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# Knowledge of Personal Protective Equipment Use of Senior Paramedic Students before Graduation during COVID-19 Pandemic Period

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**ABSTRACT**

This study is planned to determine the knowledge of personal protective equipment use of senior paramedic students before graduation during COVID-19 pandemic. The research is a descriptive study. The universe of the study consisted of 180 senior paramedic students studying at three universities in Izmir. When evaluating the study data, descriptive findings were expressed as percentage, mean, standard deviation and median. 38.1% of the students are between 18-20 years old, 50.0% are between 21-23 years old and 11.9% are 23 years old and above. 58.3% of the students participating in the study are females and 41.7% are males. In the study, 74.4% of paramedic students stated that healthcare personnel working in ambulance or patient transport vehicles should use medical masks, gowns, gloves and eye protection while transporting suspected COVID-19- (SARS-CoV-2) patients to the health institution. 78.5% of the students answered that an N95/FFP2 mask should be used while intervening and taking samples in a patient suspected o having COVID-19. As a result, it was found that during the COVID-19 pandemic period, the knowledge of personal protective equipment use of senior paramedic students before graduation is sufficient in some cases and not clear and sufficient in some cases. It is recommended that students should be given effective training on the use of PPE during the intervention of the patient with COVID-19 before graduation. It is known that the use of personal protective equipment is preventive in the transmission of the virus. There are studies supporting that the contact of healthcare professionals with patients with covid-19 increases their anxiety. In our study, it was thought that it would be helpful to determine whether paramedic students, who will be in the risk group to come into contact with covid-19 patients in the prehospital area, have sufficient knowledge about the use of personal protective equipment. In this direction, it is thought that it will contribute to the content of the training on the use of personal protective equipment during the covid-19 pandemic process.



## 1. Introduction

The COVID-19 epidemic caused by the SARS-CoV-2 virus, which emerged in China at the end of 2019, spread rapidly all over the world and made history as the first pandemic caused by corona viruses. In our country, the first positive case was defined on March 11. While trying to prevent the spread of the new type of corona virus, research on COVID-19 disease and SARS-CoV-2 virus continues in many countries. There are many issues regarding COVID-19 disease that have not yet been clarified. [1]

COVID-19 is transmitted by the way of transmission, by the droplet route and by the contact of the agent to the mucous membranes after contact with the droplets scattered on the surfaces by coughing or sneezing. While transmission mostly occurs through sick people, asymptomatic cases play a critical role in the spread of the disease.[2] COVID-19 aerosols have been experimentally shown to be suspended in the air for three hours, but their clinical significance is uncertain.[3] Coronaviruses are viruses that are generally not very resistant to the external environment, alcohol and disinfectants, but can survive up to 72 hours on plastic and steel surfaces and up to 24 hours on cartons.[4]

In healthcare services, healthcare professionals are exposed to many dangers and risks, including biological, physical, ergonomic, chemical and psychosocial, in the direction of their work. [5-6] Especially in the period of COVID-19 pandemic, it is important to choose appropriate personal protective equipment and correct use knowledge to prevent the transmission of the SARS-CoV-2 virus, which can be fatal, to healthcare professionals at risk. [7]

Personal protective equipment (PPE) refers to any device, tool or material designed to be worn or carried by persons to protect against one or more health and safety hazards. The most commonly used PPE types in healthcare are gloves, aprons, gown, masks, goggles, respirators, and face shields. Gloves reduce the risk of contamination by preventing the transmission of the infectious agent.[8] Aprons and gown are used to prevent contamination of clothing and to protect personnel's skin from blood and body fluids. Masks, goggles, and respirators provide protection against the transmission of infectious droplets with large particles that can reach short distances and come into close contact. The use of masks, goggles and respirators during procedures that may cause splashing of blood, body fluids and secretions

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protect personnel from contamination of eyes, nose and mucous membranes. Face shields protect the face, mouth, nose and eyes. [9-10]

Nowadays, research is needed, as is the case with many issues related to the COVID-19 epidemic, which has affected the world for the past year. At the end of the study, it is thought that determining the knowledge of senior paramedic students on the use of personal protective equipment during the COVID-19 pandemic and developing incomplete or erroneous information about the use of personal protective equipment is thought to be useful. In addition, it is thought that it will contribute to the approach to Covid-19 patients in the lecture notes on the use of personal protective.

