EVALUATION OF PERSONAL PROTECTIVE EQUIPMENT FOR HEALTHCARE PROFESSIONALS TO PREVENT TRANSMISSION OF COVID-19

BY

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ABSTRACT

EVALUATION OF PERSONAL PROTECTIVE EQUIPMENT FOR HEALTHCARE PROFESSIONALS TO PREVENT TRANSMISSION OF COVID-19

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Master of Science in Occupation Health and Safety

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Healthcare workers (HCWs) face an elevated risk of contracting COVID-19, and implementing safety measures, including personal protective equipment (PPE), is critical in preventing infections. The study follows a cross-sectional design, focusing on four hospitals in Babylon province with epidemiological wards for COVID-19 patients, randomly selecting two through multistage sampling. A sample size of 425 HCWs was chosen via simple random sampling, with respondents providing insights through a questionnaire spanning demographic data, prevention and control methods assessment, evaluation of COVID-19 measures, and assessment of PPE requirements.

When examining prevention and control methods by functional title and healthcare facility type, outcomes revealed that bacteriologists scored highest (4.275±0.329), followed by chemists (4.225±0.459), whereas pharmacist assistants scored lower (2.10±0.212). The assessment of medical laboratories yielded the highest score (4.059±0.400), contrasting with the emergency unit, which exhibited a lower score (3.883±0.452).

Considering the overall evaluation of PPE within primary domains, the prevention and control methods domain earned the highest score (4.001±0.501), reflecting a good evaluation level. Conversely, the COVID-19 measures domain received a lower score (4.001±0.501), signifying a moderate evaluation level.

Correlation analysis demonstrated highly significant positive correlations (P-value < 0.001) between prevention and control methods and COVID-19 measures (r=0.624), prevention and control methods and assessment of PPE conditions (r=0.476), and COVID-19 measures and assessment of PPE conditions (r=0.476).

The study's findings indicated a significant association between the total PPE evaluation score and socio-demographic variables (P-value < 0.05), excluding the type of healthcare facility, which lacked substantial association with the total PPE evaluation score (P-value > 0.05).

In conclusion, HCWs' overall assessment of PPE usage falls within an average range. Notably, a considerable percentage of HCWs reported inadequate training on PPE. The study underscores the necessity for comprehensive education and training across all HCWs, focusing on infection prevention, control strategies, and proper PPE utilization.

2023, 113 pages

Keywords: COVID-19, Pandemic, Healthcare Workers, Disease, Preventive Measures, Risk, Precaution, Infection.

ÖZET

COVİD-19'UN BULAŞMASINI ÖNLEMEK SAĞLIK ÇALIŞANLARI KİŞİSEL KORUYUCU EKİPMANLARIN DEĞERLENDİRİLMESİ

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COVID-19, son yılların en büyük sağlık krizlerinden biri olarak ortaya çıkmış ve sağlık çalışanları, enfekte hastalarla temas ettiklerinden dolayı büyük bir risk altında kalmışlardır. Bu nedenle, kişisel koruyucu donanım (KKD) sağlık çalışanlarının COVID-19 enfeksiyonu ile karşı karşıya kalma riskini azaltmada kritik bir rol oynamaktadır.

KKD, sağlık çalışanlarının enfeksiyonu önlemek için kullandığı özel ekipmanları içermektedir. Bu ekipmanlar arasında cerrahi maskeler, N95 solunum maskeleri, yüz koruyucuları, gözlükler, eldivenler ve önlükler bulunmaktadır. KKD, sağlık çalışanlarının COVID-19 enfeksiyonu ile temas etmelerini önleyerek hem sağlık çalışanlarının hem de hastaların güvenliğini sağlamaya yardımcı olmaktadır. KKD'nin doğru şekilde kullanılmadığı durumlarda, enfeksiyon riski artmaktadır. Dolayısıyla, COVID-19 salgını sırasında KKD kullanımı sağlık çalışanlarının ve hastaların güvenliğini sağlamak için hayati önem taşımaktadır

Bu kesitsel çalışma, Babil kentindeki Al-Hilla'da bulunan ve epidemiyoloji servisi bulanan dört hastaneden iki tanesinde gerçekleştirilmiştir Çalışma basit tesadüfi örnekleme tekniği kullanılarak seçilen 425 sağlık çalışanını kapsamaktadır. Seçilen Çalışma, örneklem olarak sağlık çalışanlarının demografik özellikleri, önleme ve kontrol yöntemlerinin değerlendirilmesi, COVID-19 tedbirlerinin değerlendirilmesi ve KKD ile ilgili koşul ve gereksinimlerinin değerlendirilmesi olmak üzere dört içeren anket öğelerini yanıtlanması ve yapılan sözlü mülakatlar çerçevesince yürütülmüştür.

Unvan ve sağlık kuruluşunun türüne göre önleme ve kontrol yöntemlerinin değerlendirilmesine bakıldığında, sonuçlar bakteriyologların (4.275±0.329) yüksek değerlendirme puanına sahip olduğunu ve bunu kimyagerlerin (4.225±0.459)

izlediğini göstermektedir. Eczacı asistanlarının değerlendirme düzeyleri düşük olarak bulunmuştur (2,10±0,212). En yüksek değerlendirme puanı (4.059±0.400) tıbbi laboratuarlar için olurken, en düşük değerlendirme düzeyi ise (3.883±0.452) acil ünitesi için bulunmuştur.

Bu çalışma, KKD'nin ana alanlara göre genel değerlendirilmesi bakımından en yüksek değerlendirme puanının (4.001±0.501) önleme ve kontrol yöntemleri alanında iyi bir değerlendirme düzeyi içinde kaldığını ortaya koymaktadır. En düşük değerlendirme puanı ise (4.001±0.501 idi) orta değerlendirme seviyesi ile Covid-19 tedbirleri alanındadır.

Çalışma sonuçları, önleme ve kontrol yöntemleri ile Covid-19 önlemleri (r= 0.624) arasında oldukça anlamlı bir pozitif korelasyon (*P*-değeri <0.001) olduğunu göstermektedir. Önleme ve kontrol yöntemleri ile KKD'nin koşul ve gereksinimlerinin değerlendirilmesi (r= 0,476) arasında anlamlı bir pozitif korelasyon (*P*-değeri <0,001) bulunmuştur.

Çalışma sonuçları KKD'nin toplam değerlendirme puanı ile sosyo-demografik değişkenler arasında önemli bir ilişki olduğunu ortaya koymaktadır (*P* değeri <0.05). Ancak sağlık tesisinin türü ile KKD'nin toplam değerlendirme puanı arasında anlamlı bir ilişki olmadığı görülmüştür (*P* değeri>0.05).

Sağlık çalışanlarının Covid-19' karşı kullanılan kişisel koruyucu ekipmanlarla ilgili genel değerlendirmesinin ortalama düzeyde olduğunu göstermektedir Ayrıca, sağlık çalışanlarının yüksek bir yüzdesi kişisel KKD koruyucu ekipman konusunda eğitim eksiklikleri olduğunu bildirmiştir. Çalışma, tüm sağlık çalışanlarının enfeksiyon önleme ve kontrolü ile kişisel koruyucu ekipmanların KKD'ın uygun kullanımı konusunda gerekli eğitimleri almasının önemini ortaya koymaktadır.

2023, 113 Sayfa

Anahtar Kelimeler: COVID-19, Pandemi, Sağlık Çalışanı, Hastalık, Korunma Önlemleri, Risk, Tedbir, Enfeksiyon.

PREFACE AND ACKNOWLEDGEMENTS

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Bilal Najm ABED AZZAWI

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CONTENTS

INDEX OF ABBREVIATIONS AND SYMBOLS

ANOVA	Analysis of Variance
CDC	Centers for Disease Control
COVID-19	Corona Virus Disease 2019
DRPI	Device-Related Pressure Injury
EE	Emotional Exhaustion
EMRs	Emergency Medicine Residents
FFP2	Filtering Face Piece
HCWs	Health Care Workers
ILO	International Labour Organization
OHS	Occupational Health and Safety
OHSM	Occupational Health and Safety Measures
PPE	Personal Protective Equipment
SARS	Severe Acute Respiratory Syndrome
SARS-COV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SD	Standard Deviation
WHO	World Health Organization

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1. INTRODUCTION

Safety and health are important in preventive and curative management (Elenwo 2018). On the other hand, a safe workforce is vital for sustainable social and economic development globally and locally (Beyene Gebrezgiabher *et al*. 2019).

Once COVID-19 is suspected, the World Health Organization (WHO 2020b) recently published infection prevention and control guidelines. Environmental, engineering, and administrative controls are among the WHO's strategies. Regarding PPE, the experience obtained with Severe Acute Respiratory Syndrome SARS in 2003 was invaluable (WHO 2020b).

Health professionals are at the forefront of the COVID-19 outbreak response and are exposed to many risks that endanger them. Workplace dangers include being exposed to SARS-CoV-2 and other viruses, as well as aggression, harassment, stigma, and discrimination, as well as a severe workload and protracted PPE use. This document explains the obligations, rights, and responsibilities for health and safety at work in the framework of COVID-19 and offers particular ways to protect the occupational health and safety of health workers. (WHO 2021a)

PPE protects medical staff from infectious diseases by reducing contact with bodily fluids and inhaling droplets (Honda and Iwata 2016, WHO 2020e). Using PPE correctly is one of the best ways to protect patients and HCWs from transmissible infections. This method is even more important because there is no effective preventative measure or treatment for an illness like COVID-19. HCWs must adhere to strict guidelines and wear the proper PPE while caring for patients with confirmed or suspected COVID-19 (WHO 2020f). HCWs often protect themselves by wearing a surgical mask, a waterproof gown, gloves, hair protection, a face shield, and good hand hygiene to lessen their exposure to airborne particles and protect their mucosal membranes (WHO 2020e, Wax and Christian 2020).

To prevent Covid-19, the WHO advises constantly washing your hands and keeping at least one meter away from other individuals (Shaikh *et al*. 2020, Azuma *et al*. 2020). The government's involvement in slowing the spread of COVID-19 is crucial. It is essential to create a methodical Covid-19 control approach (Pandey and Saxena 2022). Health protocols have been developed in several nations globally. For instance, the Korean government has required that people keep their distance physically, use good coughing techniques, and practice personal hygiene using face masks, shields, and sanitizers (Kim 2020). Also, governments are in charge of safeguarding employees' health at work (Dyal 2020, Michaels and Wagner 2020).

A comprehensive investigation found that certain clinical environments, poor hand hygiene, severe workloads, improper or inadequate use, and a lack of PPE could increase the occupational risk for health professionals (Chou *et al*. 2020).

The COVID-19 pandemic, which affects the entire world, slows down or stops nearly all business sectors and professions, burdening the healthcare system and raising occupational dangers for health workers (Karaca *et al.* 2020*)*.

1.2 Importance of the study

In 2019, much focus has been on reducing the nosocomial spread of coronavirus in developed and developing nations (COVID-19). One important aspect is the effective use of PPE, which may reduce the risk of infection for medical professionals while minimizing exposure to other patients they care for (McCarthy *et al*. 2020).

1.3 Aims of the study

To evaluate occupational health and safety PPE to prevent COVID-19 contagion in HCW by considering the following aspects:

- To find an association between socio-demographic characteristics and overall evaluation score for main domains.

- To find an association between occupation characteristics and overall evaluation score for main domains.
- To identify the type of association between main domains.

2. LITERATURE REVIEW

The literature context of occupational health and safety (OHS) dates back to the 1950s when the International Labour Organization (ILO) Committee on Occupational Health defined occupational health as "the optimal physical, mental, and social well-being of workers across all professions" (Gouttebarge and Aoki 2014).

The past decade has witnessed a rise in the rate of injuries occurring in the health sector (Shimizu *et al*. 2010). Hospitals are risky workplaces that are unique to risks in other work environments that are dangerous to the lives of health workers. One of the most significant issues in the healthcare sector is to control and reduce the risks facing workers because it must also consider the situation of hospital patients (Kamen *et al*. 2013).

In various institutions across Europe, America, and Asia, comprehensive occupational health and safety (OHS) training programs have been established for trainees from developing nations. These academic organizations collaborate to attract students from less developed countries, arranging engaging lectures and training sessions while ensuring adequate funding for travel and accommodation expenses. These universities have conducted diverse courses and seminars on this topic, with varying approaches and durations. This approach enables many trainees to bridge the economic gap between affluent and developing countries, which would otherwise pose a significant barrier. These programs aim to increase the number of occupational health professionals and enhance the quality of their education in low-income nations. This improvement aims to elevate working conditions in these countries by disseminating knowledge and awareness of best practices and solutions, even if they are not associated with high costs and investments. Nonetheless, these efforts are sufficient to reduce workers' exposure to specific workplace hazards (Paganelli *et al*. 2018, Lucchini and Landrigan 2015, O'Connor *et al*. 2014).

The use of PPE appropriately and practising hand hygiene are advised by the WHO and other national and international public health organizations (Otter *et al*. 2016, WHO 2021b). HCWs are frequently protected as a result, and any potential transmission can

be stopped. Although physical separation from infectious patients and bodily fluids is the most efficient way to protect healthcare workers, more aggressive care that necessitates close contact with these patients frequently lowers mortality rates for COVID-19-infected patients (WHO 2020e, Delgado *et al*. 2020).

Iraq has experienced today's most complex emergency, conflict, and security situations as a developing country. Health facilities have been badly damaged and need urgent rehabilitation. Primary healthcare centres have deteriorated due to maintenance, lack of supplies, decreased health workers, or insufficient support services (Khalied and Abdullwahid 2017).

Worldwide, HCWs are a vital component of every country's strategic response to COVID-19, as governments strive to build capacity to accommodate the inflow of patients who require emergency attention. WHO has established guidelines for appropriately using PPE in community and hospital settings (WHO 2016). Nonetheless, safeguarding HCWs remains difficult in most nations, with everyday concerns about a lack of proper PPE. Due to a lack of testing capability, early detection and isolation of cases are impossible, resulting in avoidable occupational exposure for HCWs, especially as most COVID-19 patients are asymptomatic. In a vicious loop, a lack of HCWs may push employees to labor for days, even when tired or experiencing symptoms, increasing the chance of transmission (Bandyopadhyay *et al*. 2020).

On the other hand, according to reports, there were 101,419 COVID-19 deaths and 17,004,677 verified cases of the illness in Turkey as of the date given (WHO 2022). However, the COVID-19 outbreak in Turkey and elsewhere in the world has shown that there are shortcomings, especially in terms of quality and quantity, to meet the growing need for healthcare professionals and essential PPE (Akkuş *et al*. 2022; (Cengiz *et al*. 2021, Kackin *et al.* 2021).

2.1 SARS-COV2 (COVID-19)

Coronaviruses, a subgroup within the Nidovirales order, are frequently encountered human pathogens. These viruses possess an envelope and consist of single-stranded

RNA with a positive-sense orientation. They are categorized under the Coronavirdiae family and are associated with a range of diseases, such as acute respiratory, hepatic, and neurological conditions, affecting both humans and animals (Denis *et al*. 2020, Woo *et al*. 2009).

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) belongs to the novel lineage B beta-coronaviruses within the phylogenetic tree. Its genome size is 29,891 nucleotides, coding for 9,860 amino acids. The genetic makeup of SARS-CoV-2 shares a nucleotide identity of 89% with bat SARS-like-CoVZXC21 and 82% with human SARS-CoV (Chan *et al*. 2020).

COVID-19, short for "Coronavirus Disease 2019," is a highly contagious viral respiratory illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in December 2019 in Wuhan, Hubei province, China. The disease subsequently led to a global pandemic, affecting millions worldwide and causing significant health, economic, and social impacts (Sharma *et al*. 2020).

2.2 Transmission of SARS-COV-2

2.2.1 Modes of transmission

The transmission of SARS-CoV-2 can happen through various means, including direct, indirect, or close contact with infected individuals. This can occur when contacting infected secretions like saliva and respiratory fluids or through the respiratory droplets they release while coughing, sneezing, talking, or singing (Liu *et al*. 2020, Burke *et al*. 2020, Luo *et al*. 2020). Respiratory droplets are characterized by their diameter, with sizes typically ranging from 5 to 10 micrometres. Conversely, droplets smaller than 5 micrometers are categorized as droplet nuclei or aerosols (WHO 2023). Respiratory droplet transmission can occur when an individual comes close (within 1 meter) to an infected person exhibiting respiratory symptoms such as coughing, sneezing, talking, or singing. In such scenarios, respiratory droplets carrying the virus have the potential to reach the mouth, nose, or eyes of an uninfected person, leading to possible infection. Transmission can also occur indirectly through contact with a contaminated object or

surface (known as fomite transmission), where a susceptible person touches the contaminated surface and then transfers the virus to their mouth, nose, or eyes (WHO 2023).

