COVID-19 clinics with 328 beds in 133 rooms and 3 level III COVID-19 intensive care units with 40 beds provided service in our hospital. In all our intensive care units and clinics, clean and dirty areas were established before patients were admitted to the clinic. Treatment preparation and rest areas of healthcare workers were arranged according to a double transition pattern after an isolated patient room. In areas before the corridor where isolated patient rooms were located, spaces for wearing personal protective equipment were created. All personal protective equipment was provided throughout the process to all areas where COVID-19 patients were admitted to and to all healthcare workers worked in those areas. All healthcare workers received practical training about all the basic information on COVID-19, the transmission routes and especially the use of personal protective equipment. Almost all healthcare workers were screened in March and April. The main purpose of screening healthcare workers was to identify asymptomatic patients and to evaluate the adequacy of the measures taken. In this respect, negative and positive cases that underwent PCR tests in our hospital between 12 March 2020 and 12 May 2020 were compared. Accordingly, the cases who worked in our hospital between 12 March 2020 and 12 May 2020 and who had a negative or positive PCR test result were compared.

MATERIALS AND METHODS

The research objectives

This study is a retrospective experimental study conducted in order to measure the effectiveness of clinical-based regulations in our hospital, to determine the positive asymptomatic and symptomatic healthcare workers, and to closely monitor their condition.

Place and time of the research

All employees who were tested in a Training and Research Hospital in Istanbul between 12 March 2020 and 12 May 2020 were included in the study.

Research sample

The research sample consisted of 1103 healthcare workers who actively worked in a Training and Research Hospital in Istanbul between 12.03 and 12.05.2020, and who had PCR tests between the same dates. The entire population was reached.

Research ethics

Permission was obtained from the Scientific Research Platform of T.R. Ministry of Health and by the approval letter of the Clinical Research Ethics Board of a University Hospital (dated 12.05.2020 and numbered B. 10.1.TKH.4.34 H. GP.0.01/162). The study was carried out with the permission of the hospital administration, with the data obtained from the system and in accordance with the principles of the Helsinki Declaration.

Evaluation of data

Chi-squared test and Fisher's exact test were used in the evaluation of the data obtained from the research. The results were evaluated at 95% confidence interval and $p < 0.05$ significance level. PSPP (PSPP is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 3 of the License, or (at your option) any later version.) and Microsoft Excel computer programs were used.

RESULTS AND DISCUSSION

During the COVID-19 pandemic, many factors such as working in close contact with suspected or confirmed COVID-19 patients, changing working environment, working order, changing teammates and the concern of infecting family members lead to a difficult process for healthcare workers. Beyazadam and Alimoğlu established that 365 (51.5%) of the global 708 deaths caused by COVID-19 among healthcare workers in 52 countries until April 27, 2020, were doctors and 126 (17.79%) were nurses^[13]. The highest number of deaths was recorded in Italy (153), followed by the United States (US) (135), Iran (84), and England (70) and Turkey (26)^[13]. Turkish Thoracic Society reported that the number of healthcare worker cases declared in Turkey as of the end of April is 7 thousand 428, and the total number of COVID-19 patients in Turkey as of September 1, 2020 is 271 thousand 705^[14]. In our hospital, 1103 healthcare workers had a PCR test. COVID-19 PCR test result of 118 employees was positive. Among those who tested positive, (8%) 19 were doctors and pharmacists, (11%) 41 nurses, (7%) 2 anaesthesia technicians, (16%) 31 healthcare assistants, (15%) 13 data entry clerks, (20%) 3 technical team, (10%) 6 security, and (7%) 3 were kitchen staff (**Table 1**). Considering the distribution, it was identified that the branches positive cases were seen the most were the technical team, healthcare assistants and data entry clerks, respectively. We think that the employees working outside the COVID areas,

