Artvin Çoruh Üniversitesi
Orman Fakültesi Dergisi
ISSN:2146-1880, e-ISSN: 2146-698X
Yıl: 2023, Cilt: 24, Sayı:2, Sayfa: 78-92

ofd.artvin.edu.tr

Artvin Coruh University
Journal of Forestry Faculty
ISSN:2146-1880, e-ISSN: 2146-698X
Year: 2023, Vol: 24, Issue:2, Pages: 78-92

Occupational health and safety measures in pandemic conditions: COVID-19 practice

Pandemi koşullarında iş sağlığı ve güvenliği önlemleri: COVID-19 uygulaması

Hafiz Hulusi ACAR[1], Kemal ÜÇÜNCÜ[2]
[1]İstanbul Yeni Yüzyıl Üniversitesi, Sağlık Bilimleri Fakültesi, İş Sağlığı ve Güvenliği Bölümü, İstanbul
[2]Karadeniz Teknik Üniversitesi, Orman Fakültesi, Orman Endüstri Mühendisliği Bölümü, Trabzon

Eser Bilgisi / *Article Info*
Derleme / Review
DOI: 10.17474/artvinofd.1241282

Sorumlu yazar / *Corresponding author*
Kemal ÜÇÜNCÜ
e-mail: kucuncu@ktu.edu.tr

Geliş tarihi / *Received*
23.01.2023
Düzeltme tarihi / *Received in revised form*
25.07.2023
Kabul Tarihi / Accepted
19.08.2023
Elektronik erişim / *Online available*
15.10.2023

Anahtar kelimeler:
COVID-19
Occupational health and safety
Occupational control methods

Keywords:
COVID-19
İş sağlığı ve güvenliği
İş kontrol yöntemleri

Abstract
The coronavirus disease (COVID-19) first appeared in China and spread globally in a short time. It was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. Pandemics are a human problem. Due to the risk posed by COVID-19 on human health, all production and service workplaces around the world have slowed down their activities. These developments have caused significant labor and production losses. The most effective and practical way to prevent the transmission of the coronavirus; although there are physical distance, personal hygiene and mask applications, these do not constitute a definitive solution. Governments, organizations, employers and workers are facing important challenges to combat the COVID-19 pandemic and protect safety and health in the workplace. Unsafe workplace conditions and inappropriate working principles lead to significant health risks in the workplace. COVID-19 causes negative effects in all areas where people are present, such as health, social, economic, education, construction, manufacturing, transportation and trade. In this study, protective measures that can be taken are evaluated by reviewing the literature on the negative effects of COVID-19 on human health and therefore on workforce loss.
In addition to additional safety measures in the prevention of COVID-19, basic occupational health and safety (OHS) control methods were evaluated in the following order: (1) elimination / substitution, (2) engineering controls, (3) organizational controls, and (4) personal protective equipment (PPE). In addition to the protection of health, due to the effective safety measures, the stress caused by COVID-19 will decrease in people, so comfort in their social lives and productivity in their work lives will be increased. Therefore, governments, employers and workers' organizations have to form a joint organization with universities and health institutions.

Özet
Koronavirüs hastalığı (COVID-19) ilk olarak Çin'de ortaya çıktı ve kısa sürede tüm dünyaya yayıldı. 11 Mart 2020'de Dünya Sağlık Örgütü (WHO) tarafından pandemi ilan edildi. Pandemi, bir insanlık sorunudur. COVID-19'un insan sağlığı üzerinde oluşturduğu risk nedeniyle, dünya genelinde bütün üretim ve hizmet işyerleri faaliyetlerini yavaşlatmıştır. Bu gelişmeler önemli ölçüde işgücü ve üretim kayıplarına neden olmuştur. Koronavirüsün bulaşmasını önlemenin en etkili ve pratik yolu; fiziki mesafe, kişisel hijyen ve maske uygulamaları olsa da bunlar kesin çözüm oluşturmuyor. Hükümetler, kuruluşlar, işverenler ve işçiler, COVID-19 salgınıyla mücadele etmek ve işyerinde güvenlik ve sağlığı korumak için önemli sorunlarla yüzleşmektedirler. Güvenli olmayan işyeri koşulları ve uygun olmayan çalışma ilkeleri, işyerinde önemli sağlık risklerine yol açmaktadır. COVID-19, sağlık, sosyal, ekonomik, eğitim, inşaat, imalat, nakliye, ticaret gibi insanların bulunduğu her alanda olumsuz etkilere yol açmaktadır. Bu çalışmada, COVID-19'un insan sağlığı ve dolayısıyla işgücü kaybı üzerindeki olumsuz etkileri ile ilgili literatür taraması yapılarak alınabilecek koruyucu önlemler değerlendirilmiştir. COVID-19 önleyici iş sağlığı ve güvenliği (İSG) kontrol yöntemleri aşağıdaki sıraya göre değerlendirilmiştir: (1) eleme/ikame, (2) mühendislik kontrolleri, (3) organizasyonel kontroller ve (4) kişisel koruyucu donanımlar (KKD). Sağlığın korunmasının yanı sıra etkin güvenlik önlemlerine bağlı olarak kişilerde COVID-19'un yarattığı stres azalacağından sosyal yaşamlarında rahatlık ve iş yaşamlarında verimlilik artışı sağlanacaktır. Bu nedenle, hükümetler, işverenler ve işçi örgütleri üniversiteler ve sağlık kurumları ile ortak bir örgüt oluşturmak durumundadırlar.

INTRODUCTION

Epidemics have been and continue to be among the serious problems of humanity. Epidemics have negative effects both individually and socially. The most basic feature of the epidemic is that the infectious agent makes

the susceptible host sick and the host infects 2-4 other people. When the epidemic affects a wide geography, a continent or the whole world, it is defined as a pandemic (Kocay and Baba 2022).

COVID-19, which emerged in Wuhan, China on December 1, 2019, began to spread globally in a short time. WHO named this disease the new coronavirus (COVID-19) on February 11, 2020, and was declared a global epidemic on March 11, 2020, when the first case was seen in Türkiye (Er 2020, Bozkurt et al. 2020). Coronaviruses are very important human and animal pathogens (Cui et al. 2018, Er 2020, El-Sayed and Kamel 2021). The virus that causes the COVID-19 disease has been named Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) (Hu et al. 2021).

All parties of the production organization (governments, employers, unions and workers) must face enormous challenges as they try to protect health and safety in their workplaces to combat the COVID-19 disease. These key issues need to be addressed to focus on public health impact, symptoms, diagnosis, case management, emergency response and preparedness to assess and prevent the sectoral (agricultural, industrial, service) impacts of the global disaster caused by the COVID-19 disease.

The risk of transmission of the SARS-Cov-2 virus, which causes COVID-19 disease, is higher indoors. Employers should take the necessary epidemic-related occupational health and safety (OHS) measures in their workplaces to protect all persons involved in the system (employers, workers, customers, guests) from potentially worsening epidemic conditions. Employers and workers can benefit from the guide prepared by the OHS administration. Because researches on OHS measures are continuing in order to prevent and control the risk of contagion related to the epidemic, psychosocial risks, ergonomic and other OHS risks. Risk levels will be reduced with the control measures to be implemented in line with this guideline. However, new guidelines have been established as COVID-19 mutants and outbreak conditions change (OSHA 2020).