2.2.2 Airborne transmission

Airborne transmission refers to transmitting an infectious agent through the dispersion of tiny droplet nuclei (aerosols) that can remain infectious while suspended in the air for extended periods and over considerable distances (WHO 2014). The transmission of SARS-CoV-2 via airborne means can occur mainly during medical procedures that produce aerosols, often referred to as "aerosol-generating procedures" (WHO 2020).

2.2.3 Fomite transmission

Respiratory secretions or droplets emitted by individuals infected with the virus can contaminate various surfaces and objects, creating fomites, which are essentially contaminated surfaces. The presence of viable SARS-CoV-2 virus or its RNA, detectable through RT-PCR testing, has been observed on these surfaces for varying durations, ranging from hours to days. The persistence of the virus depends on factors like temperature, humidity, and the nature of the surface itself. This phenomenon is particularly noticeable in healthcare settings where COVID-19 patients receive treatment (Van Doremalen *et al*. 2020, Chia *et al*. 2020, Pastorino *et al*. 2020).

Consequently, the potential for transmission is not limited solely to direct person-to-person contact. Indirect transmission pathways can also come into play. These involve coming into contact with surfaces in close proximity or objects contaminated with the virus from an infected individual. For instance, items like stethoscopes or thermometers could carry a high virus concentration in healthcare facilities where COVID-19 patients are treated. Following contact with such contaminated surfaces or objects, the virus can be transferred to the mucous membranes of the mouth, nose, or eyes through subsequent hand-to-face contact (WHO 2020).

2.3 Prevent transmission of COVID-19.

To prevent transmission, WHO recommends a comprehensive set of measures including (WHO 2023):

- Frequent Hand Hygiene

Wash hands with soap and water for at least 20 seconds, especially after being in public places or touching surfaces. Use hand sanitiser with at least 60% alcohol when soap and water are unavailable.

- Wearing Masks

Wear masks in public settings, mainly when physical distancing is challenging. Masks help prevent respiratory droplets from spreading, protecting others. HCWs should use appropriate masks and protective gear when dealing with patients.

- Physical Distancing

Maintain at least 6 feet (2 meters) of distance from others not from your household. Avoid close contact, especially in crowded spaces.

- Avoiding Crowded and Enclosed Spaces

Limit time spent in enclosed areas with poor ventilation. Avoid crowded places where maintaining distance is difficult.

- Good Respiratory Hygiene

Cover your mouth and nose with a tissue or elbow when coughing or sneezing. Dispose of used tissues properly and wash hands immediately.

- Testing and Isolation

Get tested if you have symptoms of COVID-19 or have been in close contact with a confirmed case. Isolate yourself if you test positive to prevent spreading the virus to others.

- Quarantine for Close Contacts

Quarantine if you've been in close contact with a confirmed case, even if you don't have symptoms. Testing and monitoring can help identify cases early.

- Travel Safety

Follow travel advisories and guidelines from health authorities. Consider the COVID-19 situation in your destination and the risks involved.

- Vaccination

Get vaccinated when eligible and follow booster shot recommendations if applicable. Vaccination significantly reduces the risk of severe illness and transmission.

- Cleaning and Disinfecting

Regularly clean and disinfect frequently touched surfaces, such as doorknobs, light switches, and electronic devices.

- Workplace Measures

Employers should implement measures to enable physical distancing, provide adequate ventilation, and ensure good hygiene practices in the workplace.

- Stay Informed

Keep up with the latest information from reliable sources like health organizations and government agencies.

2.4 Effect of COVID-19 on healthcare workers

The COVID-19 pandemic has brought about a cascade of challenges for HCWs. These professionals have grappled with a surge in patient numbers, labouring extended hours in high-pressure settings and straining their physical endurance and mental well-being as they navigate the complexities of a novel and swiftly evolving disease. Operating on the front, doctors, nurses, and support staff have faced elevated risks of infection due to direct exposure to afflicted patients, giving rise to heightened apprehension about their safety and their families. The emotional toll has been profound, with HCWs shouldering the burden of making tough decisions, providing end-of-life care, and offering solace to patients' families while grappling with their inner turmoil. This prolonged period of extraordinary demand and emotional stress has driven burnout, anxiety, depression, and post-traumatic stress, underscoring the pressing need for respite and mental health support(WHO 2022).

Moreover, shortages of essential supplies like PPE and ventilators have thrust HCWs into ethical quandaries, navigating the intricate landscape of resource allocation. Yet, amidst these adversities, HCWs have showcased remarkable adaptability, swiftly

embracing new treatment protocols, technologies, and care delivery methods, often without established guidelines. Effective communication has been paramount, as they convey intricate medical information to patients and families across language barriers and the limitations of virtual interfaces. Unfortunately, some have also faced stigmatization from their communities due to misconceptions about transmission, compounding the emotional strain they bear. While public support and appreciation have surged, a more systematic approach is needed to give them the necessary mental health resources and recognition for their sacrifices. The pandemic has underscored the pivotal role of international collaboration in pooling knowledge, research, and resources among healthcare professionals to manage and mitigate the crisis effectively (Gupta *et al*. 2021, Centers for Disease Control and Prevention 2023).

2.5 Overview of occupational health and safety

Workplace safety, health, welfare, and well-being are all topics covered by OHS. Companies in Britain are required by law to provide a secure working environment for employees, and OHS mandates both the prevention and care of any health problems the team might encounter while at work or as a result (British Safety Council 2022).

2.6 Occupational health and safety measures

PPE is the protective gear that workers require to be safe while doing their tasks. Respirators (such as N95), face shields, goggles, and disposable gloves are examples of PPE. While engineering and administrative controls and correct work practices are thought to be more successful in reducing exposure to many occupational dangers, using PPE is also critical in laboratory settings (Occupational Safety and Health Act 2011).

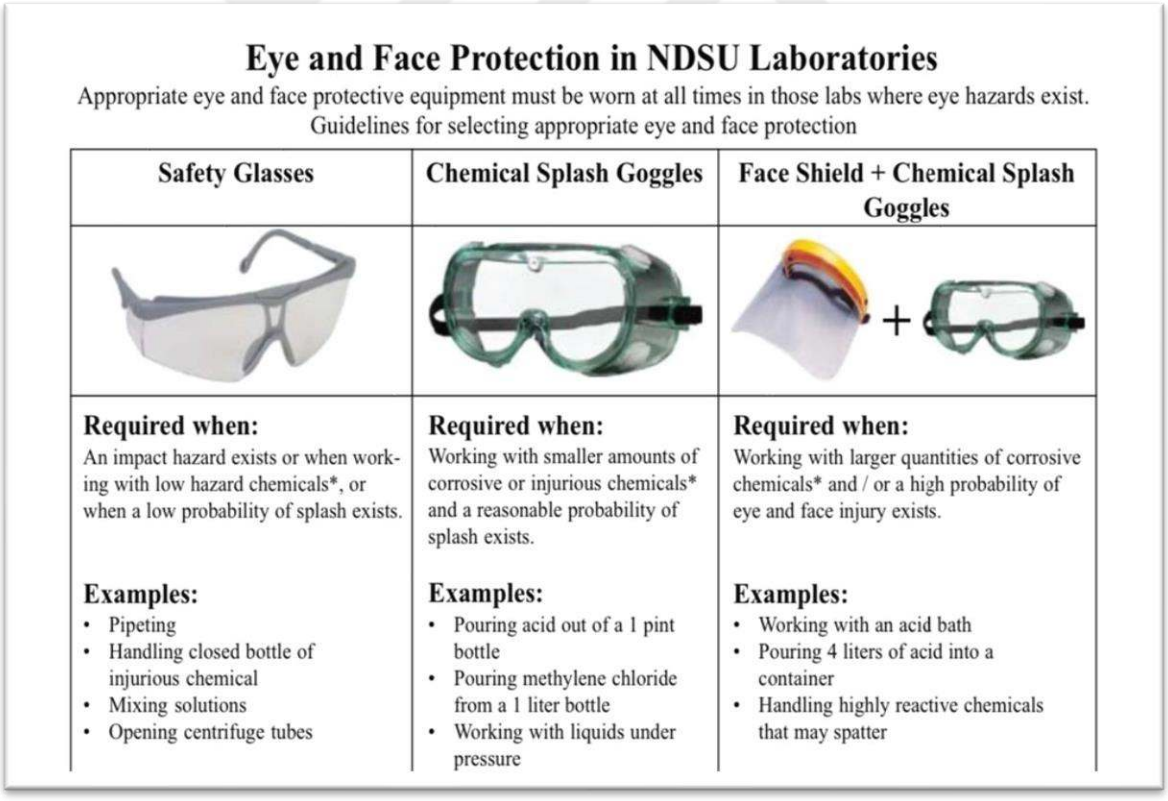
PPE is routinely used in healthcare environments such as hospitals, doctor's offices, and clinical labs. When worn properly, PPE is a barrier between the body, mouth, nose, and eyes (mucous membranes) and infectious substances, including viruses and bacteria. PPE can prevent pathogens from being transferred by respiratory secretions, blood, or other bodily fluids (United States Food and Drug Administration 2020).

2.7 The types of personal protective equipment

HCWs involved in the direct care of patients should use the following PPE: gowns, gloves, medical masks, and eye protection (goggles or face shield) (WHO 2020g).

Mainly, HCWs should wear respirators, eye protection, gloves, and gowns for aerosol-generating procedures (such as tracheal intubation, non-invasive ventilation, tracheostomy, cardiopulmonary resuscitation, manual ventilation before intubation, and bronchoscopy); aprons should also be worn if gowns are not fluid resistant (WHO 2014b).

Anastasia *et al.* (2016) highlighted some types of PPE, which are shown in (Figure 2.1 and Figure 2.2)



Eye and Face Protection in NDSU Laboratories

Appropriate eye and face protective equipment must be worn at all times in those labs where eye hazards exist.
Guidelines for selecting appropriate eye and face protection

Safety Glasses	Chemical Splash Goggles	Face Shield + Chemical Splash Goggles
Required when: An impact hazard exists or when working with low hazard chemicals*, or when a low probability of splash exists.	**Required when:** Working with smaller amounts of corrosive or injurious chemicals* and a reasonable probability of splash exists.	**Required when:** Working with larger quantities of corrosive chemicals* and / or a high probability of eye and face injury exists.
Examples: • Pipeting • Handling closed bottle of injurious chemical • Mixing solutions • Opening centrifuge tubes	**Examples:** • Pouring acid out of a 1 pint bottle • Pouring methylene chloride from a 1 liter bottle • Working with liquids under pressure	**Examples:** • Working with an acid bath • Pouring 4 liters of acid into a container • Handling highly reactive chemicals that may spatter

Figure 2.1 Eye and face protection equipment (Anastasia *et al.* 2016)

Glove Types	Glove Shell Construction	Features and Attributes
 Leather	• Cut pieces are sewn together (has seams) • Common leathers: cow, sheep, goat, pig, horse, buffalo, deer, elk	• Highly durable • High abrasion resistance • Naturally flame resistant
 String Knit	• Seamless knit • Common fibers: cotton, nylon, polyester, HPPE, para-aramid	• High dexterity • High breathability • Engineered yarns can offer several hazard protections
 Mechanics	• Layers of different materials	• Cut and sewn • High dexterity • Variety of protection offerings • Zoned protection
 Chemical	• Common materials: nitrile, neoprene, latex, PVC	• Resists liquid and chemical penetration • Can resist chemical degradation
 Disposable	• Common materials: nitrile, latex, polyethylene	• Prevents cross contamination

Figure 2.2 The types of gloves (Anastasia *et al.*, 2016)

2.7.1. Gloves

Chemical-resistant gloves are used to guard against chemicals, whereas non-latex gloves are used to protect against infectious illnesses. Other concerns include offering various sizes and manufacturers of PPE for suit and comfort, which can be essential factors in proper use (WHO 2018).

2.7.2 Disposable respirators and masks

Respiratory particles might be categorised as droplets or aerosols depending on their size, especially their aerodynamic diameter. Disease transmission with particles larger than 5 microns is classified as "droplet transmission," while transmission with particles smaller than 5 microns is classified as "aerosol transmission," according to WHO and the Centers for Disease Control and Prevention CDC (Shiu *et al*. 2019).

2.7.3 Filter masks

The average filtration strength of N95-police filters in the range of sizes assessed is approximately 8-12 times higher than that of disposable surgical masks, whose filtrations vary considerably across studies regarding the type and size of aerosol particles (1.3 to 6.5 m). Other studies have found that respirators with an N95 face filter give seven times the protection of surgical masks (Lee *et al*. 2008). Breathing is made more accessible with N95 respirators that have an exhalation valve. An N95 facial filter respirator with a breathing valve retains its capacity to protect the wearer against bacterial and viral particles in the air. The exhalation valve aerosol penetration was also evaluated for negative pressure respirators. Results showed no valve fault levels of roughly 0.03 to 0.04% (Chellamani *et al.* 2013).

When PPE was scarce during earlier public health catastrophes involving acute respiratory illnesses, respirators (such as N95, FFP2, or comparable standards) were utilized for a prolonged period (Beckman *et al*. 2013). Research has shown that respirators continue to protect when worn for extended periods, which means using the same respirator while providing care for multiple patients with the same diagnosis

without taking it off. Wearing one respirator for longer than four hours might be uncomfortable, though. It should, therefore, not be used (Janssen *et al*. 2014, Radonovich *et al.* 2009).

Medical masks should be distributed to members of the general public who have respiratory symptoms or are taking care of COVID-19 patients at home. See Home care for COVID-19 patients presenting with moderate symptoms and management of their contacts for further information (WHO 2020d).

Any mask should not be worn by those who are symptom-free. When not necessary, wearing medical masks can increase costs and procurement burdens, give one a false sense of security, and make one disregard other crucial preventative measures. For more information, refer to the COVID-19 framework for guidance on the use of masks in the community, during home care, and in healthcare settings (WHO 2020a)

2.7.4. Disposable surgical masks (Face masks)

Although temporary surgical masks offer significant protection, they are less effective than FFP2 masks. On the other hand, surgical masks are less influenced by limited supply and do not need additional resources for mass production. Surgical masks, such as droplet nuclei, are not expected to guard against minute particle transmission. However, partial transmissibility decreases might be sufficient to drastically lower the number of persons affected and halt the pandemic (Van-der *et al.* 2008).

2.7.5. Safety goggles and splash guard visor

Through the tear duct, microorganisms can penetrate the conjunctiva. As a result, protecting the eyes against SARS-CoV-2 infection is vital while in direct contact with an individual suspected of having the disease (Cirrincione *et al*. 2020).

2.7.6 Isolation gowns

Temporary (single-use) insulation gowns are manufactured of nonwoven fabrics either by themselves or with components that better resist fluid penetration, such as plastic films. They may be produced with nonwoven fiber bonding methods (thermal, chemical, and mechanical) that provide consistency and strength rather than interlocking forms to woven materials (Kilinc 2015).

2.8 The steps to put on personal protective equipment

In (Figure 2.3), the World Health Organization (WHO 2014) highlights steps to Put on PPE.