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especially the data entry clerks, do not know whether the patient group they encounter at the outpatient clinic is a COVID patient or not and they are at greater risk due to the crowded areas. These employees should evaluate each patient as a potential COVID patient, and awareness of the use of masks, social distance, hand hygiene, and protective equipment should be raised. According to the findings of Turkish Thoracic Society, it is stated that healthcare workers are infected at outpatient clinics and services, which are places where patients are frequently encountered, rather than the emergency services and intensive care units defined as high-risk areas for COVID-19 [14]. Turkish Thoracic Society has stated that according to the scientific studies, the risk of healthcare workers testing positive for COVID-19 was 12 times higher than that of the society, and the inability to access the appropriate personal protective equipment increased the risk by 31%, while in their own studies they have concluded that the healthcare workers were 46 times more likely to get COVID-19 [14]. Among positive cases; 6 of the doctors and pharmacists worked in intensive care, 11 at clinic, 1 in emergency services; 26 of the nurses worked at clinic, 7 in emergency services, 4 in intensive care, 4 in non-direct contact areas (2 in sterilization, 2 in biochemistry); 2 of the anaesthesia technicians worked in a pharmacy outside of COVID-19 clinics due to their health conditions; 20 of the healthcare assistants worked in outdoor cleaning, 7 at clinic, 2 in emergency services, and 2 in intensive care (Table 2). The difference between the hospital units according to the branches was found to be statistically significant ($p=0.001$). While the PCR test result differences between the doctor-pharmacist and nurse was not statistically significant ($p = 0.14$), PCR test result differences between the doctor-pharmacist and the anaesthesia technician, healthcare assistant was found to be statistically significant ($p=0,004$; $p=0.0001$, respectively) (Table 2). It was observed that the PCR test result differences between the nurse and the anaesthesia technician, the healthcare assistant was statistically significant ($p=0.005$; $p=0.0001$, respectively) (Table 2). The difference between the branches according to the hospital units was found to be statistically significant ($p=0.001$). The difference between non-direct contact areas and emergency services, COVID-19 clinics, COVID-19 intensive care units was found to be statistically significant ($p=0.006$; $p=0.0001$; $p=0.001$, respectively) Table 2. In our study, it was determined that 58% of the doctors and 63% of the nurses who tested positive for COVID-19 worked at clinic; 32% of the doctors and 10% of the nurses worked in intensive care (Table 2).

Table 1. Hospital employees with COVID-19 PCR (+) and PCR (-) by branch.

Hospital Employees	Negative	Positive	p
	N: 985 n (%)	N: 118 n (%)	
Doctor and pharmacist	247 (92%)	19 (8%)	0.068
Nurse	356 (89%)	41 (11%)	
Anaesthesia Technician	29 (93%)	2 (7%)	
Healthcare assistant	167 (84%)	31 (16%)	
Data entry clerk	74 (85%)	13 (15%)	
Technical Team	12 (80%)	3 (20%)	
Security	57 (90%)	6 (10%)	
Kitchen staff	43 (93%)	3 (7%)	

Table 2. COVID-19 PCR (+) Healthcare workers by branch and hospital unit.

Hospital Employees	Positive Case				p (Branch)
	Emergency Services	COVID-19 Clinics	COVID-19 Intensive Care	Non-Direct Contact Areas	
	n:10	n:44	n:12	n:27	
Doctor and pharmacist	1 (5%)	11 (58%)	6 (32%)	1 (5%)	D/PàN p=0.14
nurse	7 (17%)	26 (63%)	4 (10%)	4 (10%)	D/PàAT p=0.004
Anaesthesia technician	0 (0%)	0 (0%)	0 (0%)	2 (100%)	D/PàHA p<0.001
Healthcare assistant	2 (6%)	7 (24%)	2 (6%)	20 (64%)	NàAT p=0.005
P (Inter-unit)	ESàC p=0.58	C àIC p=00.21	ICàNDCA p=0.001	-	NàHA p<0.001
	ESàIC p=0.12	CàNDCA p<0.001	-	-	ATàHA p=0.78
	ESàNDCA p=0.006	-	-	-	-

32% of the doctors who tested positive for COVID-19 worked in intensive care, 58% at clinic and 5% in emergency services; 63% of the nurses worked at clinic, 17% in emergency services, 10% in intensive care, 5% in sterilization, 5% in biochemistry; two of the anaesthesia technicians worked in a pharmacy outside of COVID-19 clinics due to their health conditions; 64% of the healthcare assistants worked in outdoor cleaning, 24% at clinic, 6% in emergency services, and 6% in intensive care. Although healthcare workers working in intensive care have longer and closer contact, the lower risk of transmission is thought to be the result of better compliance with protective measures and experienced health workers. The results obtained are consistent with the literature. It is stated that more than 3000 healthcare workers have been infected in Hubei province, China [15]. In a study conducted in Wuhan, it