After the recognition of COVID-19 as a pandemic, practices such as quarantine, isolation, transportation restriction began. These applications have limited production and brought to the fore working methods such as working from home and digital working for production.

Decreasing employment due to the impact of COVID-19 negatively affected the sectors financially at the global level. These illustrate the effects of the coronavirus pandemic and the importance of efforts to contain it. On the other hand, the global epidemic caused by the spread of COVID-19 negatively affected mental health and created a negative economic impact, leading to a serious increase in hospitalizations, deaths and quarantine-related crises (Das 2022).

While the COVID-19 epidemic threatens workplaces and the flow of activities, has causes serious health problems and negative socio-economic developments in employees. Studies on the source of the COVID-19 disease, which has affected the whole world and turned into a pandemic, are important for the protection of human health for the future.

Effective implementation of OHS measures for COVID-19 or similar epidemics in workplaces is not only important for the protection of the health of employees and the responsibility of the employer, but also a matter of public health (Baycık et al. 2021).

The WHO Global Emergency Committee, at its meeting No. 15 dated May 4, 2023, adopted the recommendation to end the global public health emergency. However, there have been warnings that the virus remains a significant threat. Despite the recommendation by WHO to lift the global public health emergency, it is known that the virus continues to be a significant threat. In this review, the measures to prevent the transmission of the virus were evaluated in terms of OHS, and the necessity of redesigning and reorganizing the workplace or workplaces was emphasized.

Literature Review

The new type of coronavirus (COVID-19) is a virus that is generally defined by fever and shortness of breath,

causes respiratory tract infection, is transmitted from person to person through droplets and contact, and can lead to death (Viramgami et al. 2020, Ateş 2020). Coronaviruses (CoV) are a class of ribonucleic acid (RNA) viruses that cause disease in the respiratory, gastrointestinal, liver, and cardiovascular systems (Wu et al. 2020). Four types of CoV variants, alpha, beta, delta and gamma, have been described (Di Gennaro et al. 2020).

Modes of Transmission of COVID-19

The virus is transmitted from person to person in two ways (Lotfi et al. 2020, Andersen et al. 2020, Holmes et al. 2021):

- *Direct transmission*: COVID-19 is transmitted to people at a distance of about 2 meters through virus-laden droplets spread by the infected person when breathing, speaking, coughing and sneezing. It is the most common mode of transmission.

- *Indirect transmission*: It is transmitted through contact from contaminated surfaces. It spreads by the precipitation of virus-laden droplets onto various surfaces and objects. When an infected person talks, coughs or sneezes, infected droplets are transmitted to surrounding surfaces. Transmission can occur if a person touches surfaces or objects contaminated with SARS-CoV-2, or rubs their mouth, nose, or eyes.

The virus passes into the lungs, especially through the mucous membranes of the nose, larynx and eyes; attacks the lung, heart, kidney and digestive system (Türken and Köse 2020, Saydam 2020). Human-produced viral particles are entrapped in respiratory droplets and droplet nuclei that are larger than a single virus. Most respiratory droplets or particles formed during breathing, speaking, singing, sneezing and coughing are smaller than 5 µm (Bar-On et al. 2020). Temperature and relative humidity affect the transmission power of COVID-19. However, it is practically not possible to create the desired temperature and relative humidity to reduce or eliminate the effect of COVID-19. The SARS-CoV-2 virus is sensitive to high temperatures; Over 99.99% inactivates in just a few minutes at 70°C. Although some studies show that the survival time of viruses can be reduced when the relative humidity is in the range of 40-60%, this is quite limited (Wang et al. 2021). From an epidemiological point of view, counting asymptomatic cases and determining the total cases and understanding the extent of the pandemic is difficult (Lipsitch et al. 2020).

Classification of the Risk of Employee Exposure to SARS-CoV-2

During the epidemic, the risk of occupational exposure of workers to the SARS-CoV-2 that causes COVID-19 depends on the type of industry, contact with infected people, local conditions and social behavior patterns. The risk of exposure depends on: (1) The physical characteristics of the workplace, (2) The characteristics of the work performed, (3) The health status and non-work activities of the employee, (4) Social customs and conditions, (5) Employees' use of necessary personal protective equipment, (6) Close contact (CC: 2 m distance for a total of 15 minutes or more in a 24-hour period), (7) Compliance with the COVID-19 Health Management and Working Guidelines.

Occupational Risk Pyramid for COVID-19

The potential risk exposure levels of job duties can be divided into 4 groups (OSHA 2020, OSHA 2021a):

- *Low Risk Level*: Limited contact with the public or other workers in this category; work from home, remote work, long-distance office work, etc. includes.

- *Moderate Risk Level*: Jobs that usually require close contact or constant close contact with other people in areas of social pollution; close work in open or well-ventilated workplaces; public transportation, market, restaurant, bus station, construction industry, some public duties, farm etc.

- *High Level of Risk*: Jobs with high potential for exposure to suspected or known sources of SARS-

CoV-2; health services, ambulance vehicle workers, morgue workers-washing and incineration, working in closed and airless workplaces, workplaces where commercial transactions are made, etc.

- *Very High Level of Risk*: Jobs with very high potential for exposure to suspected or known sources of SARS-CoV-2 during certain medical, post-mortem or laboratory functions; aerosol generating procedures-intubation, dental procedures, sampling from suspect, morgue workers - autopsy etc.

COVID-19 Symptoms

The clinical appearance of COVID-19 is as follows; (a) asymptomatic conditions, (b) conditions requiring mechanical oxygen administration, and (c) severe respiratory failure. Known and common symptoms of COVID-19 are as follows (OSHA 2020): (1) Fatigue, headache or general aches, (2) Throat congestion and pain, cough, fever or chills, (3) Nausea and vomiting or diarrhea, (4) Loss of new taste or smell. It is difficult to fully distinguish COVID-19 disease from other viral respiratory infections. It has been found that symptoms usually appear between 2 and 14 days after exposure to the virus. Therefore, it should not be confused with other symptoms (McIntosh 2021).

COVID-19 Tests

Two diagnostic tests currently approved worldwide (Tahamtan and Ardebil 2020, CDC 2021):

- *PCR Test:* The PCR test enables the detection of people who have caught COVID-19 and are actively carrying the virus.

- *Antibody Tests*: With the antibody test, the level of protective antibodies against COVID-19 after illness or vaccination is understood.

COVID-19 Work Planning

Within the scope of the workplace safety management system, a COVID-19 work plan should be created with the cooperation of the OHS board and the syndicate, if any. This plan consists of the steps to be taken to protect workers from the risk of exposure to COVID-19 and the necessary procedures for monitoring worker health. A good COVID-19 business plan (OSHA 2020);

a) Recognition of hazards,
b) Evaluate the relevant risks and risks; and
c) It makes it possible to take control measures to reduce the spread of the coronavirus.