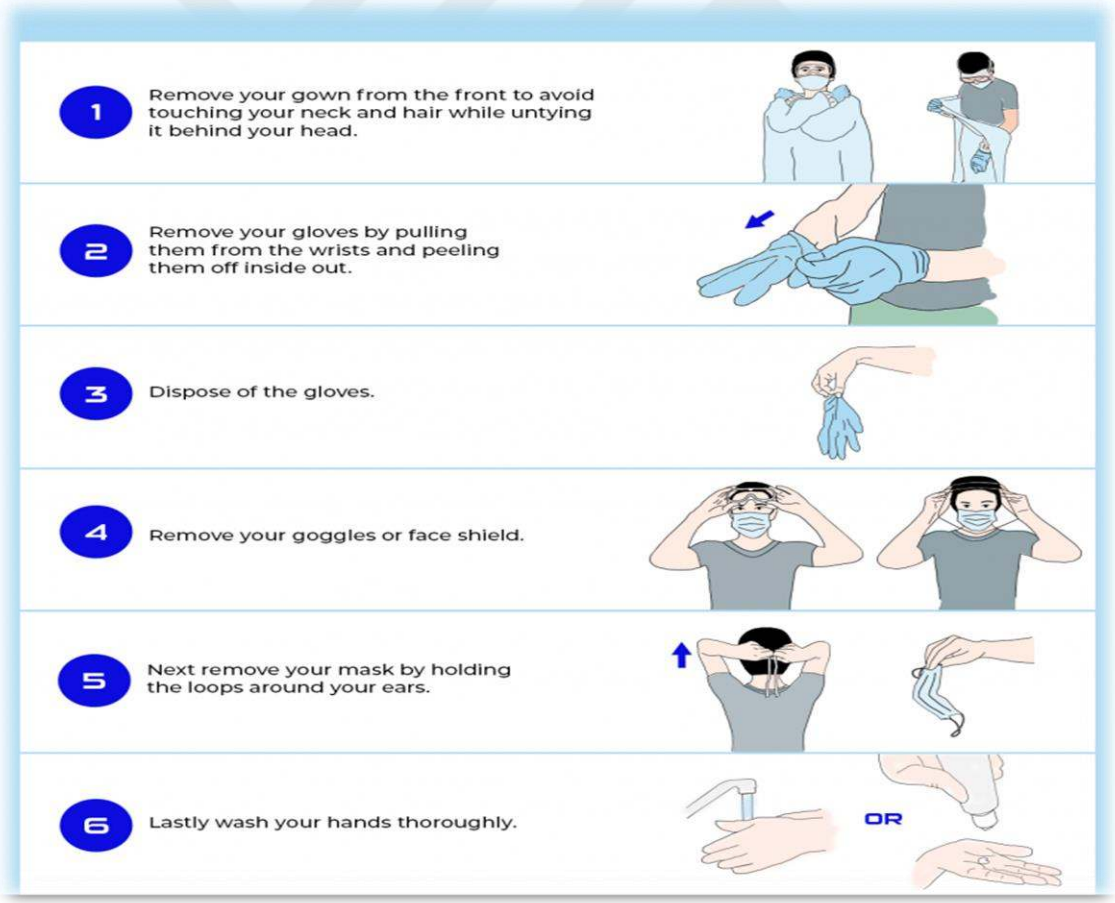


Figure 2.3 The steps to put on PPE (WHO 2014).

2.9 Hierarchy of controls applied toCOVID–19

Appropriate and targeted OHSM are required, taking into account the current conditions impacting the safety and health of people at work to protect the health of outpatient caregivers during the COVID-19 pandemic. OHSM must be put into place as a result, keeping in mind the factors affecting the safety and health of employees while at work. The hierarchy of hazard control, from technological to organizational to personal protective measures, must be taken into account when implementing OHSM in a context (Bundesministerium für Arbeit und Soziales 2020).

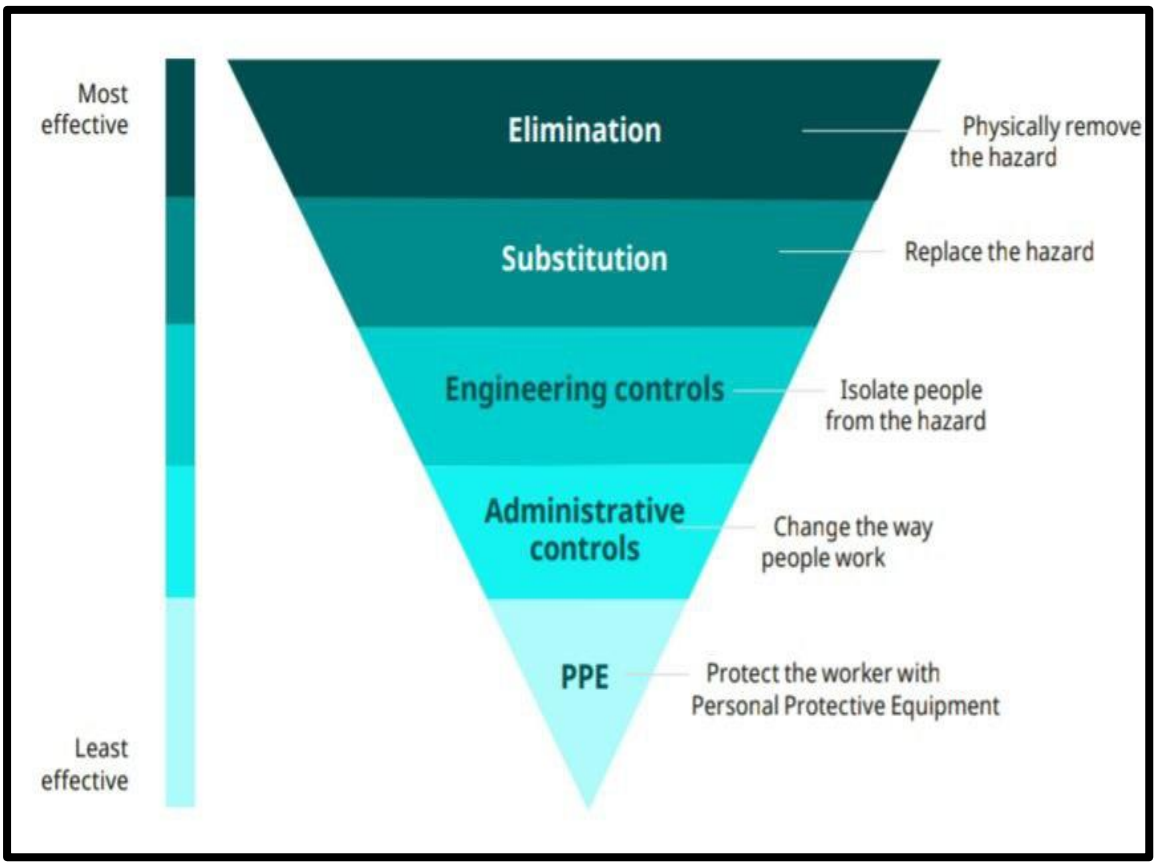


Figure 2.4 Hierarchy of controls applied to Covid–19 (International Labour Organization 2021)

Figure 2.4 shows a hierarchy of controls used to determine how to implement feasible and effective control solutions (CDC 2015). This is a technique of categorizing control options for a specific workplace hazard, as with COVID-19, in a method that progresses from the most effective and protective to the least effective and protective. This

hierarchy of controls may be used to organize and provide numerous solutions for preventing COVID-19 worker exposure, especially by promoting physical separation and hand cleanliness (Government of Canada 2020).

According to the International Labour Organization (2021), a hierarchy of controls includes Elimination/substitution. The occupational danger (coronavirus) cannot be eliminated or replaced if the workplace reopens. Thus, further preventative measures must be taken to shield employees from the virus. Technical control Options include constructing physical barriers, such as see-through plastic sneeze guards, raising ventilation rates in the workplace, and adding a drive-through window for customer service. Administrative and organizational controls include adjustments to work practices or policies to lessen or eliminate risk exposure, such as adding extra shifts, keeping a safe distance, or using appropriate hygiene and infection control techniques aimed at both employees and the workplace.

Even if engineering and administrative controls are thought to be more successful, PPE could still be required to prevent some forms of exposure, particularly for the riskiest professions.

2.10 Barriers to effective PPE use for healthcare workers

The understanding of the guidelines, how they were communicated, managerial support, workplace culture, depth of training, physical space restrictions, access to necessary equipment, confidence in the effectiveness of the equipment, and the desire to provide quality patient care are some of the individual factors that have contributed to inconsistent PPE use (Houghton *et al*. 2020). PPE usage is recognized to be influenced by behavioral variables, which may be affected by institutional system messages and leadership role models exhibiting proper behaviors (Broussard *et al*. 2020). Concerns about the depersonalization brought on by the use of masks, such as misreading communication, the impression of detachment, or the inability to adequately express sentiments owing to restricted facial visibility, are another obstacle to the efficient use of PPE (Reidy *et al*. 2020).

Consistency of PPE usage can also be improved or diminished by evaluating the risk posed by caring for patients with diverse diseases. While caring for individuals with illnesses is thought to have a higher potential for pathogenesis, PPE usage has been approached with more care (Zaheer *et al*. 2020). Nonetheless, despite healthcare workers' awareness of PPE use and COVID-19 prevention, guidelines for certain work settings must be stressed further to increase adherence (Zaheer *et al*. 2020).

Barriers that prevent people from using PPE to its full potential may be multifaceted and involve different people, groups, settings, and circumstances. Personal and social factors influence ineffective PPE usage (Broussard *et al*. 2020, Houghton *et al*. 2020, Neo *et al*. 2012, Reidy *et al*. 2020).

Insufficient instruction and training regarding PPE usage may harm compliance with PPE use requirements (Honda and Iwata 2016).

2.11 The modules of OHS in the context of COVID-19

According to (WHO 2022), there are four modules of OHS about COVID-19, which comprises:

Module 1, Infectious risks to health and safety: By the end of this module, you should be able to describe how health workers can come into contact with infectious hazards, how blood-borne pathogens and respiratory infections are spread to health workers, and how health workers can protect themselves from respiratory infections by using basic safety precautions and infection-control methods.

Module 2, Physical risks to health and safety: By the end of this module, you ought to be able to name the primary causes of musculoskeletal disorders in the healthcare sector, talk about patient handling duties that carry a high risk of injury, and list the major categories of occupational hazards that impact health workers and how to avoid them.

Module 3, Psychosocial risks to health and safety: By the end of this module, you ought to be able to list the main causes of psychosocial risks for healthcare workers, describe the signs of fatigue and how to avoid them, talk about workplace violence risk factors, symptoms, and preventive measures, and talk about how healthcare professionals and managers can support and safeguard mental health.

Module 4, Basic OHS in Health Services: At the end of this module, you should be able to identify the roles managers and employers play in promoting OHS and define the steps HCWs may take to further these goals.

2.12 Workplace risk assessment for SARS-CoV-2

Healthcare workers may be exposed to SARS-CoV-2 at work based on their likelihood of having direct, indirect, or close contact with someone infected with the virus. This includes administering direct physical care or handling contaminated things or surfaces, operating on COVID-19 patients while not wearing appropriate personal protection, or interacting with infected people in confined spaces with inadequate ventilation (WHO 2020g). The risk of occupational exposure increases as SARS-CoV-2 community transmission levels rise (WHO 2020c).

When doing rapid risk assessments for potential occupational exposure to SARS-CoV-2 for various vocations or tasks, employers and occupational health services may find the following workplace risk levels helpful (Occupational Safety and Health Administration 2020);

- It has reduced risk occupations or duties that don't necessitate regular close contact with the public or other persons or interaction with those known to be or may be SARS-CoV-2 infected.
- Medium-risk occupations or duties don't need contact with persons known or suspected to have SARS-CoV-2 infection but have regular close contact with patients, visitors, suppliers, and coworkers (WHO 2020c).
- • Jobs or activities that carry a high risk of SARS-CoV-2 exposure through close contact with people known to be infected with the virus or suspected of doing so,

as well as through contact with potentially contaminated surfaces and objects (WHO 2020b).

- Activities and extremely risky jobs expose workers to SARS-CoV-2 aerosols, like those that call for them to engage with infected people in crowded, enclosed spaces where COVID-19 patients frequently undertake aerosol-generating procedures (WHO 2020f).

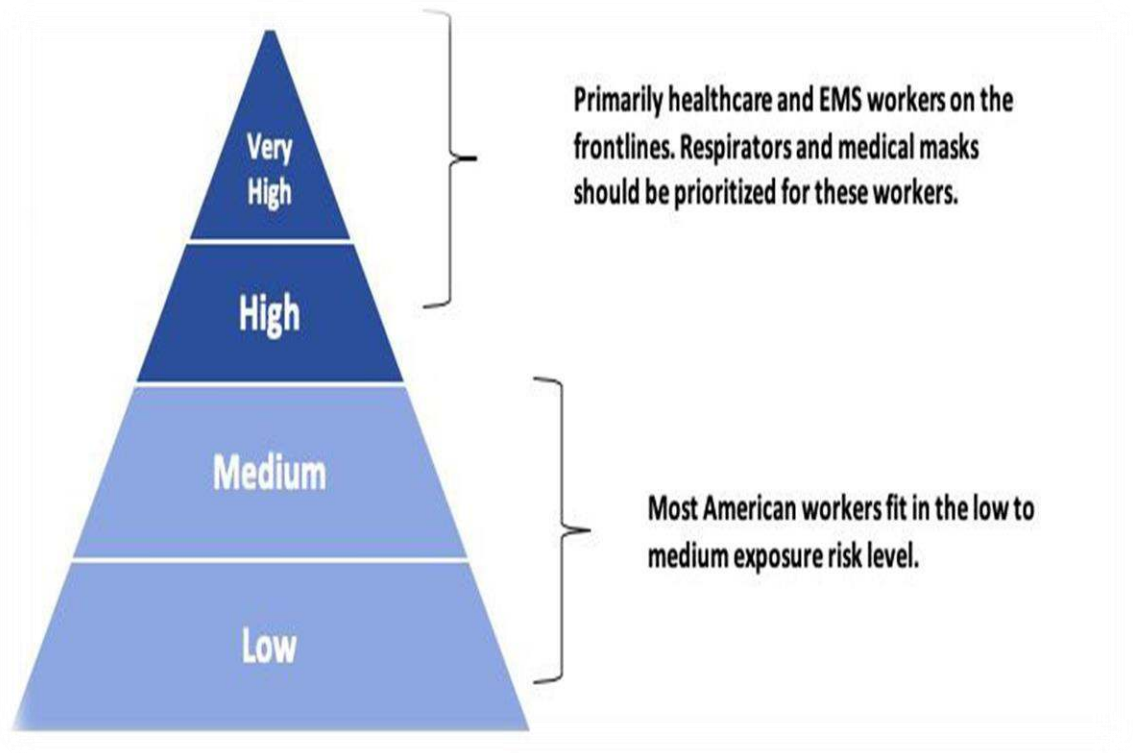


Figure 2.5 shows COVID-19 Occupational Risk Pyramid (WHO 2020c).

2.13 Previous studies about occupational health and safety

In Turkey, a study by Barlas and Izci (2018) on individual and workplace factors related to fatal occupational accidents among shipyard workers discovered that poor workshop maintenance, the lunchtime effect, inclement weather, improper PPE use, being exhausted and sleepy, overproduction of ships, frantic work, overtime, being a subcontractor worker, and strenuous work are the main risk factors for workplace accidents.

Studies conducted by Celik et al. (2020) and Cengiz et al. (2021) noted significant issues with the lack of nursing staff, PPE, and medical equipment, and the poor administration and coordination of pandemic processes in Turkey.

In a study by Çelik *et al*. (2022) regarding the experience and views of nurses on nursing services and personal protective equipment during the Covid-19 pandemic, the case of Turkey, They found that compared to nurses in other categories, the satisfaction levels were much better for nurses who worked in 8-hour shifts, weren't assigned to various clinics, received official letter notification, and were informed one week or one month in advance before assignment.

A study by Ulubeyli et al. (2014) on the safety and health perception of Turkish workers found that they neglected safety training, hesitated to hire doctors for building sites, and were underinvested in personal protective equipment (PPE). Workers did not place enough priority on occupational training despite being the ones who created projects. Additionally, they refused to wear some PPE. Essential players in HS affairs like employees, contractors, unions, and the government should be aware of their shortcomings to change the harmful perception of the currently prevalent sector.

Demirbilek et al. (2020) stated that Turkey produces PPE such as gloves, medical and respiratory masks, gowns, and goggles/face protectors. As a result, there has been no PPE shortage, and aid has been given to many nations.

Also, a study by Ağalar and Engin (2020) on Protective measures for COVID-19 for healthcare providers and laboratory personnel indicated that in addition to the risk of infection, HCWs also deal with other challenges like physical and mental tiredness, stress from making triage decisions, and grief from losing patients and colleagues. The spread of the pandemic can only be prevented with teams of wholesome and ejective HCWs. The fact that the transmission speed is very high indicates that it is very urgent and necessary to protect healthcare providers.

Almost 540,000 HCWs are fighting the epidemic in Turkey, where a military backs them. According to statistics from the Turkish Medical Association, one out of every ten confirmed instances of COVID-19 is an HCWs. More than 120,000 healthcare workers have the disease, and 282 have died (Turkish medical association 2021).