Research & Reviews: Journal of Nursing & Health Sciences

was determined that 31 (77.5%) of 40 healthcare workers who tested positive for COVID-19 were working in the general services, 7 (17.5%) in emergency services and 2 (5%) in intensive care unit [16]. Similarly, in a study conducted in China, it is stated that the mortality for 1688 infected Chinese healthcare workers in Wuhan was significantly lower, 0.3% (5/1.688), 0.65% (193/29.798), respectively, than the mortality rates of 29,798 infected patients aged between 20 and 59 [17]. Only 4% of the 149 Chinese healthcare workers infected with COVID-19 outside the city of Wuhan after February 1, were reported to be in severe condition (6/149) and there were no deaths. In the study conducted in Italy, it was established that the infection among healthcare workers in the country increased considerably with the increase in coronavirus cases and mortality rates, accounting for 8.3% of the total cases, at least 2,629 healthcare workers have been infected with coronavirus since the outbreak began in February, and that the percentage of infected healthcare workers almost doubled the number of cases recorded in China during the epidemic [18]. Among those who tested positive for COVID-19, all the doctors, 90% of the nurses and 35% of the healthcare assistants were in direct contact with COVID-19 patients (Table 2). We think that this result occurs because interventional procedures and nursing practices are situations where one-to-one contact with the patient is made, and distance cannot be maintained. In the study conducted by Turkish Thoracic Society, which examined the cases of COVID-19 among healthcare workers, it was stated that 36 doctors and 72 healthcare workers died due to COVID-19 in Turkey as of September 1, 2020 and according to the research findings covering the first three months of the pandemic, the rate of COVID-19 infection among healthcare workers was 13.9%, and that this rate was 17 times the rate of people with antibodies in the society [14].

In a study conducted in China, it was reported that 3.8% of all COVID-19 cases were seen among healthcare workers and 14.8% of them had serious or critical illnesses that require hospitalization [19]. In our study, 6 doctors and pharmacists (3 of the doctors in intensive care, 1 in emergency services, 2 at COVID-19 clinic); 7 nurses (2 in intensive care, 4 at COVID-19 clinic, 1 in emergency services); 5 healthcare assistants (2 in intensive care, 1 in emergency services, 2 at COVID-19 clinic) received inpatient treatment at COVID-19 clinics due to COVID-19 PCR (+) and clinical findings (Table 3).

Table 3. Inpatient and outpatient healthcare workers according to the area and branch.

Parameters		Positive Cases					
		Emergency Services n:10		COVID-19 Clinics n:44		COVID-19 Intensive Care n:12	
Area		Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient
Treatment method							
Doctor and pharmacist		1	0	2	9	3	3
		-1	0	(18.18%)	(81.82%)	-0.5	-0.5
Nurse		1	6	4	22	2	2
		(14.29%)	(85.71%)	(15.38%)	(84.62%)	-0.5	-0.5
Healthcare assistant		1	1	2	5	2	0
		-0.5	-0.5	(28.57%)	(71.43%)	-1	0
p	Areas by branch regarding "Inpatient"	p= 0.93					
	Areas by branch regarding "Outpatient"	p= 0.21					
	Branch according to the treatment method regarding "Area"	Emergency Services TM□B p=0.17		COVID-19		COVID-19 IC	
				TM□B p=0.72		TM□B p=0.42	
Area according to the treatment method regarding "Branch"	Doctor/Pharmacist		Nurse		Healthcare Assistant		
	TM□A p=0.14		TM□A p=0.24		TM□A p=0.20		