This study is planned to determine the personal protective equipment usage knowledge of senior paramedic students prior to graduation during the COVID-19 pandemic period.

## 2.Methods

### 2.1.Study Design

The research is a descriptive study. The universe of the study consisted of 180 senior year students studying in Paramedic programs in the spring semester of the 2019-2020 academic year of the three universities in Izmir In the research, it was tried to reach the whole universe without choosing a sample.

### 2.2. Data Collection Tools

**Introductory Information Form and Data Collection Form:** Introductory information form to be used to collect the data of the study, socio-demographic information of paramedic students created by the researchers by scanning the literature, is a 17-question data collection form created by researchers to determine the personal protective equipment use knowledge of paramedic students during the Covid-19 pandemic. [9-10] This questionnaire form prepared within the scope of the research was uploaded to google forms and sent as a short URL link to the students within the scope of the research.

### Research Application

The data from the senior paramedic students included in the study were collected on the internet, during the hours when the students did not have a course or exam. During the data collection process, the researchers first gave information to the students about the purpose and method of the research and those who agreed to participate in the study were included in the study. Afterwards, the data collection form short URL link was sent to the participants using social media and e-mail. They have been given 30 days to complete. Information obtained from electronic questionnaires was collected on the system via google form in the form of Microsoft Excel file.

### Statistical analysis

The information obtained from the electronic questionnaires was collected as Microsoft Excel on the system via google form. SPSS (Statistical Package for Social Sciences) 25.0 version package program was used for statistical analysis of the obtained data. While evaluating the study data, descriptive findings were expressed as percentage, mean, standard deviation and median. [11-12]

### Ethics Committee Approval and Informed Consent

Written consent for data collection was obtained from the Research Ethics Committee of Dokuz Eylul University and the institutions where the study was carried out. Students were informed about the study and verbal consent was obtained from those who accepted to participate in the study (dated August 4, 2020; No. 2020/17-11).

## 3.Results

The introductory information of paramedic students is given in Table 1. 38.1% of the students are between 18-20 years old, 50.0% are between 21-23 years old and 11.9% are 23 years old and above. 58.3% of the students participating in the study are females and 41.7% are males. 35.7% of the students stated that they work and 64.3% stated that they do not work. 26.7% of the working students work in the emergency service of public hospitals, 40.0% in the 112 emergency health service stations and 33.3% in other institutions. 50% of the working students are emergency medical technicians, 33.3% are nurses and 16.7% are other staff.

The distribution of the knowledge about the use of personal equipment of paramedic students is given in Table 2. The question of "Which PPEs should healthcare professionals working in ambulance or patient transport vehicles use when transporting suspected COVID-19- (SARS-CoV-2) patients to the health institution?" was answered by 20.8% of the students as the medical mask, 17.8% gown/aprons, 14.8% gloves, 14.2% goggles, 74.4% all and 4.7% none. The question of "Which type of PPE or procedure is sufficient when the driver working in the ambulance or patient transport vehicle does not have direct contact with the patient during the transfer of the suspected COVID-19- (SARS-CoV-2) patient to the healthcare facility?" was answered by 89.2% of the students as it is necessary to leave at least 1 meter distance, 5.9% no PPE is required, 17.8% all and 11.9% none. "Which PPEs should be used if the driver working in the ambulance or patient transport vehicle helps to place or unload the patient suspected of having COVID-19?" 7% of the students answered the question as medical mask, 4.7% gown, 14.2% gloves, 7.1% goggles and 85.7% all. "Which PPE should be used when cleaning the ambulance after the transport of the patient suspected of having COVID-19 in the ambulance or patient transport vehicle to the health institution?" 47.6% of the students answered the question as medical masks, 33.3% gown, 8.3% heavy work gloves, 21.4% goggles, 14.2% boots or closed work shoes and 60.7% all. "Should a patient with suspected COVID-19 use PPE during transport by ambulance or patient transport vehicle?" 29.1% of the students answered that, if tolerated, they should use a medical mask, 88.0% said: "Yes, they should."