A study by Aksoy and Büyükbayram (2022) revealed that 60.5% of HCWs had DRPI due to wearing PPE. The most common anatomical sites of DRPI were the cheekbones (20.8%), behind the ears (24.6%), and the bridge of the nose (30.2%) of the developed DRPIs, which were stage 1 in 79.5% of cases. According to the results of the logistic regression analysis, being a male over the age of 35, a doctor or nurse, wearing personal protective equipment for a prolonged period (>4 h), and sweating while doing so were all risk factors for the emergence of DRPI (p 0.05).

Azap *et al*. (2005) did a study in Ankara in 2005 on the occupational exposure of HCWs to blood and body fluids. 988 HCWs participated in the survey, comprising 152 nurse assistants (15%), 212 residents (21%), 500 nurses (51%), and others (13%). Of the HCWs, 634 (64%) had at least one professional exposure to body fluids like blood (0.85 exposure per person-year). Sharps injuries were most frequently caused by recapping the needle (45% of the time). 60 (28%) of the injured HCWs wore no PPE, and 144 (67%) did not seek medical assistance for their wounds.

In 2015, A study by Azap *et al*. (2005) on the effects of OHS on the healthy lifestyle behaviors of workers found that a lower incidence of occupational accidents in the company indicates that practical OHS training had been provided for the workers.

Despite associated institutions, model studies, and well-drafted laws, Turkey's OHS level has not been adequate.

In 2004, a study by Yoshimura and Acar (2004) revealed that despite PPE being strongly advised to prevent fatal or serious accidents, most respondents said they did not wear any. Regarding job satisfaction, 43% of the respondents reported being unsatisfied with their position, primarily due to the meager pay and demanding workload. The potential for job happiness to be significantly influenced by marital status, educational background, and length of employment was present.

Various recommendations about the pharmacy staff's use of PPE were also made in 2021. Despite the variations in the guidance, it is crucial for HCWs, including community pharmacy staff members engaged in routine patient care activities, to maintain the recommended social distance and to wear the appropriate PPE. However, full PPE should be worn when interacting with patients who may have the COVID-19 virus (Hasan *et al*. 2021).

In a study by Ocak *et al*. (2021) regarding the occupational accidents experienced by EMRs, 215 EMRs were exposed to 1919 occupational accidents over the course of the previous year, but only 287 of these accidents were recorded. In the past 12 months, all participants experienced at least one work accident. 37.9 and 44%, respectively, of biologic and chemical transmission mishaps did not involve PPE. Exam gloves, surgical masks, respirators, goggles, gowns, and face shields were used by the EMRs 60, 19, 19, 8, 15, and 4% of the time, respectively, when they were essential.

Sezgin *et al*. (2022) noted that the workload and duties of ICU nurses had significantly increased due to the Covid-19 epidemic. The occupational health risks for nurses have grown due to this circumstance in terms of social, psychological, and physical elements. ICU nurses continue to put themselves at risk during this constantly-evolving process despite the elevated danger of infection and the psychological strain, occasionally worrying about workplace safety, career happiness, and the sufficiency of pertinent training.

In 2021, a study by Çağlar *et al*. (2022) on symptoms connected to the use of PPE among front-line HCWs during the COVID-19 pandemic indicated that prolonged PPE use, smoking, and obesity were all independently linked to the onset of new symptoms. The influence on working performance was mentioned by a resounding majority of symptomatic participants (193/208, 92.7%).

A study by Akova *et al*. (2022) on the prevalence of burnout, depression, anxiety, stress, and hopelessness among HCWs during the COVID-19 pandemic revealed that working at a public hospital, increasing job intensity, a decline in income, and difficulties obtaining PPE were risk factors for emotional tiredness. Risk factors for COVID-19 included being male, under 40, being a doctor, working in a public hospital, and having trouble obtaining PPE. Depression risk variables included being under 40, interacting with COVID-19 patients, and having a lower income. Risk factors for anxiety included being a woman, being under 40, working in a public hospital, having a chronic condition, dealing with patients, and having family members at high risk for COVID-19. Being female, being a doctor, and making more money were risk factors for hopelessness.

In 2012, A study conducted by Gulhan *et al*. (2012) at a plant in Ankara on occupational accidents and the variables impacting the metal sector found that the inability to wear PPE and inadequate vocational training are the main causes of accidents.

3. MATERIAL AND METHODS

The sample group to be used and the material and method to be used while preparing the proposed thesis with the title of the thesis are presented below.

The research study sample will consist of staff working in Babylon hospitals. The study targets doctors and employees in selected health institutions, hospitals, and health centers. It will be ensured that the sample size targeted to be included in the study is statistically significant.

A four-part questionnaire will be applied during the data collection process from the sample to be included in the research. The first part of the questionnaire consists of questions about the employees' demographic information. While the second part consists of questions to measure employees' compliance with prevention and control methods in terms of preventive measures, the third part includes questions about the physical measures of COVID-19, and the fourth part includes questions about the terms and conditions presented by the employees. Questions will be asked about their views on the adequacy of their applications.

It is aimed to be used in our study by reviewing the business metrics related to the research by performing reliability and statistical validity tests.

3.1 Permissions and approvals

Necessary permissions were obtained from the Babylon health department (Appendix - 1). The researcher attached each questionnaire and explained it in Arabic langue, and all participants were informed about the aim and content of the study. The confidentiality of the participants was ensured. Ultimately, all the data collected was used for research purposes only.

3.2 Study design and time

This is a cross-sectional study conducted at Babylon hospitals. The data collection started from the 3rd of November 2022 till the 15th of February 2023, and the time allocated for data collection is 5 days per week, 5 hours per day (9.00 A.M - 2.00 P.M).

3.3 Setting of study

This study was conducted in the Babylon governorate, which included 2 hospitals located within the geographical location of the Babylon governorate.

3.4 Sampling size

Steven Thompson's formula (Thompson, 2012) for calculating sample size was used to calculate the sample size. As a result, the minimum sample size for healthcare workers is 370, while we have taken 425 to strengthen the study, as shown below:

$$n = \frac{N \times p(1-p)}{[[N-1 \times (d^2 \div z^2)] + p(1-p)]},$$

Where:

N= The Study Population size (10000 HCWs)

n = sample size (370 for HCWs).

Z= Confidence level at 95% (1.96)

P = Probability (0.50)

D = Error Proportion (0.05)

3.5 Sampling technique

The total number of hospitals in Babylon City is Four that receive patients with coronadisease and have epidemiological wards in Al-Hilla City, the center of Babylon province. Two hospitals were randomly chosen by multistage sampling technique from all institutions. Then, participants were selected by simple random sampling from all hospitals, as explained in (Table 3.1).

Table 3.1 Names of hospitals taken randomly according to catchment maps

HOSPITALS	No	%
Morgan Hospital	225	52.94
Imam Sadiq Hospital	200	47.06
Total	425	100.0

The study is aimed at employees and doctors in selected hospitals. The data was collected through questionnaires distributed based on axes following Socio-demographic characteristics through a direct interview regarding (Age, Gender, Residence, Level of education, social status, Functional title, Type of healthcare facility, and Experience years) An interview with HCWs regarding (assessment of prevention and control methods, evaluation of COVID-19 Measures, and Evaluation of the terms, conditions, and requirements of PPE).

3.6 Pilot study

The pilot study consisted of 425 HCWs selected randomly from hospitals in the Babylon governorate. Samples were taken from them to validate this study, to explore the challenge and difficult items, to review the ease and clarity, and to check the design questionnaire and the average completion and filing of the questionnaire takes about 20-25 minutes.

3.7 Reliability of questionnaire

Cronbach's alpha values vary from 0.0 to +1.0, with higher values suggesting better internal consistency, and this approach is used to measure the questionnaire's reliability. The overall reliability was 0.844, with values ranging from 0.798 to 0.872, as shown in (Table 3.2).

All expert observations were taken into consideration for a slight correction. Most agreed that the questionnaire was understandable, clear, and sufficient for the study.

Table 3.2 The Alpha of Cronbach for the reliability of all dimensions

CRONBACH'S ALPHA	NO OF ITEMS	DOMAIN
0.863	20	Assessment of prevention and control methods
0.872	6	Evaluation of COVID-19 Measures
0.798	9	Evaluation of the terms, conditions, and requirements of PPE
0.844	35	Total

3.8 Ethical considerations

The researcher attached each questionnaire and explained it in Arabic langue, and all participants were informed about the aim and content of the study. The confidentiality of the participants was ensured. All the data collected was used for research purposes only.

3.9 Scoring criteria

The five levels of the measure were graded on a 5-point scale (Likert responder scale), with 5 representing "strongly agree or always," 4 representing "agree or often," 3 representing "neutral or sometimes," 2 representing "disagree or rarely," and 1 representing "strongly disagree or never".

The minimum and maximum mean scores for the sub-domain assessment questions are 1 and 5, respectively, with 3 as the median. Less than 50% was regarded as low (3 scores), 50-75% acceptable/moderate (3-4 MS), and more than 75% was regarded as good (>4 MS).

There were 20 questions in the total assessment of preventative and control strategies; the minimum score was 20, the maximum score was 100, and the median score was 60. A score of more than 75% was considered good (>80 score), 50-75% moderate (60-80 score), and less than 50% was taken as poor (<60 score).

There were six questions in the overall evaluation for the Covid-19 measures, resulting in a minimum score of six, a maximum score of thirty, and a median score of 18. A score of more than 75% was considered good (>24 score), 50-75% moderate (18-24 score), and less than 50% was taken as poor (<18 score).

There were 9 questions in the overall evaluation of the PPE terms, conditions, and criteria. Therefore, the minimum score was 9, the maximum score was 45, and the median Score was 27. A score of more than 75% was considered good (>36 score), 50-75% moderate (27-36 score), and less than 50% was taken as poor (<27 score).

There were 35 questions in the evaluation, making the minimum score 35, the maximum score 175, and the median score 27. More than 75% of the possible points were regarded as good (>140 score), 50-75% as moderate (105-140 score), and less than 50% as poor (<105 score).

3.10 Statistical analysis

The data from the questionnaire and the information for each question were transferred to code sheets, entered into the personal computer, and examined using the statistical software provided by SPSS for Windows 28.0 (SPSS-28 2021). Data were shown in simple measures of frequency, percentage, mean, standard deviation, and range (minimum and maximum values). The Pearson Chi-square test (2-test) was used to determine whether the difference between the percentages (qualitative data) was statistically significant. The P-value was considered significant when equal to or lower than 0.05. Two independent sample test analysis was used to study the difference in mean between the two groups. One-way ANOVA analysis was used to study the difference in mean between three or more groups, provided that the variable is normally distributed. Using Levene Statistic (equal variance is not assumed), Games-Howell is the Post-hoc test in the present study. *P* 0.05 was deemed a significant value Field, A. (2018).

4. RESULTS

4.1 Socio-demographic characteristics of healthcare workers

Table 4.1 demonstrates the distribution of HCWs according to socio-demographic variables. The mean ± SD of the participant's age was 27.97±5.2 years, the age range was between 19-54 years, the highest percentage (54.6%) was in the age group (26-30) years and the lowest percentage (0.5%), was in the age group (41-45) years. There was a distinct male preponderance of 71.5%. While 75.8% of HCWs residence in urban areas. As for educational level, the study found that the highest percentage (41.2%) had a diploma, followed by 37.4% of participants with a Bachelor. The highest percentage (48.9%) of the HCWs were married. Regarding the functional titless of HCWs, the results found that the highest percentage (37.6%) of HCWs were medical technicians, followed by medical assistants, 28.0%. Also, these results found that 52.9% of HCWs were working in other hospital departments. Finally, the results indicate that 71.1% of participants have experience ≤ 5 years.

Table 4.1 Distribution of HCW according to socio-demographic variables

SOCIO-DEMOGRAPHICS		**No.**	**PERCENT %**
Age groups	<= 20 year	2	0.5
	21-25 years	122	28.7
	26-30 years	232	54.6
	31-35 years	46	10.8
	36-40 years	12	2.8
	41-45 years	2	0.5
	>45 years	9	2.1
	Mean± SD (Range)	27.97±5.2 (19-54)	
Gender	Male	304	71.5
	Female	121	28.5
Residence	Urban	322	75.8
	Rural	103	24.2

Table 4.1 Distribution of HCW according to socio-demographic variables (continued)

SOCIO-DEMOGRAPHICS		No.	PERCENT %
Level of education	Primary School	11	2.6
	Intermediate	7	1.6
	Secondary	25	5.9
	Diploma	175	41.2
	Bachelor	159	37.4
	Postgraduate	48	11.3
Social status	Married	208	48.9
	Single	205	48.2
	Widower	4	.9
	Absolute	8	1.9
Functional title	Physician	10	2.4
	Pharmacist	13	3.1
	Medical technician	160	37.6
	Medical assistant	119	28.0
	Bacteriologist	12	2.8
	Laboratory Assistant	59	13.9
	University Nurse	16	3.8
	Technical nurse	19	4.5
	Skilled Nurse	13	3.1
	Chemist	2	.5
	Pharmacist assistant	2	.5
Type health care facility	Medical wards	56	13.2
	Emergency unit	46	10.8
	Medical Laboratories	65	15.3
	X-rays and Sonar Units	26	6.1
	Hemodialysis unit	7	1.6
	Other	225	52.9
Experience years	≤ 5 years	302	71.1
	6-10 years	95	22.4
	11-15 years	12	2.8
	16-20 years	4	.9
	>20 years	12	2.8
	Mean± SD (Range)	5.20±4.92 (1-33)	

4.2 Evaluation of prevention and control methods

In Table 4.2, the current study found that all indicators have a good assessment score (mean score >4), except for the 1st, 3rd, and 20th questions HCWs are given training courses on prevention from the coronavirus, avoiding direct contact with patients (hugging and shaking hand), and a workplace response strategy is provided if coronavirus symptoms and the staff are aware of them) have a poor assessment score (2.96±1.580, 2.86±1.561, 2.88±1.544) with the answer rate 59.2%, 57.2%, 57.6% respectively. The 17th question (the availability of records of waste removal, destruction, and treatment) has a moderate assessment score (3.85±1.177) with a response rate of 77.0%. Using one sample t-test, the results indicate a highly significant difference among HCW's answers, except for the 1st, 3rd, and 20th questions, which did not find significant differences (*P* value>0.05).