For this purpose, employers and auditors;

a) Takes necessary control measures,
b) Informs the employees about these measures,
c) Ensures that employees comply with these procedures.

Occupational Health and Safety

OHS systems need to prevent the spread of the COVID-19 epidemic and create an internal environment that provides a reasonable balance between personal safety and work engagement. The most effective solution mechanism against the threat of COVID-19 disease is OHS. Because OHS measures provide important and effective support and contribution to returning to the workplace in a safe and healthy way after periods of quarantine, isolation or working from home.

OHS principles contribute to the preparation of guidelines for the following measures:

- Protecting the health and safety of employers and workers at work during the COVID-19 pandemic.

- To create a safe and healthy working environment after the general measures related to the epidemic are lifted.

Effects of COVID-19

Industry Impacts of COVID-19

COVID-19's restrictions on travel and mobility affected labor markets, consumer demands, health systems, social behaviour. These factors also led to significant changes in the sectors. Supply-demand-driven sectors (such as manufacturing, construction, retail, education and mining) and medical fields such as healthcare and pharmaceuticals have been significantly affected by the pandemic. Other sectors such as utilities and energy were moderately affected; financial services, stock markets and agriculture sectors were generally positively affected. Industries lost their workforce to the extent that they were affected (Delardas et al. 2022). The global pandemic resulting from the spread of COVID-19 has created a significant amount of uncertainty due to the increase in hospitalizations, deaths and quarantine-related crises (Saadat et al. 2020). COVID-19 has increased mortality and morbidity rates, negatively impacted mental health conditions, and had a huge, negative economic impact (Das 2022).

The COVID-19 pandemic has created a great socio-economic concern in all industries worldwide. Production and access cuts in agriculture and food systems have made the livelihoods of the majority of people significantly difficult. In addition, the continuation of the crisis has led to logistical problems, which has led to global food insecurity. The marketing cost of agricultural products increased due to logistical difficulties under the influence of the pandemic. COVID-19 has also affected the economic growth of countries, including the industrial sector, agricultural production, trade and service sectors. Increases in input costs and perishability of agricultural products cause huge losses for farmers. Current circumstances have delayed the distribution of food and agricultural inputs, creating barriers to sustainable food production and supply to markets (ILO 2020, Arumugama et al. 2021).

The spread of the coronavirus pandemic has created an imbalance in all sectors of the world, causing significant disruptions to the global economy. Social distancing, quarantines and excessive travel restrictions have resulted in a massive reduction in labor and production across all industrial sectors. Due to the impact of COVID-19, the most important lesson learned in this area has been the creation of a resilient food system (Sridhar et al. 2023).

The service sector (education, health, utilities, tourism, etc.) has faced the worst financial setbacks due to the coronavirus. Globally, passenger movements were restricted, with most airline industries shutting down. Due to the panic and spread of the disease, the number of tourists and passengers decreased rapidly (Xiang 2021). COVID-19 has affected various service industries such as tourism and accommodation, transportation and restaurants. The decrease in tourism has also led to job loss for various industries and has caused great losses in these areas. The COVID-19 crises have also affected the media and entertainment industry. COVID-19 is affecting education sectors beyond student learning. School closures put this industry at serious risk of unemployment and, at worst, complete school closures. The COVID-19 quarantine has brought the restaurant and hotel industries to a standstill. Despite the challenges faced by this industry, the online ordering service has significantly supported companies.

All the restrictions and measures taken to reduce human contact and movement in order to slow the spread of the virus led to a discontinuity on a sectoral basis. COVID-19 has disrupted supply-demand mechanisms and production capacity, contributed to increased uncertainty and financial instability, and posed a major strategic challenge. Although COVID-19 disrupted the traditional market order, it has increased the efforts of organizations in the field of innovation to overcome this problem. The change in understanding created by the pandemic is also very important for overcoming the crises that will be encountered from now on (Vecco et al. 2022).

Health Effects of COVID-19

The health problems of the pandemic can be long-term or short-term. A significant portion of those infected with the virus faced serious physical and mental difficulties in returning to normal life. The various health impacts of COVID-19 are as follows (Mueller et al. 2021, CDC 2022):

(1) Lung and long-term cardiovascular and brain ailments, (2) Neglect of patients with other diseases and health conditions, (3) Overburdening of high-risk physicians and other healthcare workers, (4) High operating burden of the existing healthcare system, (5) Deficiencies in healthcare systems, (6) Difficulties in diagnosis, quarantine and treatment related to COVID-19, (6) High need for prevention of COVID-19, post-traumatic stress, and treatment, (7) Long-term stress syndrome, (8) Long-COVID-19 cases in the world and in Türkiye was given (URL-1 2023, WHO 2023). In millions of survivors, long term symptoms that prevent a return to normal life have been observed, and mental problems have increased term stress and failure of the medical supply chain, and (9) cardiac symptoms, neurological symptoms, digestive symptoms, joint or muscle pain. As of July 2023, approximately 768.237.788 people in the world have been infected with the virus and approximately 6.951.677 people have died from this virus (URL-1 2023, WHO 2023). Similarly, as of May 2023, at least 17.232.036 cases and 102.174 deaths were observed in Türkiye. In Table 1

significantly (Mueller 2021). Until July 2023, a total of 13.474.287.083 doses of COVID-19 vaccine were administered in the world and 152.722.197 doses of COVID-19 vaccine in Türkiye.

Table 1. COVID-19 case results in the world and in Türkiye

Status	**World**		**Türkiye**	
	5 May-2023	**24 July-2023**	**April- 2023**	**24 July-2023**
Population	8.027.260.000	8.050.121.000	85.279.553	N/A
1) Total number of cases	765.222.932	768.237.788	17.232.066	N/A
Case/Population ratio (%)	9.56	9.57	20.21	N/A
2) Total number of deaths	6.921.614	6.951.677	102.174	N/A
Death rate (%)	0.90	0.91	0.59	N/A
3) Total number of vaccines	13.344.670.055	13.474.287.083	152.657.595	152.722.197

Healthcare for people with other health needs has been severely disrupted as COVID-19 increases the pressure on healthcare institutions (Mueller 2021). Significant increases were observed in the number of patients waiting in non-emergency care plans (Department of Health and HSE 2021), creating difficulties in human resources management, facility-tool-equipment use and medical equipment management (Haileamlak 2021).