"Which type of mask should be used when intervening and taking samples in a patient suspected of having COVID-19?" 28.5% of the students answered the question as medical mask, 78.5% of the N95/FFP2 mask and 14.2% all. "Which PPEs should be used to prevent the splashing of body fluids while intervening in a patient suspected of having COVID-19?" 42.6% of the students answered N95/FFP2 mask, 46.4% gown, 53.5% goggles, 10.7% liquid soap and alcohol-based hand antiseptic and 46.4% all.

"Which type of PPE or procedure is sufficient to apply in cases where healthcare professionals working in the triage field do not have direct contact with the patient?" 46.4% of the students gave the answer to the question as medical mask, 35.7% N95/FFP2 mask, 82.1% said that they should leave at least one meter spatial distance, 7.1% all. "Which PPE type(s) or procedure(s) is/are sufficient for patients with respiratory symptoms waiting in the triage area?" 71.4% of the students answered, if tolerated, medical mask, 38.0% N95/FFP2 mask, 21.4% gown, 42.8% gloves, 38.0% face protection, 50.0% a spatial distance of at least one meter and 21.4% all.

"What is the difference between N95/FFP2 mask and medical mask?" 7.1% of the students answered "N95 is used only in processes that cause aerosolization", while 73.8% replied "N95/FFP2 masks are the masks that hold at least 95% of the particles, bacteria or viruses with 0.3 micron diameter or larger in the environment". "How is the order of use when using the following PPE?" 14.8% of the students answered gown-gloves-medical/N95/FFP2 mask-goggles/face protection, 45.2% medical/N95/FFP2 mask-gloves-goggles/face protection-gown and 39.8% gown-medical/N95/FFP2 mask-goggles/face protection-gloves.

**4.Conclusion**

Half of the students are between the ages of 21-23 and more than half are females. 35.7% of the students stated that they work at the same time. 66.7% of the employees work in the emergency service of public hospitals or in the 112 emergency health service station. 35% of the students are working. 50% of the working students are emergency medical technicians, 33.3% are nurses and 16.7% are other staff.

In the study, 74.4% of the students responded that healthcare personnel working in ambulance or patient transport vehicles should use medical masks, gown, gloves and eye protection when transporting suspected COVID-19-(SARS-CoV-2) patients to the healthcare institution.

In the WHO's Guidelines for the use of PPE for COVID-19, the use of medical masks, gown/gowns, gloves and eye protection as PPE when transporting suspected COVID-19-(SARS-CoV-2) patients to healthcare facilities by healthcare professionals working in ambulances and patient transport vehicles is recommended. [10]

89.2% of the paramedic students said that the driver working in the ambulance or patient transport vehicle should leave at least 1 meter distance during the transfer of the suspected COVID-19- (SARS-CoV-2) patient to the healthcare facility, while 5.9% said PPE is not required and 17.8% said all is required, which actually shows that only 17.8% of the students have correct information.

85.7% of the students answered correctly that the driver working in the ambulance or patient transport vehicle should use a medical mask, gown, gloves and eye protection if the driver helps to place or unload the patient who is suspected of having COVID-19 into the ambulance. 60.7% of the students gave the correct answer that a medical mask, gown, heavy-duty gloves, eye protection and boots or closed work shoes should be used when the ambulance is being cleaned after the transfer of the patient suspected of having COVID-19 to the health institution by the ambulance or patient transport vehicle.

29.1% of the students answered that a medical mask should be worn if tolerated during transportation of the suspected COVID-19 patient by ambulance or patient transport vehicle. In the WHO Guidelines for the use of PPE for COVID-19, it is recommended that the patient with suspected COVID-19 wearing a medical mask if tolerated during transport by ambulance or transport vehicle. [10]

78.5% of paramedic students gave the correct answer that N95/FFP2 mask should be used while intervening and taking samples in a patient suspected of having COVID-19. 42.8% of the students did not state that N95/FFP2 mask should be used in order to prevent the splashing of body fluids while intervening in the patient suspected of having COVID-19. Healthcare professionals dealing with COVID-19 are considered to be potentially infectious when dealing with the patient and taking samples, and the use of an N95/FFP2 mask is recommended as sampling is considered to cause aerosolization. [13-14- 15] In the study conducted by Ng et al. (2020), it was stated that 85% of healthcare workers wear medical masks while performing an aerosol-generating procedure and the rest wear N95 masks. They recommended that all healthcare professionals should wear N95 masks when performing an aerosol-generating process. [16-17]

While 82.1% of the students answered correctly that healthcare workers working in the triage field should leave a spatial distance of at least one meter in cases that do not involve direct contact with the patient, none of them marked the correct answer that PPE is not required. 71.4% of the students answered correctly that patients with respiratory symptoms waiting in the triage area should wear a medical mask if tolerated, and 50.0% gave the correct answer that at least one meter should be left, while 38.0% gave the wrong answer that N95/FFP2 masks, 21.4% are gown, 42.8% gloves, 38.0% face shields and 21.4% all should be worn.