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Healthcare professionals are given training courses on prevention from the coronavirus.	Strongly Disagree	119	28.0	2.96±1.580	0.645	59.2%	Poor
	Disagree	80	18.8				
	Neutral	23	5.4				
	Agree	103	24.2				
	Strongly agree	100	23.5				
Provide instructions on infection prevention and control of COVID-19	Strongly Disagree	3	0.7	4.47±0.752	<0.001	89.4%	Good
	Disagree	9	2.1				
	Neutral	22	5.2				
	Agree	143	33.6				
	Strongly agree	248	58.4				
Avoiding direct contact with patients (hugging and shaking hands)	Strongly Disagree	126	29.6	2.86±1.561	0.063	57.2%	Poor
	Disagree	85	20.0				
	Neutral	25	5.9				
	Agree	101	23.8				
	Strongly agree	88	20.7				

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
The workspace must be Disinfected periodically.	Strongly Disagree	6	1.4	4.50±0.853	<0.001	90.0%	Good
	Disagree	13	3.1				
	Neutral	26	6.1				
	Agree	96	22.6				
	Strongly agree	284	66.8				
The medical equipment is disinfected both before and after usage.	Strongly Disagree	11	2.6	4.39±0.978	<0.001	87.8%	Good
	Disagree	22	5.2				
	Neutral	20	4.7				
	Agree	109	25.6				
	Strongly agree	263	61.9				
Provide soap and tissue paper near the hand-washing basin	Strongly Disagree	9	2.1	4.40±0.972	<0.001	88.0%	Good
	Disagree	22	5.2				
	Neutral	29	6.8				
	Agree	93	21.9				
	Strongly agree	272	64.0				

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Washing hands before entering the workplace, after removing any personal protective equipment, and before leaving the workplace	Strongly Disagree	9	2.1	4.51±0.822	<0.001	90.2%	Good
	Disagree	7	1.6				
	Neutral	15	3.5				
	Agree	122	28.7				
	Strongly agree	272	64.0				
Avoidance wherever feasible, frequent touch with shared surfaces (leaving doors open where possible)	Strongly Disagree	9	2.1	4.31±0.877	<0.001	86.2%	Good
	Disagree	9	2.1				
	Neutral	37	8.7				
	Agree	158	37.2				
	Strongly agree	212	49.9				
Avoid crowding in elevators or using them to carry people, as they are risky given the coronavirus's present circumstances.	Strongly Disagree	5	1.2	4.31±0.856	<0.001	86.2%	Good
	Disagree	18	4.2				

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
	Neutral	26	6.1				
	Agree	167	39.3				
	Strongly agree	209	49.2				
When personnel and Auditors enter the medical facility, they are examined for symptoms of the coronavirus.	Strongly Disagree	6	1.4	4.16±0.961	<0.001	83.2%	Good
	Disagree	24	5.6				
	Neutral	59	13.9				
	Agree	142	33.4				
	Strongly agree	194	45.6				
Personal protection equipment (masks, gloves, medical glasses, long shoes, protective work suits, etc.) is readily available in sufficient quantities	Strongly Disagree	14	3.3	4.33±1.023	<0.001	86.6%	Good
	Disagree	18	4.2				
	Neutral	37	8.7				
	Agree	102	24.0				
	Strongly agree	254	59.8				
Sterilization devices (Protective equipment) are checked periodically, maintained and replaced as necessary	Strongly Disagree	10	2.4	4.30±0.935	<0.001	86.0%	Good

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
	Disagree	15	3.5				
	Neutral	36	8.5				
	Agree	142	33.4				
	Strongly agree	222	52.2				
Personal protective equipment is disposed of safely to avoid harming other people or the working environment.	Strongly Disagree	9	2.1	4.37±0.955	<0.001	87.4%	Good
	Disagree	17	4.0				
	Neutral	39	9.2				
	Agree	104	24.5				
	Strongly agree	256	60.2				
The jewellery must be covered(it should not affect the gloves)and removed before entering any workplace	Strongly Disagree	5	1.2	4.26±0.869	<0.001	85.2%	Good
	Disagree	12	2.8				
	Neutral	53	12.5				
	Agree	152	35.8				
	Strongly agree	203	47.8				
Portable electronics are kept in places that cannot get contaminated and are periodically disinfected.	Strongly Disagree	5	1.2	4.20±0.903	<0.001	84.0%	Good
	Disagree	24	5.6				
	Neutral	37	8.7				
	Agree	175	41.2				
	Strongly agree	184	43.3				

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Presence of warning signs of biological hazards at patient sites	Strongly Disagree	8	1.9	4.34±0.933	<0.001	86.8	Good
	Disagree	16	3.8				
	Neutral	41	9.6				
	Agree	120	28.2				
	Strongly agree	240	56.5				
The availability of records of waste removal, destruction, and treatment.	Strongly Disagree	22	5.2	3.85±1.177	<0.001	77.0%	Moderate
	Disagree	45	10.6				
	Neutral	63	14.8				
	Agree	139	32.7				
	Strongly agree	156	36.7				
Cleaning workers must be receiving education on medical waste linked to the Coronavirus	Strongly Disagree	13	3.1	4.20±1.065	<0.001	84.0%	Good
	Disagree	28	6.6				
	Neutral	45	10.6				
	Agree	116	27.3				
	Strongly agree	223	52.5				
The availability of a published contingency plan regarding COVID-19.	Strongly Disagree	162	38.1	2.43±1.449	<0.001	48.6%	Poor
	Disagree	101	23.8				
	Neutral	27	6.4				
	Agree	87	20.5				
	Strongly agree	48	11.3				

Table 4.2 The distribution and assessment of participant answers according to prevention and control methods (continued)

PREVENTION AND CONTROL METHODS		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
A workplace response strategy is provided if the coronavirus symptoms and the staff know them.	Strongly Disagree	121	28.5	2.88±1.544	0.125	57.6%	Poor
	Disagree	84	19.8				
	Neutral	29	6.8				
	Agree	105	24.7				
	Strongly agree	86	20.2				

*The median for mean Score =3. A score of more than 75% was considered good (>4 MS), 50-75% was acceptable/moderate (3-4 MS), and less than 50% was taken as poor (<3 score). *One sample test.

Table 4.3 shows the assessment of prevention and control methods according to Functional title and type of health care facility; the results indicate that bacteriologists have a high assessment score (4.275±0.329) followed by a Chemist (4.225±0.459). While Pharmacist assistants have low assessment levels (2.10±0.212). The highest assessment score (was 4.059±0.400) for Medical Laboratories, and the lowest assessment level (was 3.883±0.452) for the Emergency unit. Using ANOVA analysis, the result reveals a highly significant difference between averages of functional titles (*P* value<0.001).

Table 4.3 The assessment of prevention and control methods according to Functional title and type health care facility

		No	MEAN	SD	RANK	ASSESSMENT	F	*P* VALUE
Functional title	Physician	10	3.650	1.292	10	Moderate	5.234	<0.001
	Pharmacist	13	4.188	0.318	3	Good		
	Medical technician	160	4.007	0.436	6	Good		
	Medical assistant	119	4.066	0.469	4	Good		
	Bacteriologist	12	4.275	0.329	1	Good		
	laboratory assistant	59	3.985	0.464	7	Moderate		
	University Nurse	16	3.821	0.441	8	Moderate		
	Technical nurse	19	3.771	0.458	9	Moderate		
	Skilled Nurse	13	4.050	0.366	5	Good		
	Chemist	2	4.225	0.459	2	Good		
	Pharmacist assistant	2	2.10	0.212	11	Poor		
Type health care facility	Medical Lobbies	56	4.051	0.490	2	Good	0.848	0.516
	Emergency unit	46	3.883	0.452	6	Moderate		
	Medical Laboratories	65	4.059	0.400	1	Good		
	X-rays and Sonar Units	26	4.040	0.416	3	Good		
	Hemodialysis unit	7	3.950	0.447	5	Moderate		
	Other	225	3.993	0.548	4	Moderate		

Table 4.4 demonstrates that tests of homogeneity of variances Mean values of prevention and control methods regarding the functional title. Using the Levene Statistic explains that the test was significantly at <0.001. This indicates that equal variance is not assumed.

Table 4.4 Tests of Homogeneity of Variances for Mean values of prevention and control methods regarding functional title

Tests of Homogeneity of Variances					
		Levene Statistic	**df1**	**df2**	***P* value**
Mean values of prevention and control methods	Based on Mean	4.956	10	414	<0.001

The present results reveal that the mean of pharmacists, bacteriologists, university nurses, and skilled nurses in assessing prevention and control methods is significantly higher than in other categories, as explained in Table 4.5.

Table 4.5 Post-hoc tests between mean values of prevention and control methods and functional title

Multiple Comparisons						
Dependent Variable: mean values of prevention and control methods						
Games-Howell						
(I) Functional title	**(J) Hospital type of health care personal**	**Mean Difference (I-J)**	**Std. Error**	***P* value**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Pharmacist	Pharmacist assistant	2.08846*	0.17414	0.048	0.0599	4.1170
Bacteriologist	Technical nurse	0.50395*	0.14198	0.044	0.0082	0.9997
	Parmacist assistant	2.17500*	0.17769	0.038	0.2990	4.0510
University Nurse	Pharmacist assistant	1.72187*	0.18619	0.043	0.1204	3.3234
Technical nurse	Bacteriologist	-0.50395-*	0.14198	0.044	-0.9997-	-0.0082-
	Parmacist assistant	1.67105	0.18327	0.050	-0.0029-	3.3450
Skilled Nurse	Pharmacist assistant	1.95000*	0.18125	0.040	0.2033	3.6967
* The mean difference is significant at the 0.05 level.						

One-way ANOVA analysis was used to study the difference in mean between three or more groups, provided that the variable is normally distributed. Using the Levene Statistic (equal variance is not assumed), Games-Howell is post-hoc test in the present study. A p-value of <0.05 was considered significant.

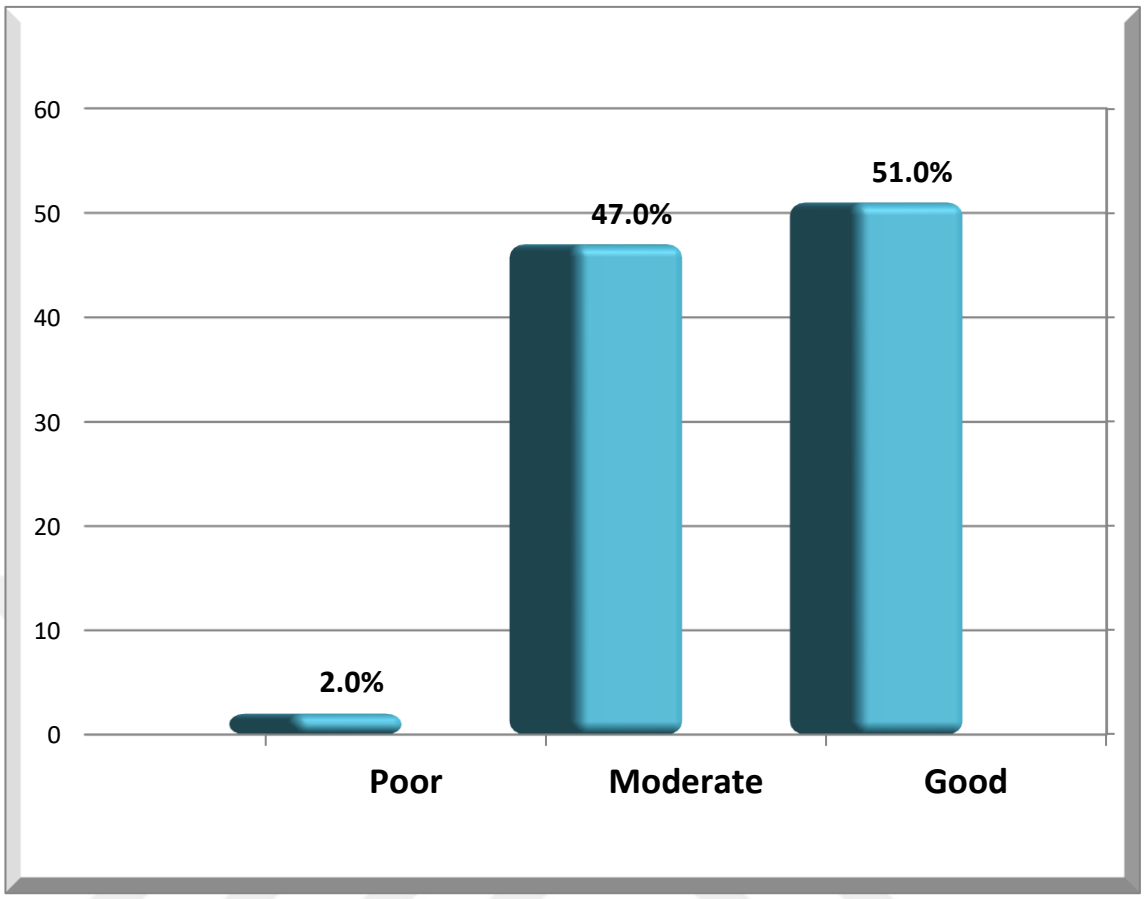


Figure 4.1 The overall assessment of prevention and control methods

Figure 4.1 shows that the highest percentage, 51.0%, of HCWs have a good assessment score, while the lowest percentage, 2.0%, has a poor assessment score. The mean ± SD of the overall assessment score was (80.025±10.038) which rested within a good level (>80 scores).

4.3 Evaluation of COVID-19 measures

In Table 4.6, the results reveal that 2nd and 3rd questions regarding the necessity to get the COVID-19 vaccination and the necessity to sterilization before wearing the paws and after each patient have moderate and poor assessment levels in which the mean ± SD were 3.79±1.223, and 2.91±1.563 respectively. While other indicators have a good assessment level (>4). By using one-sample, t. test, the results indicate a highly significant difference among HCW's answers, except for the 3rd question, which did not find significant differences (*P* value>0.05).

Table 4.6 The distribution and assessment of participant answers according to COVID-19 Measures

COVID-19 MEASURE		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Commit to wearing personal protective equipment	Strongly Disagree	9	2.1	4.48±0.874	<0.001	89.6%	Good
	Disagree	11	2.6				
	Neutral	22	5.2				
	Agree	109	25.6				
	Strongly agree	274	64.5				
The necessity to get the COVID-19 vaccination	Strongly Disagree	21	4.9	3.79±1.223	<0.001	75.8%	Moderate
	Disagree	45	10.6				
	Neutral	110	25.9				
	Agree	75	17.6				
	Strongly agree	174	40.9				
The necessity of sterilization before wearing the paws and after each patient	Strongly Disagree	122	28.7	2.91±1.563	0.251	58.2%	Poor
	Disagree	82	19.3				
	Neutral	22	5.2				
	Agree	109	25.6				
	Strongly agree	90	21.2				
Commitment to wearing a mask to avoid infection with covid 19	Strongly Disagree	4	9	4.31±0.918	<0.001	86.2%	Good
	Disagree	21	4.9				

Table 4.6 The distribution and assessment of participant answers according to COVID-19 measures (continued)

COVID-19 MEASURE		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
	Neutral	46	10.8				
	Agree	122	28.7				
	Strongly agree	232	54.6				
Dispose of personal protective equipment after work is completed	Strongly Disagree	13	3.1	4.23±0.986	<0.001	84.6%	Good
	Disagree	22	5.2				
	Neutral	25	5.9				
	Agree	161	37.9				
	Strongly agree	204	48.0				
Commitment to maintaining device sterilization during COVID-19 pandemic	Strongly Disagree	18	4.2	4.18±1.075	<0.001	83.6%	Good
	Disagree	24	5.6				
	Neutral	34	8.0				
	Agree	137	32.2				
	Strongly agree	212	49.9				

Table 4.7 shows the assessment of Covid-19 measures according to functional title and type of healthcare facility; the results indicate that pharmacists have a high assessment score (4.217±0.421) followed by a bacteriologists (4.138±0.394). While pharmacist assistants have low assessment levels (2.416±0.117). The highest assessment score (was 4.044±0.456) for medical lobbies, and the lowest assessment level (was 3.690±0.580) for the hemodialysis unit. Using ANOVA analysis, the result reveals a highly significant difference between averages of functional titles (*P* value<0.001).

Table 4.7 The assessment of COVID-19 measures according to Functional title and type of healthcare facility

		No	MEAN	SD	RANK	ASSESSMENT	F	*P* VALUE
Functional title	Physician	10	3.350	1.263	10	Moderate	4.764	<0.001
	Pharmacist	13	4.217	0.421	1	Good		
	Medical technician	160	3.997	0.471	6	Moderate		
	Medical assistant	119	4.079	0.495	4	Good		
	Bacteriologist	12	4.138	0.394	2	Good		
	Laboratory Assistant	59	3.901	0.491	7	Moderate		
	University Nurse	16	4.020	0.407	5	Good		
	Technical nurse	19	3.807	0.572	9	Moderate		
	Skilled Nurse	13	3.820	0.506	8	Moderate		
	Chemist	2	4.083	0.353	3	Good		
	Pharmacist assistant	2	2.416	0.117	11	Poor		
Type health care facility	Medical Lobbies	56	4.044	0.456	1	Good	1.077	0.373
	Emergency unit	46	3.873	0.528	5	Moderate		
	Medical Laboratories	65	3.992	0.472	3	Moderate		
	X-rays and Sonar Units	26	3.929	0.346	4	Moderate		
	Hemodialysis unit	7	3.690	0.580	6	Moderate		
	Other	225	4.002	0.581	2	Good		

Table 4.8 demonstrates that tests of homogeneity of variances Mean values of COVID-19 measures regarding functional title. Using Levene Statistic explains that the test was significantly at <0.001. This indicates that equal variance is not assumed.

Table 4.8 Tests of Homogeneity of Variances for Mean values of Covid-19 measures regarding functional title

Tests of Homogeneity of Variances					
		Levene Statistic	**df1**	**df2**	***P* value**
Mean values of Covid-19 measures	Based on Mean	3.291	10	414	<0.001

The present results reveal that the mean of Pharmacist assistants regarding COVID-19 measures assessment is lower significantly than other categories, as explained in Table 4.9.