Economic Impacts of COVID-19

It has implemented full or partial lockdown measures around the world to slow the spread of the COVID-19 disease. This practice, by affecting the service, production, agriculture, food, education, sports and entertainment sectors, led to economic deterioration, deterioration in the supply chain, unemployment, and a decrease in the quality of life (Naseer et al (2023). 255 million full-time working days were lost in 2020 due to business closures. The estimated total financial burden of the COVID-19 pandemic related to loss of productivity and decline in health is estimated at more than $16 trillion (Cutler and Summers 2020, Yeyati and Filippini 2021). It is estimated that approximately 1 billion working days are lost due to COVID-19 in the USA in 2022 (McKinsey Company 2023). Research results show that consumption habits will change, total expenditures will decrease, savings rates will increase and unemployment rates will increase during the COVID-19 epidemic; this shows that there will be stagnation in the economies of the countries and as a result poverty rates will increase (Bárcena et al. 2020). As a matter of fact, the world experienced a negative economic growth of 2.8% in 2019 and -3.1% in 2020. With the measures taken in 2021, a global economic growth of 5.8% was achieved (CRS 2021, Ünüvar and Aktaş 2022). The IMF predicts that the global economic growth rate, which was 3.4% in 2022, will decline to 2.9% in 2023. In addition to saving lives, proactive global actions are required to protect economic well-being (Pak et al. 2020). Financial impacts of COVID-19: (1) Significant slowdown in income growth, (2) Decrease in employment, increase in unemployment, (3) Weak cash flow in the market, (4) Slowdown in the production of basic necessities, (5) Slowdown in the

transportation, service and manufacturing sectors, (6) Losses in national and international trade, (7) Disruptions in the supply chain of products, (8) Increasing poverty.

Impact of COVID-19 on Education

The aim of education is to ensure that all young people have the opportunity to develop knowledge, skills, attitudes and values at school. The closure of schools worldwide due to the COVID-19 epidemic and the introduction of distance education instead of face-to-face education negatively affected education. Meinck et al (2022) reported that administrators, teachers, and students perceived a decrease in learning progress. The pandemic has exposed many inadequacies and inequalities in education systems; led to learning losses and increased inequality. Losses experienced in extracurricular practices can turn into long-term difficulties. Although distance education techniques do not provide teacher-student interaction, it is beneficial to develop and strengthen distance education techniques, since it is not known how long the pandemic will last. On the other hand, necessary efforts should be continued to prepare compensation programs, to allocate sufficient budget for education and to be prepared for future uncertainties (Donnelly et al. 2021). Following the February 6, 2023 Kahramanmaraş earthquake, continuing distance education in higher education in Türkiye requires being prepared for similar disasters.

Socio-Cultural Impacts of COVID-19

Despite the clear and understandable public health and economic impacts of COVID-19, its sociocultural impacts are often neglected (Wassler and Talarico 2021). Al Adawi et al. (2021) stated that quarantine, physical distance and access restriction related to COVID-19 may affect the measures to be taken by creating differences in terms of regional, religious beliefs, cultures and norms. The physical distance and quarantine applied to protect from COVID-19 create socio-cultural negativities (UNICEF 2021, Mansouri 2022): (1) Inability of the service sector to serve as it should, (2) Cancellation or postponement of important sporting events and tournaments, (3) Postponement or cancellation of any travel unless it is very urgent, (4) Disruption of cultural, religious and holiday celebrations, (5) Increase in social stress, (6) Closure of exams, games and sports halls.

Psycho-Social Effects of COVID-19

Fear of getting sick and dying due to coronavirus disease, economic recession negatively affected the mental health of many people and increased their substance use (Schäfer 2020, Panchal et al. 2021). On the other hand, Monroe et al. (2023) stated that the COVID-19 epidemic had psychosocial effects in terms of increased anxiety, decreased quality of life, financial difficulties and feelings of isolation. Similarly, it has been observed that individual, interpersonal, community, institutional, and structural factors can affect health outcomes in COVID-19 conditions. In a study examining the psychosocial effects of COVID-19, generalized anxiety was found in 21.0% of subjects and major depression in 25.5% (Généreux 2020). In another study conducted in low- and middle-income countries, 28.2% anxiety, 18.3% stress, and 26.6% depression were reported (Chen et al. 2021).

Environmental Impacts of COVID-19

COVID-19 interacts with the climate. Climate effects accelerate the spread of some diseases and make disease control difficult (Rosengren 2021). Due to the decrease in energy use during the pandemic process, CO2 emissions decreased by 5.8% in 2020 (Khan et al. 2021). Overall, the pandemic has led to major global socio-economic changes that directly or indirectly affect the environment, such as the effects on human health of environmental damage caused by pharmaceutical and vaccine waste, improving air and water quality, reducing noise and restoring ecology (Chakraborty and Maity 2020, Somani et al. 2020, Saadat et al. 2020). However, the acceleration in economic activity after the pandemic will reverse the positive effects (Meena 2021). Nevertheless, it is possible that the results of environmental measurements resulting from COVID-19 will provide a significant

sensitivity to humanity in this regard. In addition, the indiscriminate disposal of various infected materials that pose a constant danger to the environment, such as gloves, masks, untreated medical waste due to COVID-19, causes significant environmental pollution (Fadare and Okoffo 2020, Nghiem et al. 2020, Singh et al. 2020, Meena 2021).

RESEARCH METHODOLOGY

Documentary research models were used to test the details of the research problem. A conceptual framework was created with a literature review. The basic question of the research was expressed as follows: "What are the additional and basic OHS measures that will reduce COVID-19 infections in the workplaces?" The research was carried out in two stages: in the first stage, COVID-19 infections and their effects on working life were examined, and in the second stage, additional measures to prevent the transmission of COVID-19 and basic OHS measures were evaluated. In this review, evidence-based research and documents such as articles, communiqués and institutional catalogs containing the effects of COVID-19 on human health, which was declared a pandemic by WHO, on a sectoral basis were examined and OHS measures were evaluated to reduce these damages.

RESULTS AND DISCUSSION

COVID-19 business planning and organizational arrangements should be made in order to effectively realize individual, interpersonal, social and corporate OHS.

The priority is to save lives. In the face of this extraordinary situation and to protect life, countries have no choice but to take extraordinary measures. Enabling OHS measures requires workplace evaluation. Employers should conduct a workplace assessment process to identify the measures necessary to protect the health and safety of their employees. Such an assessment creates an internal network of responsibilities in the workplace. In this system, everyone, such as employers, auditors, workers, health and safety representatives or joint health and safety committees, takes part in ensuring health and safety in the workplace (Ingram et al. 2021, Baycık et al. 2021).

General measures to prevent transmission of COVID-19 disease and are currently considered public health measures (Di Gennaro et al. 2020):

- To be vaccinated
- Using a face mask
- Depending on the risk of COVID-19, hands are washed with soapy water at regular intervals or disinfected with a hand disinfectant containing at least 60% alcohol
- Stay at least 1 meter away from people who are coughing, sneezing or singing
- Maintaining isolation with infected people to avoid contact with infected people
- Mouth and nose are covered to prevent the spread of virus droplets from coughing and sneezing; for this, respiratory hygiene is applied by covering the mouth and nose with the bend of the elbow or a handkerchief
- Avoiding touching these body organs, especially with unwashed hands, as the virus enters the mouth, nose and eyes of a person
- If you have symptoms such as fever, cough and difficulty breathing, get tested early and seek medical attention if necessary
- Having knowledge
- Follow the advice given by the healthcare provider
- Follow the advice given by the health professional
- Enforce quarantine.

The protection of workers from COVID-19 disease depends on the risk of exposure. In general, this risk varies according to the type, weight, duration of the work and the degree of pollution of the working environment.