Only 3.5% of the students gave the correct answer that no PPE is required to the patients who are waiting in the triage area and do not have respiratory symptoms. In triage, WHO recommends a medical mask, and CDC recommends a N95 mask in addition to eye protection, gowns, gloves for patient examination with direct contact. [10-13- 18] 14.2% of the students knew the difference between N95/FFP2 and a medical mask, and 39.8% gave the correct answer to the usage order of PPE. [14- 19-20] From here, it can be said that the knowledge of the paramedic students is not clear and sufficient.

As a result, during the COVID-19 pandemic period, paramedic senior students' knowledge of using personal protective equipment before graduation is sufficient for patient transport, ambulance cleaning, the procedure / PPE that should be used in the field of triage and the type of mask that should be used in patient intervention but it has been observed that it is not clear and sufficient about what kind of PPE should be used to prevent the splashing of body fluids while intervening, especially to the patient suspected of having COVID-19, the order of use of PPE, which type of PPE should be used in cases where there is no direct contact with the patient, and which type of PPE and which procedures should be applied to patients without symptoms.

Despite all the measures taken, the COVID-19 pandemic continues to affect the world. Health personnel have an important place in the fight against pandemic. The number of detected cases and the number of patients requiring treatment in intensive care is increasing in our country and in the world and healthcare professionals are affected by this increase. In order not to increase the number of COVID-19 cases detected in healthcare personnel, prevent deaths, early diagnosis and thus prevent disruptions in health services, it is important for paramedic students to know the effective and correct use of personal protective equipment. It is recommended that students should be given effective training on the use of PPE during the intervention of the patient with COVID-19 before graduation. At the same time, it is thought that more research is needed to understand the effects of the COVID-19 pandemic in the world.

**Table 1. Distribution of sociodemographic and introductory information of paramedics**

| Variables | Number | % |
|---|---|---|
| Age | | |
| Between 18-20 | 64 | 38.1 |
| Between 21-23 | 84 | 50.0 |
| 23 and above | 20 | 11.9 |
| Gender | | |
| Female | 98 | 58.3 |
| Male | 70 | 41.7 |
| **Employment Status** | | |
| Yes | 60 | 35.7 |
| No | 108 | 64.3 |
| **Institution** | | |
| Public Hospital Emergency Service | 16 | 26.7 |
| 112 Emergency Service Station | 24 | 40.0 |
| Other | 20 | 33.3 |
| **Position** | | |
| Emergency medical technician | 30 | 50.0 |
| Nurse | 20 | 33.3 |
| Other | 10 | 16.7 |
| **Total** | **168** | **100.0** |