Table 4.9 Post-hoc tests between mean values of COVID-19 measures and functional title

Multiple Comparisons						
Dependent Variable: means						
Games-Howell						
(I) Functional title	**(J) Hospital type of health care personal**	**Mean Difference (I-J)**	**Std. Error**	***P* value**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Pharmacist assistant	Physician	-0.93333-	0.40802	0.502	-2.5982-	0.7316
	Pharmacist	-1.80128-*	0.14358	<0.001	-2.4516-	-1.1510-
	Medical technician	-1.58125-*	0.09129	0.046	-3.0774-	-0.0851-
	Medical assistant	-1.66317-*	0.09492	0.030	-2.8779-	-0.4484-
	Bacteriologist	-1.72222-*	0.14114	<0.001	-2.3760-	-1.0684-
	laboratory assistant	-1.48446-*	0.10506	0.013	-2.3240-	-0.6449-
	University Nurse	-1.60417-*	0.13165	<0.001	-2.2484-	-0.9599-
	Technical nurse	-1.39035-*	0.15558	<0.001	-2.0350-	-0.7457-
	Skilled Nurse	-1.40385-*	0.16339	<0.001	-2.0850-	-0.7227-
	Chemistry	-1.66667-	0.26352	0.227	-7.5924-	4.2590

One-way ANOVA analysis was used to study the difference in mean between three or more groups, provided that the variable is normally distributed. Using the Levene Statistic (equal variance is not assumed), Games-Howell is post-hoc test in the present study. *A p*-value of <0.05 was considered significant.

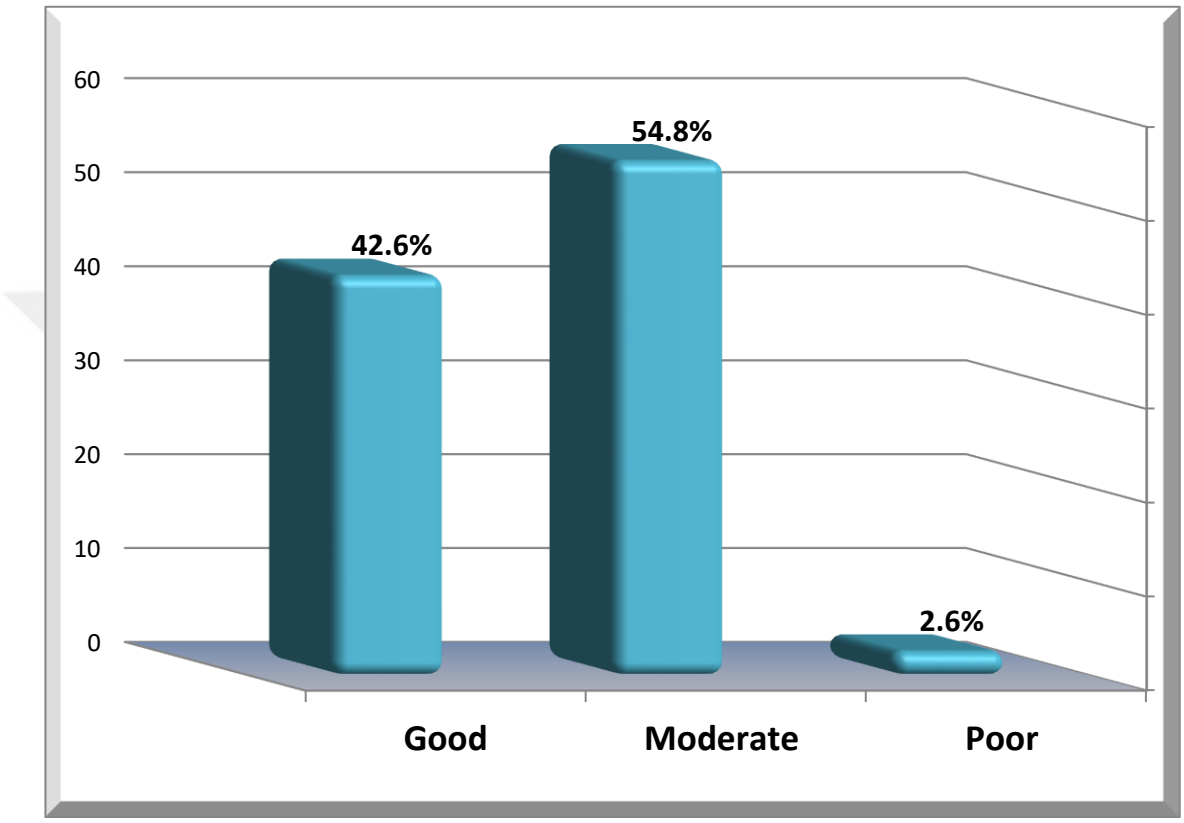


Figure 4.2 Overall assessment of COVID-19 measures

Figure 4.2 shows that the highest percentage, 55.0% of HCWs, have a moderate assessment score, while the lowest percentage, 3.0%, has a poor assessment score. The mean ± SD of the overall assessment score was (23.89±3.199) which rested within a moderate level (18-24 score).

4.4 Evaluation of the terms, conditions, and requirements of PPE

In Table 4.10, the results reveal that the 3rd and 5th questions regarding (Providing education to HCWs constructively and continuously on the usage of PPE and implementing rules for isolation and quarantine) have a moderate assessment levels in

which the mean ± SD were 3.87±1.168 and 3.51±1.462 respectively. The 6th question regarding COVID-19-related training, such as how to utilize PPE (donning, doffing), isolation, quarantine, etc.), has poor assessment levels in which the mean ± SD was 2.88±1.439. As for other indicators, have a good assessment level (>4). Using one sample t-test, the results indicate a highly significant difference among HCW's answers.

Table 4.10 The distribution and assessment of participant answers according to their perspective about the terms, conditions, and requirements of PPE

		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
The availability of appropriate PPE (as recommended by WHO) when handling a COVID-19 patient in the institution.	Never	8	1.9	4.13±1.002	<0.001	82.6%	Good
	Rarely	26	6.1				
	Sometime	62	14.6				
	Often	134	31.5				
	Always	195	45.9				
Information on the organization's PPE stock levels should be available to frontline staff.	Never	5	1.2	4.30±0.871	<0.001	86.0%	Good
	Rarely	14	3.3				
	Sometime	44	10.4				
	Often	147	34.6				
	Always	215	50.6				
Provide education to healthcare professionals constructively and continuously on the usage of PPE	Never	32	7.5	3.87±1.168	<0.001	77.4%	Moderate
	Rarely	20	4.7				
	Sometime	69	16.2				
	Often	155	36.5				
	Always	149	35.1				
The workplace's order and cleanliness	Never	6	1.4	4.38±0.864	<0.001	87.6%	Good
	Rarely	13	3.1				
	Sometime	33	7.8				
	Often	133	31.3				
	Always	240	56.5				

Table 4.10 The distribution and assessment of participant answers according to their perspective about the terms, conditions, and requirements of PPE (continued)

		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Implementing rules for isolation and quarantine	Never	64	15.1	3.51±1.462	<0.001	70.2%	Moderate
	Rarely	51	12.0				
	Sometime	73	17.2				
	Often	80	18.8				
	Always	157	36.9				
Get COVID-19-related training, such as how to utilize PPE (donning, doffing), isolation, quarantine, etc	Never	114	26.8	2.88±1.439	<0.001	57.6%	Poor
	Rarely	59	13.9				
	Sometime	84	19.8				
	Often	101	23.8				
	Always	67	15.8				
Substitution of PPE In all patients undergoing surgery or procedures involving the airway	Never	5	1.2	4.42±0.838	<0.001	88.4%	Good
	Rarely	10	2.4				
	Sometime	37	8.7				
	Often	122	28.7				
	Always	251	59.1				
Washing/sanitizing my hands before handling any PPE components	Never	27	6.4	4.09±1.182	<0.001	81.8%	Good
	Rarely	25	5.9				
	Sometime	42	9.9				
	Often	120	28.2				
	Always	211	49.6				

Table 4.10 The distribution and assessment of participant answers according to their perspective about the terms, conditions, and requirements of PPE (continued)

		No.	%	MEAN± SD	*P* VALUE	RESPONSE RATE	ASSESSMENT
Having an observer with a checklist while performing the doffing procedure to avoid a breach of technique	Never	40	9.4	3.80±1.279	<0.001	76.0%	Moderate
	Rarely	30	7.1				
	Sometime	67	15.8				
	Often	125	29.4				
	Always	163	38.4				

Table 4.11 shows the assessment of the terms, conditions, and requirements of PPE according to Functional title and type of healthcare facility; the results indicate that bacteriologists have a high assessment score (4.157±0.551) followed by Pharmacists (4.128±0.310). While Pharmacist assistants have low assessment levels (2.055±0.392). While the highest assessment score (was 4.092±0.500) for medical Laboratories, and the lowest assessment level (was 3.698±0.461).

Table 4.11 The assessment of the terms, conditions, and requirements of PPE according to Functional title and type of healthcare facility

		No	MEAN	SD	RANK	ASSESSMENT
Functional title	Physician	10	3.611	1.370	10	Moderate
	Pharmacist	13	4.128	0.310	2	Good
	Medical technician	160	3.947	0.484	6	Moderate
	Medical assistant	119	3.982	0.638	4	Good
	Bacteriologist	12	4.157	0.551	1	Good
	Laboratory Assistant	59	3.783	0.676	9	Moderate
	University Nurse	16	3.888	0.442	8	Good
	Technical nurse	19	3.964	0.667	5	Moderate
	Skilled Nurse	13	4.068	0.617	3	Moderate
	Chemist	2	3.944	0.078	7	Good
	Pharmacist assistant	2	2.055	0.392	11	Poor
Type health care facility	Medical Lobbies	56	4.057	0.609	2	Good
	Emergency unit	46	3.995	0.562	3	Moderate
	Medical Laboratories	65	4.092	0.500	1	Good
	X-rays and Sonar Units	26	3.812	0.492	5	Moderate
	Hemodialysis unit	7	3.698	0.461	6	Moderate
	Other	225	3.861	0.660	4	Moderate

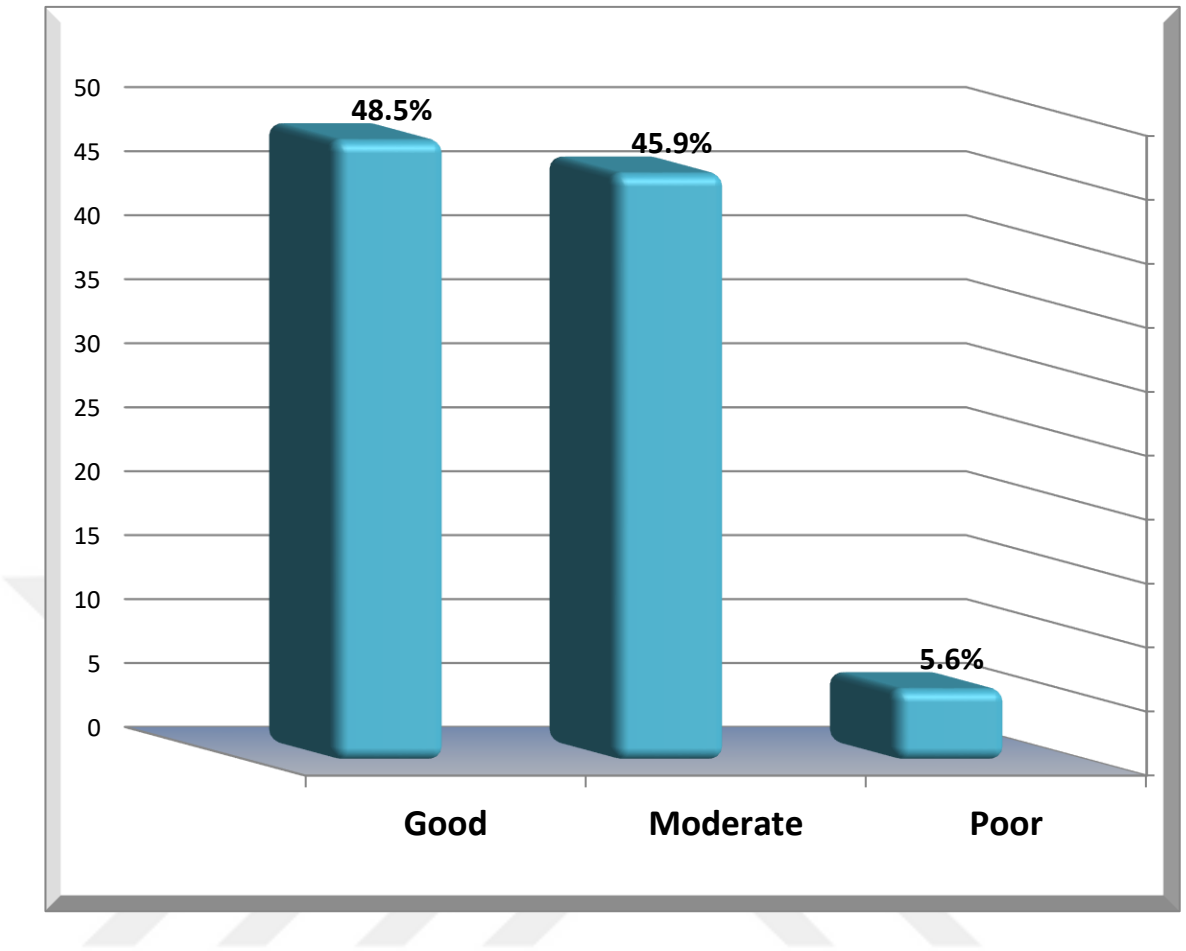


Figure 4.3 The overall assessment of the terms, conditions, and requirements of PPE

Figure 4.3 shows that the highest percentage, 48.0% of HCWs, have a good assessment score, while the lowest percentage, 6.0%, has a poor assessment score. The mean ± SD of the overall assessment score was (35.38±5.53) which rested within a moderate level (27-36 score).

4.5 Overall Evaluation of PPE

Table 4.12 shows the overall evaluation of PPE according to main domains; the study reveals that the highest assessment score (was 4.001±0.501) for the prevention and control Methods domain, which rested within a good evaluation level. The lowest assessment score (4.001±0.501) for the COVID-19 measures domain rested within a moderate evaluation level. As for the overall evaluation of PPE, the mean was 3.971±0.036, which falls within a moderate evaluation level (MS 3-4).

Table 4.12 The overall evaluation of PPE according to main domains

	MEAN	SD	RANK	ASSESSMENT
Prevention and Control Methods	4.001	0.501	1	Good
Covid-19 Measures	3.982	0.533	2	Moderate
Assess the perspective of healthcare workers on the terms, conditions, and requirements of PPE	3.931	0.614	3	Moderate
Overall Evaluation	3.971	0.036		Moderate

Table 4.13 shows that there is a highly significant positive correlation (*P* value <0.001) between Prevention and control methods and Covid-19 measures (r= 0.624); a highly significant positive correlation (*P* value <0.001) between Prevention and control methods and Assessment of Terms, conditions, and requirements of PPE (r= 0.476). A highly significant positive correlation (*P* value <0.001) between Covid-19 measures and the Assessment of Terms, conditions, and requirements of PPE (r=0.476).

Table 4.13 Pearson Correlation Coefficient between Main Domains

PEARSON CORRELATİON COEFFİCİENT BETWEEN MAİN DOMAİNS				
		PREVENTION AND CONTROL METHODS	COVID-19 MEASURES	ASSESSMENT OF TERMS, CONDITIONS, AND REQUIREMENTS OF PPE
Prevention and control methods	R	1	0.624**	0.476**
	P value		<0.001	<0.001
Covid-19 measures	R	0.624**	1	0.429**
	P value	<0.001		<0.001
**. Correlation is significant at the 0.01 level (2-tailed).				