Employers should implement effective workplace hazard assessment-based infection prevention control strategies using a combination of the following OHS measures to prevent worker exposure. Employers' COVID-19 response plans are usually ranked from most effective to least effective (Acar ve Üçüncü 2020, OSHA 2021b):

1. Elimination: Physical removal of the hazard.
2. Replacement: Replacing the dangerous with the non-hazardous.
3. Engineering controls: Isolating people from danger by technical solutions.
4. Administrative controls and safe working practices: Changing the way people work.
5. Personal protective equipment (PPE&NMM): People's use of personal protective equipment.

Elimination

Elimination is the process of removing or eliminating the hazard from the workplace. Efforts to remove potentially contagious persons from the workplace are consistent with the goal of eliminating danger. For this purpose, worker screening is inevitable. Screening for the presence of COVID-19 symptoms in employees is an important part of employers' efforts to keep operations and reopen businesses. The complexity of screening for coronavirus symptoms varies with workplace conditions and the risk of coronavirus transmission to workers. It may be possible to reduce the rate of spread by substituting or replacing the hazard with something less dangerous, replacing old business processes with new ones (ILO 2020).

Substitution

Substitution, in the business system, is to replace a hazardous road or material with a non-hazardous road or material. Hazard can be avoided by developing a safer way to complete the job task. However, no new hazards should arise in the business system during this change.

Engineering Controls

Engineering controls are making a physical change or arrangement in the workplace so that workers can be kept away from hazards. Such controls reduce exposure to hazards regardless of employee behavior. Implementing engineering controls is often the most cost-effective solution (Sehgal and Milton 2023).

Employers should implement the following engineering controls to protect workers from SARS-CoV-2 (Dehghania 2020, Üçüncü ve Acar 2021):

- First of all, it is inevitable that the volume to be allocated to employees should be designed in a way that does not increase the risk of contamination. This approach should also be taken into account in existing workplaces,

- Installation of high efficiency air filters. Also, adjusting ventilation systems to increase air exchange to provide outside air and/or fresh air,

- Create barriers between workers (such as assembly lines) or between workers and customers (such as sales points) from suitable materials (plexiglass, stainless steel, aluminum, etc.). Using rope and strut systems to prevent customers/visitors from moving closer than 2m,

- Maintaining safe distances between employees by designing appropriate physical workspaces,

- Wearing physical shields made of clear and lightweight plastic sneeze guards and similar materials,

- Creating a transition window for customer service,

- Special negative pressure ventilation applications in facilities with aerosol spread (for example; airborne infection isolation rooms in healthcare institutions and special autopsy packages in mortuary environments).

While there is no conclusive evidence to date that the live virus is transmitted through an HVAC system and infects

people in other areas served by the same system, airflows in a given area can help spread the disease among people in that area. SARS-CoV-2 viral particles spread more easily between people than outside. In the open air, the virus concentration decreases even with a light wind. Therefore, it is expected that viral particles will be more in closed areas. Designing protective ventilation applications; thereby reducing the concentrations of coronavirus in the air and their viral effects on building occupants. Ventilation practices are an effective way to reduce viral particle concentration in indoor environments. Other measures besides ventilation technique can be used as viral protection: physical distancing, face mask, hand hygiene and vaccination (Hayashi et al. 2023).

Ways to improve ventilation (Luo and Zhong 2021):

- Increasing the outside air intake.
- By operating the fans: It should be avoided to place the fans in such a way that they can cause the direct flow of polluted air from one person to another. If such an application is not possible, it may be economical to draw outside air into the room through doors and windows.
- Proper operation of ventilation systems and acceptable indoor air quality at the current occupancy level must be ensured for each space.
- The ventilation system should be controllable if desired. Where the operation of the HVAC fan can be controlled by the thermostat, the fan should be disabled unless heating or air conditioning is required.
- Improved central air filtration.
- Toilet exhaust fans should be operated at full capacity when the building is full.
- Kitchens, cooking areas, etc. Exhaust ventilation systems in areas should be checked and maintained.
- Portable high-efficiency particulate air (HEPA) filtered fan systems should be used to clean the air effectively (especially in high-risk patient practices).
- Portable air cleaners that use less efficient filters than HEPA filters may be sufficient to clean the room air.
- Louvers, exhausts, dampers are adjusted to provide sufficient and clean air flow. For a better and different design, the supply and exhaust equipment can be mounted on the ceiling grid system.
- When options to increase room ventilation and filtration are limited, ultraviolet germicidal irradiation (UVGI) can be used as an additional solution to neutralize SARS-CoV-2.
- In workplaces, the HVAC system should be run for 2 hours before and after working hours.

Large droplets (d≥100 µm) settle on the surrounding surfaces within seconds, while smaller particles can remain suspended in the air for much longer. The residence time of the particle increases as its diameter gets smaller. Dilution aeration and particulate filtration are mostly used to remove small particles from the air. Large particles can also be removed by these methods, but they are less likely to be captured by filtration systems as they fall rapidly out of the air. The ventilation solutions outlined here require some investment and operating costs. These remedies, together with risk assessment factors (such as incidence rates in the community, expectation to wear face masks, and room occupancy) can influence vehicle selection (Calles and Morán-López 2020).

Administrative Controls and Safe Working Practices

Administrative controls can take place with the participation and adoption of both employer and employee. Safe working practices regarding administrative controls include changes in policies and procedures regarding how employees perform their duties in order to do business safely in the workplace. Administrative controls are implemented in 5 categories (ILO 2013): (1) Maintenance, (2) Cleaning, (3) Signs, (4) Procedures, (5) Training.

Administrative controls that can be applied in protection from coronavirus:

- The number of workers working in a certain shift in workplaces should be limited and at least 2 m distance should be left between workstations.
- Signs reminding workers, customers and visitors of the rules of protection from contamination in languages they understand (par exemple, physical distancing, hand hygiene, temperature measurement etc.) should be posted in workplaces.
- Training and information resources should be provided in languages that employees can understand to contribute to the prevention of COVID-19 transmission.
- More frequent cleaning and disinfection should be applied in workplaces.
- Employees should be provided with a face mask when necessary to prevent infection.
- Sick employees should be encouraged to stay at home.
- Instead of face-to-face business activities; the use of virtual environments, work from home practices and the physical distance between people should be increased.
- In the enterprises, the density of employees should be reduced to a certain extent without changing the total working time with appropriate work programs.
- Non-essential travel to places with ongoing COVID-19 outbreaks should be stopped, and travel warning levels of the Centers for Disease Control (CDC) should be monitored regularly for this purpose.
- Contingency communication plans should be developed to respond to employee concerns, including, where appropriate, a forum and internet-based communication.
- Employees should be provided with up-to-date training on risk factors and possible risks related to COVID-19.
- Employees who need to use/wear and properly remove protective clothing and equipment should be trained, including their current and potential duties.

Easy-to-understand training materials on the prevention of viral diseases should be prepared and the language to be used should be understandable by the employees.