*%: Percentage*

**Table 2. Distribution of paramedics' knowledge on the use of personal equipment**

| Questions | Answers | Number | % |
|---|---|---|---|
| Which PPEs should healthcare professionals working in ambulance or patient transport vehicles use when transporting suspected COVID-19- (SARS-CoV-2) patients to the health institution? | Medical mask | 35 | 20.8 |
| | Gown/apron | 30 | 17.8 |
| | Gloves | 25 | 14.8 |
| | Eye protection (Goggles/ face shield) | 24 | 14.2 |
| | All | 125 | 74.4 |
| | None | 8 | 4.7 |
| Which type of PPE or procedure is sufficient to apply when the driver working in the ambulance or patient transport vehicle does not have direct contact with the patient during the transfer of the suspected COVID-19- (SARS-CoV-2) patient to the healthcare facility? | Maintaining a distance of minimum 1 metre | 150 | 89.2 |
| | PPE is not required | 10 | 5.9 |
| | All | 30 | 17.8 |
| | None | 20 | 11.9 |
| Which PPEs should be used if the driver working in the ambulance or patient transport vehicle assists in placing or unloading the patient suspected of having COVID-19 in the ambulance? | Medical mask | 12 | 7.1 |
| | Gown | 8 | 4.7 |
| | Gloves | 24 | 14.2 |
| | Eye protection (Goggles/ face shield) | 12 | 7.1 |
| | All | 144 | 85.7 |
| | None | 0.0 | 0.0 |
| Which PPEs should be used when cleaning the ambulance after the patient, suspected of having COVID-19, is transferred to the health institution? | Medical mask | 80 | 47.6 |
| | Gown | 56 | 33.3 |
| | Heavy duty gloves | 14 | 8.3 |
| | Eye protection (Goggles/ face shield) | 36 | 21.4 |
| | Boots or closed work shoes | 24 | 14.2 |
| | All | 102 | 60.7 |
| | None | 0.0 | 0.0 |
| Should a patient with suspected COVID-19 use PPE during transport by ambulance or patient transport? | Medical mask, if tolerated | 49 | 29.1 |
| | Yes | 148 | 88.0 |
| | No | 0.0 | 0.0 |
| What type of mask should be used when intervening and collecting samples with a patient suspected of having COVID-19? | Medical mask | 48 | 28.5 |
| | N95/FFP2 mask | 132 | 78.5 |
| | All | 24 | 14.2 |
| Which PPEs should be used to prevent body fluids from splashing while responding to a patient suspected of having COVID-19? | N95/FFP2 mask | 72 | 42.8 |
| | Gown | 78 | 46.4 |
| | Eye protection (Goggles/ face shield) | 90 | 53.5 |
| | Liquid soap and alcohol-based hand sanitizer | 18 | 10.7 |
| | All | 78 | 46.4 |
| | None | 0 | 0.0 |
| Which type of PPE or procedure is sufficient for healthcare professionals working in the triage field in cases that do not involve direct contact with the patient? | Medical mask | 78 | 46.4 |
| | N95/FFP2 mask | 60 | 35.7 |
| | Maintaining a spatial distance of minimum 1 metre | 138 | 82.1 |

| | | | |
|---|---|---|---|
| | PPE is not required | 0 | 0.0 |
| | | | |
| | All | 12 | 7.1 |
| | None | 0 | 0.0 |
| Which PPE type(s) or procedure(s) is/are sufficient for patients with respiratory symptoms waiting in the triage area? | Medical mask, if tolerated | 120 | 71.4 |
| | N95/FFP2 mask | 64 | 38.0 |
| | Gown | 36 | 21.4 |
| | Gloves | 72 | 42.8 |
| | Face shield | 64 | 38.0 |
| | Maintaining a spatial distance of minimum 1 metre | 84 | 50.0 |
| | All | 36 | 21.4 |
| | None | 0 | 0.0 |
| Which PPE type(s) or procedure(s) is/are sufficient for patients who do not have respiratory symptoms waiting in the triage area? | Medical mask, if tolerated | 108 | 64.2 |
| | N95/FFP2 mask | 18 | 10.7 |
| | Gloves | 42 | 25.0 |
| | Face shield | 24 | 14.2 |
| | Maintaining a spatial distance of minimum 1 metre | 90 | 53.5 |
| | PPE is not required | 6 | 3.5 |
| | All | 24 | 14.2 |
| | None | 0 | 0.0 |
| What is the difference between N95/FFP2 mask and medical mask? | N95 is used only in processes that cause aerosolization | 12 | 7.1 |
| | N95 / FFP2 masks are the masks that retain at least 95% of the surrounding particles 0.3 micron diameter or larger, bacteria or viruses. | 124 | 73.8 |
| | Surgical masks are the masks designed to limit the transmission of infectious agents from personnel to patients and from patients to personnel during surgical procedures. | 30 | 17.8 |
| | All | 24 | 14.2 |
| | None | 0 | 0.0 |
| What is the order of use when using the following PPEs? | Gown-gloves- medical/N95/FFP2 mask-goggles/face shield | 25 | 14.8 |
| | Medical/N95/FFP2 mask- gloves -goggles/face shield- Gown | 76 | 45.2 |
| | Gown-medical/N95/FFP2 mask-goggles/face shield –gloves | 67 | 39.8 |
| **Total** | | **168** | **100.0** |
| ***%: Percentage*** | | | |

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