R= Pearson Correlation

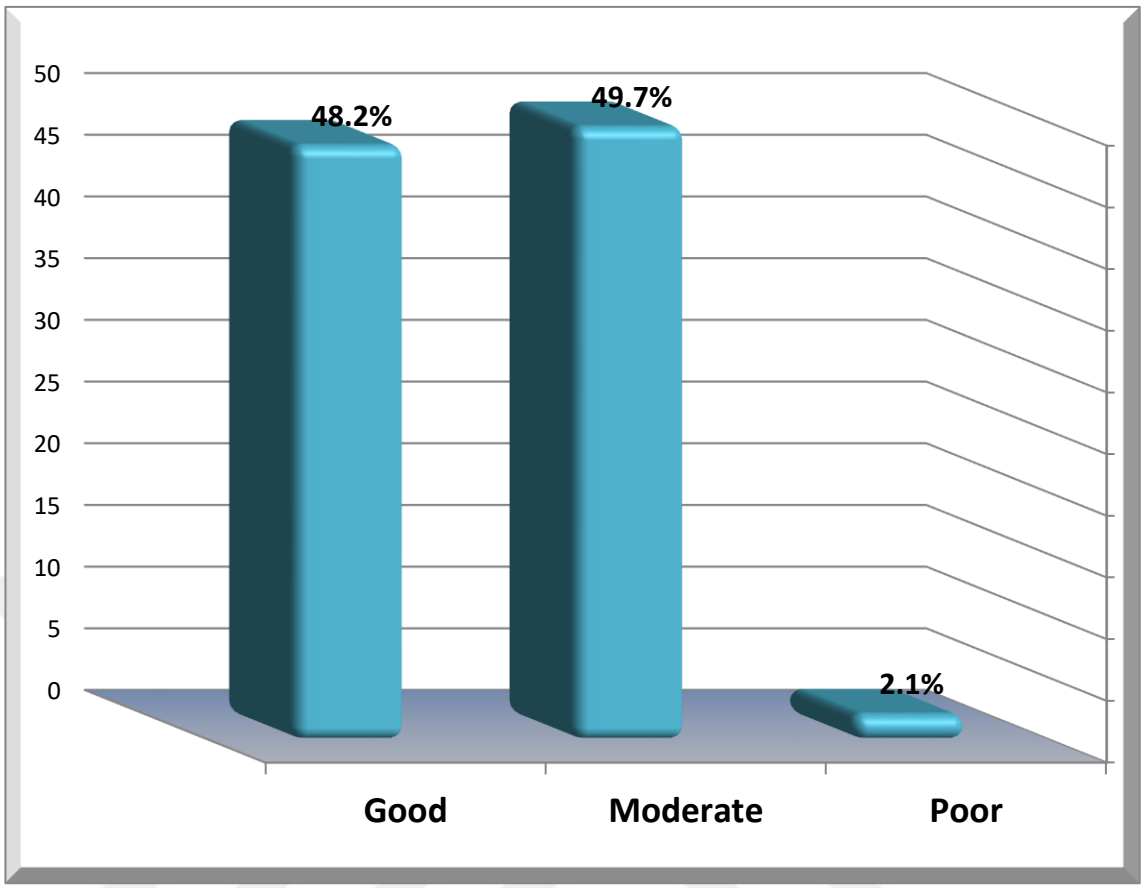


Figure 4.4 The overall assessment of PPE

Figure 4.4 shows a final assessment of PPE; the study reveals that the highest percentage, 50.0% of HCWs, have a moderate assessment score, while the lowest percentage, 2.0, has a poor assessment score. The mean ± SD of the overall assessment score was (139.30±15.80) which rested within a moderate level (105-104 score).

Table 4.14 shows the association between the total evaluation score of PPE and socio-demographic variables; the study reveals that there is a significant association between the total evaluation score of PPE and socio-demographic variables (*P* value <0.05), except for the type of healthcare facility which not significant association with a total evaluation score of PPE (*P* value>0.05).

Table 4.14 The association between the total evaluation score of PPE and socio-demographic variables

			OVERALL ASSESSMENT OF PPE			X^2	*P* VALUE
			POOR (<105 SCORE)	MODERATE (105-140 SCORE)	GOOD (>140 SCORE)		
Age groups	<=20 year	No.	0	0	2	42.154	<0.001
		%	0.0%	0.0%	100.0%		
	21-25 years	No.	1	54	67		
		%	0.8%	44.3%	54.9%		
	26-30 years	No.	4	119	109		
		%	1.7%	51.3%	47.0%		
	31-35 years	No.	1	24	21		
		%	2.2%	52.2%	45.7%		
	36-40 years	No.	3	8	1		
		%	25.0%	66.7%	8.3%		
	41-45 years	No.	0	2	0		
		%	0.0%	100.0%	0.0%		
	>45 years	No.	0	4	5		
		%	0.0%	44.4%	55.6%		
Gender	Male	No.	2	159	143	12.578	0.002
		%	0.7%	52.3%	47.0%		
	Female	No.	7	52	62		
		%	5.8%	43.0%	51.2%		
Residence	Urban	No.	5	170	147	6.492	0.039

Table 4.14 The association between the total evaluation score of PPE and socio-demographic variables (continued)

			OVERALL ASSESSMENT OF PPE			X^2	*P* VALUE
			POOR (<105 SCORE)	MODERATE (105-140 SCORE)	GOOD (>140SCORE)		
		%	1.6%	52.8%	45.7%		
	Rural	No.	4	41	58		
		%	3.9%	39.8%	56.3%		
Level of education	Primary School	No.	2	2	7	30.270	0.001
		%	18.2%	18.2%	63.6%		
	Intermediate	No.	1	4	2		
		%	14.3%	57.1%	28.6%		
	Secondary	No.	1	12	12		
		%	4.0%	48.0%	48.0%		
	Diploma	No.	3	83	89		
		%	1.7%	47.4%	50.9%		
	Bachelor	No.	0	90	69		
		%	0.0%	56.6%	43.4%		
	Postgraduate	No.	2	20	26		
		%	4.2%	41.7%	54.2%		
Social status	Married	No.	5	99	104	30.832	<0.001
		%	2.4%	47.6%	50.0%		
	Single	No.	2	106	97		
		%	1.0%	51.7%	47.3%		
	Widower	No.	0	0	4		

Table 4.14 The association between the total evaluation score of PPE and socio-demographic variables (continued)

			OVERALL ASSESSMENT OF PPE			X^2	*P* VALUE
			POOR (<105 SCORE)	MODERATE (105-140 SCORE)	GOOD (>140 SCORE)		
		%	0.0%	0.0%	100.0%		
	Absolute	No.	2	6	0		
		%	25.0%	75.0%	0.0%		
Function Al title	Physician	No.	2	3	5	135.559	<0.001
		%	20.0%	30.0%	50.0%		
	Pharmacist	No.	0	3	10		
		%	0.0%	23.1%	76.9%		
	Medical technician	No.	0	88	72		
		%	0.0%	55.0%	45.0%		
	Medical assistant	No.	1	57	61		
		%	0.8%	47.9%	51.3%		
	Bacteriologist	No.	0	2	10		
		%	0.0%	16.7%	83.3%		
	Laboratory Assistant	No.	2	29	28		
		%	3.4%	49.2%	47.5%		
	University Nurse	No.	0	11	5		
		%	0.0%	68.8%	31.3%		
	Technical nurse	No.	2	11	6		
		%	10.5%	57.9%	31.6%		
	Skilled Nurse	No.	0	6	7		

Table 4.14 The association between the total evaluation score of PPE and socio-demographic variables (continued)

			OVERALL ASSESSMENT OF PPE			X^2	*P* VALUE
			POOR (<105 SCORE)	**MODERATE (105-140 SCORE)**	**GOOD (>140 SCORE)**		
		%	0.0%	46.2%	53.8%		
	Chemist	No.	0	1	1		
		%	0.0%	50.0%	50.0%		
	Pharmacist assistant	No.	2	0	0		
		%	100.0%	0.0%	0.0%		
Type health care facility	Medical Lobbies	No.	1	23	32	10.199	0.423
		%	1.8%	41.1%	57.1%		
	Emergency unit	No.	2	25	19		
		%	4.3%	54.3%	41.3%		
	Medical Laboratorie	No.	0	30	35		
		%	0.0%	46.2%	53.8%		
	X-rays and Sonar Units	No.	0	14	12		
		%	0.0%	53.8%	46.2%		
	Hemodialysis unit	No.	0	6	1		
		%	0.0%	85.7%	14.3%		
	Other	No.	6	113	106		
		%	2.7%	50.2%	47.1%		

Table 4.14 The association between the total evaluation score of PPE and socio-demographic variables(continued)

			OVERALL ASSESSMENT OF PPE			X^2	*P* VALUE
			POOR (<105 SCORE)	**MODERATE (105-140 SCORE)**	**GOOD (>140 SCORE)**		
Experienc e years	<=5 years	No.	5	147	150	47.282	<0.001
		%	1.7%	48.7%	49.7%		
	6-10 years	No.	2	51	42		
		%	2.1%	53.7%	44.2%		
	11-15 years	No.	0	5	7		
		%	0.0%	41.7%	58.3%		
	16-20 years	No.	2	2	0		
		%	50.0%	50.0%	0.0%		
	>20 years	No.	0	6	6		
		%	0.0%	50.0%	50.0%		

5. DISCUSSION

HCWs practitioners worldwide have faced considerable hurdles due to the COVID-19 epidemic, emphasizing the critical importance of personal protective equipment (PPE) in preventing the transmission of the virus (Park, 2020). PPE plays a crucial role in preventing the transmission of COVID-19, especially for healthcare professionals at the forefront of the battle against the virus (Griswold *et al*. 2021). In this discussion, let's explore the different types of PPE and their effectiveness in safeguarding HCWs. Additionally, we focus primarily on engineering controls (e.g., ventilation), administrative controls (e.g., social distancing, hand hygiene), and PPE as a last resort. Implementing all these measures in combination provides a comprehensive approach to safeguarding HCWs against COVID-19 transmission.

5.1 Socio-demographic characteristics of healthcare workers

According to the results of the current study, the participants' ages ranged from 19 to 54 years, with a mean of 27.975.2 years. Of these individuals, the age group (26–30 years) had the most significant proportion (54.6%) and the lowest percentage (0.5%). These findings supported the investigations (Hossain *et al*. 2021) and (Birhanu *et al*. 2021), revealing that the mean ± SD of HCWs aged 28.9±5.2 and 27.96±5.6 years, respectively. Also, (Aloweni *et al*. 2022) reported that the highest percentage (37.5%) were in the age group (21-30) years. The possible explanation for the increase of frequency in the age group from 26-30 years may be the recruitment of young energies to work in hospitals that receive Corona patients, as they are considered among the groups most resistant to diseases, unlike the elderly.

In this study, a distinct male's preponderance was 71.5%. This result agrees with the study findings by Suleiman et al. (2020), which revealed that 63.3% of the HCWs were males. The increase in the number of males in this study may be due to many explanations, including excluding pregnant females from where corona patients are, given that pregnant women are more vulnerable to infection with the coronavirus.

Therefore, the studied hospitals are among the most receiving hospitals for corona patients.

As for educational level, the study found that the highest percentage (41.2%) had a diploma, followed by 37.4% of bachelor participants. These results agreed with the findings of Birhanu et al. (2021), which found that 58.6% of the participants have an education level Bachelor and diploma. While Hossain *et al.*, (2021) reported that 64.9% of HCWs were Bachelors, this result is higher than the current study.

The highest percentage (48.9%) of HCWs were married. This result is in agreement with the study findings conducted by Hossain *et al*. (2021), which found that the highest percentage (49.6 %) of HCWs were married.

The results indicate that 71.1% of participants have experience ≤ 5 years. The mean ± SD of the participants experience was 5.20±4.92 years. These results are consistent with the study findings conducted by Hossain et al. (2021), which found that the median work experience is four years. The possible explanation for the increase in the frequency of participants with years of experience less than or equal to 5 may be the frequency of young age groups, as we mentioned in our interpretation of the age groups above.

5.2 Assessment of prevention and control methods

The results of this study indicate that the mean ± SD of the HCWs regarding (health care professionals who are given training courses on prevention from the coronavirus) was 2.96±1.580 with the answer rate of 59.2%, which rested within a poor level. These results agreed with the study findings conducted by Hoernke *et al*. (2021), which reported a lack of training on using PPE during the COVID-19 pandemic. While these results disagreed with many studies, Muhammed *et al*. (2020) said that HCWs received adequate training about PPE, and Ippolito *et al*. (2021) indicated that 79.0% of HCWs received formal training on PPE.

The possible explanation for this difference may be the replacement of health personnel in different hospital departments, which makes many of them with different specialties in their workplaces with different preventive measures. It may also be another explanation that they attribute to a shortage of health personnel, which makes it difficult for institutions to unload workers for courses since the coronavirus threatens danger so far. This lack of training may be brought on by improper PPE use, which worsens shortages and increases the risk of infection for HCWs (Nguyen *et al*. 2020).

Despite the lack of training courses on protective equipment in the current study, previous studies reported its importance regardless of the lack of healthcare workers. The significance of PPE training for HCWs to feel confident and prepared during prior infectious disease outbreaks has been highlighted by studies on how HCWs perceived working during such outbreaks (Wong *et al. 2008,* Wong *et al*. 2020). Also, other studies stated that PPE must be accessible and used effectively to prevent disease transmission to and from HCWs and patients. As a result, in addition to educating HCWs on disease prevention techniques, there is a pressing need to address the acute shortage of PPE in healthcare facilities at a time when it is most required to treat patients who are highly contagious (Ranney *et al.* 2020, Chughtai and Khan 2020, Gondi *et al*. 2020, Livingston *et al*. 2020).

Regarding infection prevention and control instructions about COVID-19, the results found that 89.4% of respondents have a good level. These results disagreed with the study findings in Wasit, Iraq, by Almayahi *et al*. (2021), which found that the mean ± SD regarding (Providing instructions on infection prevention and control of COVID-19 was 2.40±1.48 which rested within a poor level. Greenberg and Tracy (2020) and Apisarnthanarak *et al*. (2020) found that It's crucial to regularly update HCWs' abilities and get infection prevention and control guidelines through training.

The results of this study indicate that the mean ± SD of the HCWs regarding (avoiding direct contact with patients (hugging and shaking hands) was 2.86±1.561 with the answer rate of 57.2%, which rested within a poor level. These results agreed with the study findings conducted by Michel-Kabamba *et al*. (2020), which found that only

54.9% of HCWs used personal protective equipment during patient contact. The possible explanation for the poor level of this item may be due to the lack of training and health education, as shown in the results of the current study.

Regarding the disinfection of medical devices and workplaces, the current results showed good responses from HCWs. These results disagreed with the study findings by Asemahagn (2020), which found that 72.0% of HCWs stated inadequate access to disinfectants.

The results indicate that the mean ± SD of the HCWs regarding (washing hands before entering the workplace, after removing any personal protective equipment, and before leaving the workplace) was 4.51±0.822 with the answer rate of 90.2%, which rested within a good level. These results agreed with the study findings conducted by Suleiman *et al.* (2020), which found that 98.1% of HCWs are committed to hand hygiene. The WHO recommends routine hand washing, physical and social isolation, maintaining well-ventilated rooms, and engaging in respiratory hygiene to prevent the spread of COVID-19 (WHO 2020c).

The results reveal that the mean was 4.31±0.856 with an answer rate of 86.2%, which rested within a good level regarding avoiding crowding in elevators or using them to carry people, as they are risky given the coronavirus's present circumstances. These outcomes corroborated the conclusions of the research done by Ejeh *et al*. (2020), who reported that 94.2% of HCWs were aware of avoiding crowded places. These results are higher than the study findings by Michel-Kabamba *et al*. (2020), who revealed that only 41.3% of doctors were committed to avoiding crowded places.

The current study reveals that the mean ± SD was 4.16±0.961 with an answer rate of 83.2%, which rested within a good level regarding examining symptoms of the coronavirus personnel and auditors entering the medical facility. These results are inconsistent with Almayahi *et al*. (2021), who revealed poor levels regarding the examination. Symptoms of the coronavirus personnel and auditors enter the medical facility.

The current study reported good levels by health care workers regarding the availability of PPE and disposal of it safely without harming people or the environment. These results are consistent with the studies of Ejeh *et al*. (2020, and Aloweni *et al*. (2022), which reported that most HCWs stated the availability of PPE. (Asemahagn 2020 and Agarwal *et al*. 2021) revealed that most HCWs safely stated the disposal of PPE. These results disagreed with Suleiman *et al*. (2020), which found that only 18.5% of doctors indicated the availability of PPE. The possible explanation for this difference may be due to the difference in the time of the study because the comparative study was published in the year 2020 at the height of the coronavirus pandemic, and at that time, the consumption and demand for PPE increased, which made many countries suffer from its shortage.

The results found that the mean ± SD was 4.26±0.869 with an answer rate of 85.2%, which rested within a good level regarding covering the jewellery entering any workplace. These results disagreed with Almayahi *et al*. (2021), which found that the mean ± SD for Covering and removing jewelry before entering the workplace was 2.41±1.53, which rested within a poor level.