Use of Personal Protective Equipment

Engineering and administrative controls are the most effective way to prevent SARS-CoV-2. However, the use of PPE may be required from time to time. The types of PPE to be used to protect workers from exposure to SARS-CoV-2 will vary based on geographic location, work activities, exposure risks and the results of the employer's hazard assessment. A worker at risk of exposure may need to wear one or more of PPE items such as gloves, apron, face shield or goggles, and face mask or respirator, depending on their job duties and exposure risks (OSHA 2020). During the COVID-19 pandemic, the supply chain may be disrupted. For this reason, necessary precautions should be taken and arrangements should be made for the supply of PPE. Although some workers, including those working in healthcare, post-mortem care, and laboratories, may be exposed to aerosols containing higher levels of PPE (including N95 respirator); most workers are likely exposed to SARS-CoV-2 by contact or

droplet routes. Employers are responsible for providing the PPE needed to keep their workers safe while doing their jobs (Hayashi et al. 2023).

PPE including gowns, face shields, face masks and respirators will be used as a result of the COVID-19 outbreak. The following rules should be followed for the use of PPE in general and in particular for COVID-19 (Di Gennaro et al. 2020):

- Gloves should be kept clean, torn and soiled gloves should be replaced.
- When it is necessary to use face and eye protection together; surgical mask, goggles or face shield should be used. Personal glasses cannot be used as eye protection. Fabric face coverings cannot be used as PPE. These do not protect workers against viral droplets.
- Respirators must comply with and be used in accordance with OSHA's Respiratory Protection standard. Surgical masks and cloth face masks cannot be used instead of respirators. Poster and video equipment should be given information on how to properly wear and dispose of filtered face masks. Face shields can be fitted over a face mask to prevent mass contamination of the respirator.
- Appropriate PPE must be found according to the level of danger. Where workers require respiratory protection, the necessary respirators should be available. Hazards posed by fluids of human origin (blood, sweat), hazardous chemicals and contaminated surfaces should be avoided. While these guidelines are designed for healthcare, they can also be used by other industry employers to provide PPE.
- After removing PPE, hands are washed in accordance with the guideline. Necessary facilities should also be provided for the use, removal and hand hygiene of PPE.
- Employers should provide workers with procedures for the care, cleaning, storage and disposal of PPE and clothing.

CONCLUSION AND RECOMMENDATIONS

In this review study, the general and OHS measures that can be controlled for the negative effects of COVID-19 were put forward by scanning the literature about the symptoms, transmission routes and effects of COVID-19 and social protection.

In addition to serious human losses, COVID-19 has created important problem areas especially against underdeveloped and developing countries with its negative economic effects, loss of workforce, increase in unemployment, loss of welfare. The COVID-19 pandemic has undoubtedly caused serious global catastrophe.

The main measures to prevent the spread of the new coronavirus are quarantine, cleaning, social distancing, use of masks and, partly indirectly, the use of drugs. The risk of person-to-person transmission of the coronavirus is quite high, so maintaining social distancing is the best way to avoid it. However, finding an effective curative drug to control this deadly novel coronavirus is a major challenge for all global health organizations.

WHO has produced important public health documents on the prevention and protection of COVID-19. Especially in terms of public health; the ways of transmission of the virus and protection measures accordingly are explained. However, since the implementation of protection measures is related to the cultural and economic levels of the countries, the same level of measures cannot be taken on a global scale. The pandemic nature of the problem affects all countries in the same way as a result of the global structure. In general life, the perception that the COVID-19 vaccine prevents transmission remains a major problem. In this context, informing the society was considered important.

Taking work controls, administrative controls and personal protective measures within the scope of OHS in workplaces will contribute significantly to increasing

economic welfare as well as reducing workforce losses. In addition to measures related to workplace and working conditions, it is inevitable to prevent the transmission of COVID-19 and to take protective measures in case of transmission.

Responsibilities regarding the regulation of workplaces according to OHS requirements during the pandemic process should be fulfilled by employers, managers, worker representatives, health and safety stakeholders, health and safety representatives and employees.

Staff and students should ensure that appropriate precautions are taken in their institutions. Likewise, staff and students should be encouraged to behave in ways that reduce the risk of COVID-19 transmission. In face-to-face education, it is possible to reduce virus contamination with the arrangement of classroom desks (Üçüncü and Acar 2022).

The risk of contamination increases as damaged surfaces will be difficult to clean. Therefore, if the surfaces of the contact points (furniture, handrails, tools, vehicles, etc.) are damaged, they must be corrected.

To create a more resilient society, skills to overcome the disruptions caused by the pandemic crisis such as hygiene, remote work, collaboration, digitalization should be used (Schleicher 2020, Thomas 2021).

The employer must assess the challenges of COVID-19 to perform best in pandemic conditions with adequate resources and trained workers (Neil et al. 2020, Fan-Yun et al. 2020). Employers should have their employees tested and take necessary infection prevention and control measures to prevent the risk and spread of coronavirus in the community. Employers should take measures to ensure that their employees have access to information about COVID-19 and act together with employees in this regard.

The COVID-19 crisis has largely lost its impact. Although it is stated that the COVID-19 pandemic has ended by WHO, the possibility of similar outbreaks is always possible. For this reason, one should always be prepared for possible pandemic, epidemic and endemic diseases. Past experiences and research show that such criss will continue to happen in the future (Sinclair 2020). Two meaningful strategies of the COVID-19 crisis must be sustained: First, a culture of solidarity, and secondly, to prepare for future crises by developing the knowledge and experience gained.

As a result, these assessments will undoubtedly allow important lessons and experiences to be drawn in terms of global health.

REFERENCES

Acar HH, Üçüncü K (2020) İş Sağlığı ve Güvenliği. Nobel Tıp Kitabevleri, İstanbul.

Al Adawi M, Al Harthi H, Al Habsi S, Al Busaidi K, Al Salmi I (2021) Sociocultural and religious impacts opon COVID-19 pandemic physical distancing public practices. Single Anonymous Peer Review, 14:8819-8831.

Andersen KG, Rambaut A, Lipkin WI, Holmes EC, Garry RF (2020) The proximal origin of SARS-CoV-2. Nature Medicine, 26:450–452.

Arumugama S, Ozkan B, Jayaraman A, Mockaisamy B (2021) Impacts of COVID-19 pandemic on global agriculture, livelihoods and food systems. Journal of Agricultural Sciences, 27(3):239-246.

Ateş ZG (2020) COVID-19'un işverenin iş sağliği ve güvenliği konusunda alması gereken önlemlere etkisi. İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi COVID-19 Hukuk Özel Sayısı (COVID-19 Özel Ek), 38:161-179.

Bárcena A, Cimoli M, García-Buchaca R, Pérez R 2020. Report on the economic impact of coronavirus disease (COVID-19) on Latin America and the Caribbean. United Nations, Santiago, 20-00312.

Bar-On YM, Flamholz A, Phillips R, Milo R (2020) SARS-CoV-2 (COVID-19) by the numbers. eLife, 9:e57309.

Baycık G, Türkşen Ö, Dinç İC (2021) COVID-19 salgınında alınması gereken iş sağlığı ve güvenliği önlemleri. Sosyal Güvenlik Dergisi/Journal of Social Security, 11(1):17-32.