33% of the doctors, 39% of the nurses and 28% of the healthcare assistants diagnosed with COVID-19 received inpatient treatment. 50% of the doctors, 29% of the nurses and 40% of the healthcare assistants receiving inpatient treatment worked in intensive care unit (Table 3). It is thought that those receiving inpatient treatment among healthcare workers experience a higher viral load. It is stated in the literature that during the early stages of the disease, a high viral load is found in patients tested positive for COVID-19 and disease progress can be seen within a week in patients who appear stable at the beginning [20]. In another literature, it is indicated that to reduce the viral load of healthcare workers, a minimum number of personnel should be employed, and employees should plan what they will do before, during and after the shift [21]. Suspicious cases and those showing mild symptoms should be isolated at home and strict infection control measures including contact and droplet precautions should be taken at hospitals [22]. For limiting the spread of infection, strict compliance with the rules of contact and droplet precautions throughout the community is currently seen as the only option. With the awareness among society, hands should be washed frequently and contact with eyes, nose and mouth should be avoided after interacting with an environment that is likely to be contaminated [23]. It was stated in the literature that, as of 5 April 2020, 12,252 healthcare workers in Italy accounted for 10% of COVID-19 cases in the country, 80 doctors and 25 nurses died, and the workload and risk of transmission at hospitals were very high. It is clarified that PCR tests should be performed on healthcare workers to identify asymptomatic patients. In this way, viral load and transmission can be prevented at hospitals [24]. Guidelines were created by the Ministry of Health to be applied in the process of patient care and treatment, including the admission and discharge of the patients in COVID-19 process. In line with these guidelines, informing and training all employees on the use of personal protective equipment, social distance, hand hygiene, patient care and morgue operations are also very important in terms of guiding healthcare workers and protecting their health [25,26]. Conducting patient visits in the patient's room poses a risk in terms of social distance and isolation. At this point,

patients should be transferred between team members. If it is necessary for the patient, the handover should be performed at the bedside with a person from the transfer team. It should not be stayed in the patient room for longer than 10 minutes, and 1.5 m distance with the patient should be maintained. Patients should be admitted to single rooms with a bathroom. Common areas for employees should be limited and a safe area should be created for dressing. In the service, at least a surgical mask and a doctor's apron or box apron should be worn over the uniform. If the patient is to be treated, overalls, N95/FFP2 mask, and visor should be worn in appropriate order before entering the patient rooms, and after the procedure, they should be removed in the appropriate order. Clean, semi-clean and dirty areas in the service should be established and all employees should be informed about this. Transition areas such as doors, elevators, stairwells, toilets should be cleaned frequently with surface disinfectant. Hand disinfectants should be available in the service. Patient rooms and employee rooms should be ventilated frequently. Training on how to clean the room should be given to healthcare assistants. Except for the operation and cleaning, it is very important that healthcare workers wear aprons, surgical masks, box shirts, bonnets, visors, and gloves during their time at hospital. It is necessary to wear the glove during the operation and cleaning, and then remove it properly without touching anywhere, and then wash the hands. The COVID-19 pandemic process once again reveals the fact of protecting healthcare workers, which is the basic building block of the health system. Access, correct and effective use of personal protective equipment for healthcare workers is the key point in the process. Throughout the process, work and rest areas should be established for healthcare workers, and hours of work and rest should be arranged. It is extremely important to build work teams and algorithms that will guide the patient care process. It will also be necessary to strike a balance between the obligations of healthcare workers to provide treatment and the risks that can be taken. All employers, whether public or private, have both a legal and ethical responsibility to protect healthcare workers and must ensure that appropriate, adequate personal protective equipment is provided, and employees are trained in the use of this equipment. In addition to the arrangements to be made from the moment the patient enters the hospital, the precautions for the prevention of the transmission between healthcare workers are also extremely important.

CONCLUSION

In the study, 1103 healthcare workers had a PCR test. It was observed that 118 employees had positive PCR test results and most of them consisted of technical team and data entry clerks. It was determined that doctors and nurses were most infected at COVID-19 clinics; healthcare assistants in the outer area where they provided service. It was concluded that the inpatient treatment of intensive care workers consisted of doctors, healthcare assistants and nurses, respectively. All the doctors tested positive for COVID-19, most of the nurses and some of the healthcare assistants were in direct contact with COVID-19 patients. We believe that studies examining the cases of COVID-19 infection among healthcare workers in Turkey are needed and COVID-19 infection should be considered as an occupational disease for hospital employees. As authors, we guarantee that the article has not been previously published, has no conflict of interest and no funding.

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