In this study, 84.0% of respondents indicate good levels regarding Portable electronics being kept in places that cannot get contaminated and are periodically disinfected. These results agreed with Agarwal *et al*. (2021), who found the same results.

Regarding the availability of records of waste removal, destruction, and treatment, the results found that the mean ± SD was 3.85±1.177 with an answer rate of 77.0%, which rested within a moderate level. These results agreed with Almayahi *et al*. (2021), who found that the mean ± SD for the availability of records of waste removal was 3.55±1.129, which rested within a moderate level. The possible interpretation of these results, as they appeared at medium and not good levels, may be explained by the fact that most hospitals in Iraq, especially in Babil Governorate, do not have devices for treating medical waste, as they depend on other hospitals regarding waste removal, and this is what makes the lack of records for medical waste treatment.

Regarding the availability of a published contingency plan regarding COVID-19, the study reveals that the mean ± SD was 2.43±1.449 with the answer rate of 48.6%, which rested within a poor level. These results agreed with Almayahi *et al*. (2021), who found the same results. The possible explanation for this weak level regarding the existence of a plan regarding COVID-19 may be due to the lack of cadres supervising the Corona procedures and developing plans. Another explanation may be that the lack of a plan regarding COVID-19 is due to a shortage of equipment, which corresponds to (Ranney et al. 2020), who reported that equipment availability is a crucial component of following protocols correctly, significantly impacting readiness.

The study reveals that the mean ± SD was 2.88±1.544 with the answer rate of 57.6%, which rested within a poor level regarding the availability of a workplace response strategy. These results are inconsistent with the study findings done by Suleiman *et al*. (2020), who reported that institutional COVID-19 approach protocols are used by 56.2% of HCWs. The possible insufficient training of HCWs may explain the poor level of this item.

The results of this study indicate that the highest percentage, 51.0%, of HCWs have a good assessment score, while the lowest percentage, 2.0%, have a poor assessment score. The mean ± SD of the overall assessment score was (80.025±10.038) which rested within a good level (>80 scores). These results are consistent with the studies of Asemahagn (2020), Sahiledengle *et al*. (2018), and Hussein *et al*. (2017), which found that 62%, 66.1%, and 60.5% of HCWs, respectively, have good levels regarding practices of the prevention and control methods during COVID-19 pandemic. These results agreed with those of studies conducted in Pakistan (Saqlain *et al*. 2020), China (Zhang *et al*. 2020), and Uganda (Olum *et al*. 2020), where 74%, 89.7%, and 88.7% of HWs, respectively, used COVID-19 preventive methods. This discrepancy might be attributed to regional variances in COVID-19 prevalence, PPE availability, IP regulations across nations, training access, information sources, and HCWs' awareness levels (Zenbaba *et al*. 2020, Cooper *et al*. 2020).

5.3 Assessment of COVID-19 measures

The current study reveals that there is a good level of commitment to wearing a mask to avoid infection with covid 19. This result agrees with the findings of Birhanu et al. (2021), which found that 78.9% of HCWs wear a face mask. Kumar *et al*. (2020) reported that 79.8% of HCWs knew that used face masks cannot be re-used. The need for mask use during the COVID-19 epidemic is not stressed enough in certain nations. It was inferred that, in the absence of masks, the general population might be kept safe by practicing good hand hygiene (Centers for Disease Control 2020). Because of the few research and diverse study methods, it is challenging to assess the efficiency of hand cleanliness against viral infection and transmission, such as influenza (Moncion *et al*. 2019).

In this study, there is a moderate level regarding the necessity to get the COVID-19 vaccination. This result is lower than the study findings in Al Muthana, Iraq (Harb 2022), which found that 85.6% of HCWs have good levels. These results differ from the study findings by Michel-Kabamba et al. (2020), which revealed that only 27.7% of the participants are willing to receive a COVID-19 vaccine when available. A possible explanation for this difference between studies may be the difference in time of study and type of sample.

The current study reports poor levels regarding the necessity of sterilization before wearing the paws and after each patient. The possible explanation for this result may be the lack of training on PPE, as mentioned earlier, and according to the current results.

In this study, the mean ± SD of commitment to maintaining device sterilization during the COVID-19 pandemic was 4.18±1.075, with the answer rate of 83.6%, which rested within a good level. This result is in agreement with the study findings done in Al Muthana, Iraq (Harb 2022), which found that the mean ± SD of commitment to maintaining device sterilization during the COVID-19 pandemic was 4.40±0.69 with the answer rate of 88.0% which rested within a good level.

According to the study's findings, 3.0% of HCWs have a poor assessment score, compared to the greatest percentage of 55.0% who have a moderate assessment score.

The mean ± SD of the overall assessment score was (23.89±3.199) which rested within a moderate level (18-24 score). The possible explanation for the presence of medium levels of COVID-19 measures is due to the low level of injuries in Iraq, which makes HCWs more lenient with precautions when dealing with auditors.

5.4 Evaluation of the terms, conditions, and requirements of PPE

The results of this study report moderate levels regarding implementing rules for isolation and quarantine, with the mean ± SD being 3.51±1.462 with an answer rate of 83.6%. These results are consistent with Asemahagn (2020), who found that 68.0% of HCWs stated implementing a protocol for isolation and quarantine.

Regarding getting COVID-19-related training, such as how to utilize PPE (donning, doffing), isolation, quarantine, etc., the results demonstrate that there are poor levels, with the mean ± SD being 2.88±1.439 with an answer rate of 57.6%. These results are consistent with Agarwal *et al*. 2021), which found that only 57.64% of HCWs followed the steps of donning and doffing. These results are inconsistent with the many studies by Ndishimye *et al*. (2020), which revealed that all responders (100%) acknowledged and concurred that self-isolation and quarantine were necessary COVID-19 control methods. Also, Aloweni *et al*. (2022) reported that visual cues to the proper PPE donning and doffing processes are sufficient. Hoernke *et al*. (2021) explained that PPE putting on and taking off slowed down the delivery of treatment, and wearing numerous layers of gloves made palpation during physical examinations less accurate.

The results demonstrate good levels regarding washing and sanitizing hands before handling any PPE components, with the mean ± SD being 4.09±1.182 with an answer rate of 81.8%. These results agreed with the studies of Ejeh *et al*. (2020), which found the same results. These findings are inconsistent with the study results conducted in Wuhan, China (Ran *et al*. 2020), which claimed that inadequate hand hygiene was shown to increase the probability of patients transferring SARS-CoV-2 to healthcare professionals due to hand contamination.

In this study, the proportion of HCWs with good evaluation scores is 48.0%, while the proportion with poor assessment scores is 6.0%. The mean and standard deviation of the overall evaluation score were (35.385.53), which fell into the moderate range (27-36 score). These outcomes surpass those of the research by Suleiman *et al.* (2020), which found that only 28.2% of HCWs were satisfied with the infection control policy at the institution.

According to the current survey, the maximum percentage of healthcare workers—50.0%—have a moderate evaluation score, while the lowest percentage—2.0%—have a poor assessment score. The assessment's mean and standard deviation were (139.3015.80), which fell between (105-104 score). These outcomes are in line with Michel-Kabamba *et al*. (2020), which found the same results.

The present study reveals that there is a significant association between the total evaluation score of PPE and socio-demographic variables (*P* value <0.05), except for the type of healthcare facility, which has no significant association with a total evaluation score of PPE (*P* value>0.05). These results are consistent with Agarwal *et al*. (2021), which found that there was a significant association between the total evaluation score of PPE and some socio-demographic variables (*P* value <0.05).

6 CONCLUSIONS AND RECOMMENDATIONS

In this section, the results obtained from the study and the recommendations developed in this context are included.

The assessment of different measures yielded diverse responses from participants. Some measures garnered widespread agreement, while others generated mixed perceptions. This indicates that healthcare workers (HCWs) hold varying viewpoints on different aspects of prevention and control.

The assessment of the necessity of COVID-19 vaccination revealed moderate agreement. The variation in responses among HCWs implies differing perceptions regarding the importance of getting vaccinated. The assessment of the necessity of sterilization before wearing gloves and after each patient showed a poor score. Despite this, responses were relatively consistent among HCWs, suggesting a shared perception of this measure's importance.

The evaluation demonstrated that functional titles of HCWs influenced assessment scores. Certain roles, like pharmacists and bacteriologists, had higher scores, while others, such as pharmacist assistants, had lower scores. This points to differing views based on professional roles.

The type of healthcare facility also affected assessment scores. Different facility types received varying scores, indicating that the physical context of work impacts HCWs' perceptions of COVID-19 measures. The overall assessment of COVID-19 measures indicated that most HCWs fell within the moderate assessment category. A small percentage received a poor assessment, reflecting a generally acceptable level of satisfaction with the measures.

The evaluation highlighted a need for improved education and training, such as proper usage of personal protective equipment (PPE), isolation and quarantine protocols, and

COVID-19-related training. The moderate to poor assessment levels underscore potential gaps in training programs.

HCWs generally perceived good availability of appropriate PPE and accessible information about PPE stock levels. This suggests a positive aspect of the prevention and control measures. The positive workplace order and cleanliness assessment indicate a generally well-maintained environment, contributing to effective prevention and control. The moderate assessment of implementing isolation and quarantine rules suggests room for improvement in enforcing these protocols.

HCWs' adherence to hand hygiene practices and the presence of observers during doffing procedures were assessed at a moderate level. This signals opportunities for enhancing hand hygiene practices and ensuring compliance. Different domains received varied assessment levels. Prevention and control methods were well-received, while COVID-19 measures and PPE requirements received moderate assessments overall.

Strengthen training and awareness programs for healthcare professionals, focusing on coronavirus prevention, safe patient contact, and workplace response strategies to ensure comprehensive infection control. Enhance the availability and accessibility of a clear contingency plan for COVID-19 to guide healthcare workers during critical situations and promote effective decision-making.

Ensure a consistent supply of PPE and promote proper usage, disposal practices, and safety standards adherence among healthcare workers and patients. To mitigate transmission risks, emphasize regular disinfection practices and hygiene protocols, including workspace sanitization, handwashing, and equipment sterilization.

To exchange best practices and lessons learned, Foster collaboration among healthcare professionals with different functional titles, and address assessment score gaps across roles. Tailor education and awareness campaigns to healthcare workers' age and experience, recognizing workforce diversity for effective implementation.

Implement a structured system for continuous evaluation and feedback on prevention and control methods to address emerging challenges and maintain safety standards. Improve communication channels to transparently disseminate coronavirus updates and guidelines to all HCWs, ensuring alignment with recommended practices.

Launch educational campaigns addressing concerns and misconceptions among healthcare workers about COVID-19 vaccination to increase acceptance rates. Reinforce the importance of proper sterilization practices through ongoing training and reminders, ensuring consistent adherence among HCWs.

Develop targeted training programs for specific functional titles and healthcare facility types to promote consistent adherence to COVID-19 measures. Establish a structured feedback mechanism for HCWs to share concerns, suggestions, and challenges related to COVID-19 measures, informing improvements. Incorporate regular assessments and evaluations into COVID-19 measures to adapt to changing circumstances and enhance preventive strategies.

Implement recognition and incentive programs to acknowledge healthcare workers adhering to COVID-19 measures, fostering a culture of compliance. Encourage collaboration and communication across functional titles and healthcare facility types to enhance the overall effectiveness of COVID-19 measures.

Provide comprehensive education and training covering PPE usage, isolation, quarantine procedures, and other COVID-19-related measures. Develop specialized training programs focused on COVID-19 practices, ensuring accessibility and mandatory participation for all healthcare workers.

Regularly assess healthcare workers' knowledge and practices related to PPE, providing timely feedback and support to address identified gaps. Enhance COVID-19 measures by refining isolation and quarantine protocols and ensuring access to up-to-date information and communication.

Increase the presence of observers during doffing procedures to improve infection control practices and prevent breaches in technique. Offer tailored training programs based on functional titles to address different healthcare professionals' specific needs and challenges.

Regularly monitor PPE availability, stock levels, and protocol adherence, swiftly addressing shortages or issues. Strengthen the importance of consistent hand hygiene practices among HCWs and encourage unwavering compliance.

Customize interventions to meet the unique needs of each healthcare facility, ensuring effective implementation of PPE requirements. Periodically review and update PPE protocols and guidelines based on emerging research and best practices to align with evolving COVID-19 understanding.

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APPENDICES

APPENDIX 1. Approval of the Babylon Health Department in Iraq

APPENDIX 2. Questionnaire

APPENDIX 1. Approval of the Babylon Health Department in Iraq

APPENDIX 2. Questionnaire

Assessment of personal protective equipment for healthcare workers to prevent transmission of Covid-19

Part One: Demographic Information

1-**Gender**

a) Male
b) Female

2-**Age** (**years**)

3-**Residence**

c) Urban
d) Rural

4-**Level of education**

a) primary
b) Intermediate
c) preparatory
d) Bachelor
e) postgraduate
f) others

5-**Social status**

a) Unmarried
b) Marriage
c) Absolute
d) Widower

6-**Hospital type of health care personal**

a) Physician
b) Pharmacist
c) Medical technician
d) Medical assistant
e) Bacteriologist
f) laboratory assistant
g) University Nurse
h) Technical nurse
i) Skilled Nurse
j) Chemist
k) Pharmacist assistant

7- **Type health care facility**

a) Medical wards

b) Emergency unit
c) Medical Laboratories
d) X-rays and Sonar Units
e) Hemo dialysis unit
f) Other

8-**Number of years of service**

Part Two Prevention and Control Methods

Prevention and control methods	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Healthcare professionals are given training courses on prevention from the coronavirus.					
Provide instructions on infection prevention and control of COVID-19					
Avoiding direct contact with patients (hugging and shaking hands)					
The workspace must be Disinfected periodically.					
The medical equipment is disinfected both before and after usage.					
Provide soap and tissue paper near the hand-washing basin.					
Washing hands before entering the workplace, after removing any personal protective equipment, and before leaving the workplace					
Avoidance wherever feasible, frequent touch with shared surfaces (leaving doors open where possible)					
Avoid crowding in elevators or using them to carry people, as they are risky given the coronavirus's present circumstances.					
When personnel and Auditors enter the medical facility, they are examined for symptoms of the coronavirus.					

Part Two Prevention and control methods (continued)

Prevention and control methods	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Personal protection equipment (masks, gloves, medical glasses, long shoes, protective work suits, etc.) is readily available in sufficient quantities.					
Sterilization devices (Protective equipment) are checked periodically, maintained and replaced as necessary.					
Personal protective equipment is disposed of safely to avoid harming other people or the working environment.					
The jewelry must be covered (it should not affect the gloves) and removed before entering any workplace.					
Portable electronics are kept in places that cannot get contaminated and are periodically disinfected.					
Presence of warning signs of biological hazards at patient sites					
The availability of records of waste removal, destruction, and treatment.					
Cleaning workers must be receiving education on medical waste linked to the Coronavirus.					
The availability of a published contingency plan regarding COVID-19.					
A workplace response strategy is provided if the coronavirus symptoms and the staff know them.					

Part Three: COVID-19 measure

Word	**Strongly disagree**	**Disagree**	**Natural**	**Agree**	**Strongly agree**
Commit to wearing personal protective equipment.					
The necessity to get the COVID-19 vaccination					
The necessity of sterilization before wearing the paws and after each patient					
Commitment to wearing a mask to avoid infection with COVID-19					
Dispose of personal protective equipment after work is completed.					
Commitment to maintaining device sterilization during COVID-19 pandemic					

Part Four Assess the perspective of healthcare workers on the terms, conditions, and requirements of personal protective equipment in the health institution.

Questions	**Always**	**Often**	**Sometime**	**Rarely**	**Never**
The availability of appropriate PPE (as recommended by WHO) when handling a COVID-19 patient in the institution.					
Information on the organization's PPE stock levels should be available to frontline staff.					
Provide education to healthcare professionals constructively and continuously on the usage of PPE.					
The workplace's order and cleanliness					
Implementing rules for isolation and quarantine					
Get COVID-19-related training, such as how to utilize PPE (donning, doffing), isolation, and quarantine.					
Substitution of PPE In all patients undergoing surgery or procedures involving the airway					
Washing/sanitizing my hands before handling any PPE components					
Having an observer with a checklist while performing the doffing procedure to avoid a breach of technique					

CURRICULUM VITAE

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