Bozkurt B, Eğrilmez S, Şengör T, Yıldırım Ö, İrkeç M (2020) The COVID-19 pandemic: clinical information for ophthalmologists. Turk J Ophthalmol, 50:59-63.

Calles A, Morán-López JL (2020) Why size matters-the transport of expelled saliva droplets carrying SARS-CoV-2. Biological Science, DOİ:10.21203/rs.3.rs-105488/v1.

CDC (2021) Interim guidance for SARS-CoV-2 testing in non-healthcare workplaces.https://www.cdc.gov/coronavirus/2019ncov/community /organizations/testing-non-healthcare workplaces.html. Accessed Date:19.09.2021.

CDC (2022) Long COVID or Post-COVID Conditions. National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases, Centers for Disease Control and Prevention.

Chakraborty I, Maity P (2020) COVID-19 outbreak: migration, effects on society, global environment and prevention. Sci. Total Environ, 728:138882.

Chen SX, Ng JCK, Hui BPH, Au AKY, Wu WCH, Lam BCP (2021) Dual impacts of coronavirus anxiety on mental health in 35 societies. Sci Rep., 11:8925.

CRS (2021) Global Economic Effects of COVID-19. Congressional Research Service, https://crsreports.congress.gov/. Accessed Date:19.09.2021.

Cui J, Li F, Shi Z-L (2018) Origin and evolution of pathogenic coronaviruses. Nature Reviews Microbiology, 17:181-192.

Cutler DM, Summers LH (2020) The COVID-19 pandemic and the $16 trillion virüs. JAMA, 324(15):1495-1496.

Das S (2022) Impact of COVID-19 on industries. COVID-19 in the Environment, Elsevier Inc.

Dehghani F, Omidi F, Yousefinejada S, Taheri E (2020) The hierarchy of preventive measures to protect workers against the COVID-19 pandemic: a review. Work, 67:771–777.

Delardas O, Kechagias KS, Pontikos PN, Giannos P (2022) Socio-economic impacts and challenges of the coronavirus pandemic (COVID-19): an updated review. Sustainability, 14:1-13.

Department of Health and HSE (2021) Title: Impact of COVID on the Health Service. Department of Health and HSE.

Di Gennaro F, Pizzol D, Marotta C, Antunes M, Racalbuto V, Veronese N, Smith L (2020) Coronavirus diseases (COVID-19) current status and future perspectives: a narrative review. Int. J. Environ. Res. Public Health, 17(2690):1-11.

Donnelly R, Patrinos HA, Gresham J (2021) The impact of COVID-19 on education-recommendations and opportunities for Ukraine. Opinion, 2.

El-Sayed A, Kamel M (2021) Coronaviruses in humans and animals: the role of bats in viral evolution. Environmental Science and Pollution Research, 28:19589-19600.

Er AG (2020) COVID-19: Epidemiyoloji. COVID-19 Pandemi Raporu (20 Mart-20 Kasım 2020), Hacettepe İç Hastalıkları Derneği, Ankara.

Fadare OO, Okoffo ED (2020) COVID-19 face masks: a potential source of microplastic fibers in the environment. Sci. Total Environ., 737:140279.

Fan-Yun L, Chih-Fu W, Yu-Tien H, David CC, Stefanos NK (2020) Work-related COVID-19 transmission. BMJ Yale: MedRxiv. 22.

Généreux M, Schluter PJ, Hung KK, Wong CS, Mok CPY, O'Sullivan T (2020). One virus, four continents, eight countries: an interdisciplinary and international study on the psychosocial impacts of the COVID-19 pandemic among adults. Int J Environ Res Public Health, 17(22).

Haileamlak A (2021) The impact of COVID-19 on health and health systems. Ethiop J Health Sci., 31(6):1073–1074.

Hayashi M, Yanagi U, Honma Y, Yamamoto Y, Ogata M, Kikuta K, Kagi N, Tanabe S (2023) Ventilation methods against indoor aerosol infection of COVID-19 in Japan. Atmosphere, 14(1): 150.

Holmes EC, Goldstein SA, Rasmussen AL, Robertson DL, Crits-Christoph A, Wertheim JO (2021) The origins of SARS-CoV-2: A critical review. Cell., 184(19):4848-4856.

Hu B, Guo H, Zhou P, Shi ZL (2021) Characteristics of SARS-CoV-2 and COVID-19. Nature Reviews Microbiology, 19:141-154.

ILO (2013) Safety and health in the use of machinery. International Labour Office, Programme on Safety and Health at Work and the Environment, Geneva.

ILO (2020) COVID-19 küresel salgını ortamında işe sağlıklı ve güvenli dönüş. Uluslararası Çalışma Örgütü, https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-ankara/documents/publication/wcms_747957.pdf.

Ingram C, Downey V, Roe M, Chen Y, Archibald M, Kallas K-A, Kumar J, Naughton P, Uteh CO, Rojas-Chaves A, Shrestha S, Syed S, Büttner FC, Buggy C, Perrotta C (2021) COVID-19 prevention and control measures in workplace settings: a rapid review and meta-analysis. Int J Environ Res Public Health, 18(15):7847.

Khan I, Shah D, Shah SS (2021) COVID-19 pandemic and its positive impacts on environment: an updated review. International Journal of Environmental Science and Technology, 18:521-530.

Kocay F, Baba AY (2022) Geçmişten Günümüze Salgın Hastalıkların Tarihi. COVID-19 Pandemisinin Olumlu ve Olumsuz Etkileri (Ed. Funda Kocay), Medipol Üniversitesi Yayınları.

Lipsitch M, Swerdlow DL, Finelli L (2020) Defining the epidemiology of COVID-19–studies needed. N. Engl. J. Med., pp: 1194–1196.

Lotfi M, Hamblin MR, Rezaeif N (2020) COVID-19: Transmission, prevention, and potential therapeutic opportunities. Clin Chim Acta.: Elsevier Public Health Emergency Collection, 508:254-266.

Luo H, Zhong L (2021) Ultraviolet germicidal irradiation (UVGI) for in-duct airborne bioaerosol disinfection: review and analysis of design factors. Build Environ., 15(197):107852.

Mansouri F (2022) The socio-cultural implications of COVID-19. UNESCO.

McIntosh K (2021) COVID-19: Epidemiology, virology, and prevention. https://www.uptodate.com/contents/covid-19-epidemiology virology-and-prevention. Accessed Date: 19.09.2021.

McKinsey and Company (2023) One Billion Days Lost: How COVID-19 is Hurting the US Workforce. https://www.mckinsey.com/industries/healthcare/our-insights/one-billion-days-lost-how-covid-19-is-hurting-the-us-workforce#/. Accessed Date:14. 07.2023.

Meena S (2021) Impact of COVID-19 on envıronment. International Journal of Advanced Research in Commerce, Management & Social Science (IJARCMSS), 4(3):189-193.

Meinck S, Fraillon J, Strietholt R (2022) The impact of the COVID-19 pandemic on education: international evidence from the responses to educational disruption survey (REDS). UNESCO / International Association for the Evaluation of Educational Achievement (IEA) 2022 Revised Edition.

Monroe M, Kulie PE, Byrne ME, Wilbourn BC, Barth SK, Resnik JB, Huebner DM, Horberg MA, Castel AD, Greenberg AE (2023) Psychosocial impacts of the COVID-19 pandemic from a cross-sectional survey of people living with HIV in Washington, DC. AIDS Research and Therapy Volume. 20(27):20-27.

Mueller M, Suzuki E, Di Paolantonio G, Hewlett E, James C (2021) Chapter 2. The health impact of COVID-19: health at a glance. OECDiLibrary, https://www.oecd-ilibrary.org/sites/b0118fae-en/index.html?itemId=/content/component/b0118fae-en.

Naseer S, Khalid S, Parveen S, Abbass K, Song H, Achim MV (2023) COVID-19 outbreak: impact on global economy. Front Public Health, 10.

Neil MF, Daniel L, Gemma NG, Natsuko I, Kylie A, Marc B (2020) Report 9-Impact of Non-Pharmaceutical Interventions (Npis) To Reduce COVID-19 Mortality and Healthcare Demand, in Coronavirus (COVID-19) Updates. Imperial College COVID-19 Response Team, London, pp: 1-20.

Nghiem LD, Morgan B, Donner E, Short MD (2020) The COVID-19 pandemic: considerations for the waste and wastewater services sector. Case Stud. Chem. Environ. Eng., 1:100006.

OSHA (2020) Guidance on preparing workplaces for COVID-19. U.S. Department of Labor Occupational Safety and Health Administration.

OSHA (2021a) Hazard recognition. United States Department of Labor, Occupational Safety and Health Administration, https://www.osha.gov/coronavirus/hazards. Accessed Date: 19.09.2021.

OSHA (2021b) Control and prevention. Occupational Safety and Health Administration, Webside https://www.osha.gov/coronavirus/control-prevention. Accessed Date:19.09.2021.

Pak A, Adegboye, OA, Adekunle AI, Rahman KM, McBryde ES, Eisen DP (2020) Economic consequences of the COVID-19 outbreak: the need for epidemic preparedness. Front. Public Health.

Panchal N, Kamal R, Cox C, Garfield R (2021) The implications of COVID-19 for mental health and substance use. https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/, Accessed Date: 19.09.2021.

Rosengren G (2021) Impact of coronavirus on nature. Webside https://www.conservation.org/stories/impact-of-covid-19-on-nature, Accessed Date: 19.09.2021.

Saadat S, Rawtani D, Mustansar C (2020). Hussain environmental perspective of COVID-19. Sci. Total Environ., 728:138870.

Saydam N (2020) COVID-19 enfeksiyonunda epidemiyoloji ve korunma. Yüksek İhtisas Üniversitesi Sağlık Bilimleri Dergisi, 1: 1-7.

Sehgal NJ, Milton DK (2023) Applying the hierarchy of controls: what occupational safety can teach us about safely navigating the next phase of the global COVID-19 pandemic. Front. Public Health, Sec. Infectious Diseases-Surveillance, Prevention and Treatment 9, https://doi.org/10.3389/fpubh.2021.747894.

Sinclair RR, Allen T, Barber L, Bergman M, Britt T, Butler A (2020) Ocupational health science in the time of COVID-19: now more than ever. Occup Health Sci., 4(1-2):1–22.

Singh N, Tang Y, Ogunseitan OA (2020) Environmentally sustainable management of used personal protective equipment. Environ. Sci. Technol., 54(14): 8500-8502.

Somani M, Srivastava AN, Gummadivalli SK, Sharma A (2020) Indirect implications of COVID-19 towards sustainable environment: an investigation in Indian context. Biores. Technol. Rep., 11:100491.

Sridhar A, Balakrishnan A, Jacob MM, Sillanpää M, Dayanandan N (2023) Global impact of COVID-19 on agriculture: role of sustainable agriculture and digital farming. Environ Sci Pollut Res Int., 30(15):42509-42525.

Tahamtan A, Ardebil A (2020) Real-time RT-PCR in COVID-19 detection: Issues affecting the results. Expert Rev. Mol. Diagn., 20:453-454.

Thomas V (2021) 8 Positive impacts to look forward to post the COVID-19 pandemic. https://surveysparrow.com/blog/positive-impacts-to-look-forward-to-post-covid-19-pandemic/. Accessed Date: 09.09.2021.

Türken M, Köse Ş (2020) COVID-19 bulaş yolları ve önlem. Tepecik Eğit. ve Araşt. Hast. Dergisi, 30:36-42.

UNICEF (2021) The impact of COVID-19 on the mental health of adolescents and youth. https://www.unicef.org/lac/en/impact-covid-19-mental-health-adolescents-and-youth. Accessed Date: 09.09.2021.

URL-1 (2021) Worldmeters, Coronavirus. https://www.worldometers.info/coronavirus. Accessed Date: 09.09.2021.

Üçüncü K, Acar HH (2020) Ergonomi. Nobel Akademik Yayıncılık, Ankara.

Üçüncü K, Acar HH (2022) Ergonomic classroom design in the COVID-19 Pandemic: a study on the cross-arrangement of classroom seats. Artvin Coruh University Journal of Forestry Faculty, 23(2): 113-122.

Ünüvar İ, Aktaş H (2022) Dünya'da ve Türkiye'de COVID-19 pandemisinin ekonomik etkileri. Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi, 25(1):124-140.

Vecco M, Clarke M, Vroonhof P, de Weerd E, Ivkovic E, Minichova S, Nazarejova M (2022) The Impact of the COVID-19 Pandemic on Creative Industries, Cultural Institutions, Education and Research. World Intellectual Property Organization.

Viramgami A, Pagdhune A, Sarkar K, Balachandar R (2020) Occupational health and safety practices at workplace during COVID-19 pandemic. Journal of Comprehensive Health, 8(2):77-82.

Wang J, Tang K, Feng K, Lin X, Lv W, Chen K, Wang F (2021) Impact of temperature and relative humidity on the transmission of COVID-19: a modelling study in China and the United States. BMJ Open, 11:1-16.

Wassler P, Talarico C (2021) Sociocultural impacts of COVID-19: a social representations perspective. Tour Manag Perspect., 38.

WHO (2023) WHO Coronavirus (COVID-19) Dashboard. https://covid19.who.int/, Accessed Date: 24.07.2023.

Wu D, Wu T, Liu Q, Yang Z (2020) The SARS-CoV-2 outbreak: what we know. Int J Infect Dis., 94:44-48.

Xiang S, Rasool S, Hang Y, Javid K, Javed T, Artene AE (2021) The effect of COVID-19 pandemic on service sector sustainability and growth. Frontiers in Psychology, 12:1-10.

Yeyati EL, Filippini F (2021) Social and economic impact of COVID-19. Brookings Global Working Paper, 158, https://www.brookings.edu/research/social-and-economic-impact-of-covid-19/. Accessed Date: 09.09.2021.