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Original Research Article

Estimation of Environmental Cases in the COVID-19 Period by SWOT Analysis

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ABSTRACT

The COVID-19 virus, which emerged in Wuhan, China in 2019 and became an epidemic affecting the whole world, caused some concerns and had unexpected effects on the environment, economy, health, food safety, and transportation services all over the world. In addition, positive developments have emerged in terms of air, water, soil, and climate in countries due to quarantine. What has been done and will be done during the COVID-19 period is important for both the safety of the receiving environment and society. SWOT analysis is one of the most important guiding tools in making strategic decisions with its clarity, simplicity, and structure that facilitates decision-making. The study identified the strengths, weaknesses, opportunities, and threats of environmental changes during the pandemic. After the survey conducted with 137 people, it was observed that the COVID-19 period provided a 40% benefit in reducing environmental pollution. In addition, adverse effects were found to be 44% mental health and 40-47% post-COVID-19 process (mask use and plastic waste), respectively. In this study, a SWOT analysis of environmental changes in the world during the COVID-19 epidemic was made and various strategies were proposed and evaluated according to the results.

Keywords: COVID-19, SWOT Analysis, Environmental parameters, Mental health

INTRODUCTION

The novel coronavirus disease (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 patients have the following clinical symptoms: fever, cough, fatigue, myalgia, headache, diarrhea, and shortness of breath. COVID-19 was first detected in Wuhan, China in December 2019 and has since spread rapidly to all countries of the world (Ganesan *et al.* 2021, Chowdhury *et al.* 2021). COVID-19, which turned into a pandemic in a short time with its rapid and borderless spread, was evaluated by the World Health Organization (WHO) on January 30, 2020, within the scope of Public Health Emergency of International Importance (PHEIC) and announced as a pandemic on March 11, 2020 (CDC 2022, WHO 2022). Pandemic has an important place in everyone's life as a concept used in the meaning of "affecting all people", which consists of the words "pan" meaning "all" and "demos" meaning "people" in the ancient Greek language. In the age of science and technology, the first reaction of all societies (denial, shock and surprise) against the attack of a virus whose source is still not fully understood was a defense mechanism in the beginning. The defensiveness of the societies was due to the forced postponement of all short-medium-long-term plans and projects to an indefinite date. After the initial shock of denial and bewilderment, the process of cold-blooded acceptance and protection of reality began in humans. The measures, prohibitions and compliance with the rules increased. Among the measures taken, the most comprehensive and implemented in many countries was the "stay at home" policy. In this context, although the “Stay at Home” campaigns played a major role in preventing the epidemic, the isolation of people from social life brought along some negative situations both in psychosocial and physical terms. Healthcare workers and their families faced the greatest challenges in this process, along with the COVID-19 pandemic (Nundy *et al.* 2021). Many factors such as the rapidly increasing number of cases and the unpredictable and unknown features of the disease caused serious difficulties in the fight against the disease. While the COVID-19 pandemic is a global health problem, it has also brought unprecedented destruction to socio-economic systems. It still causes scientific and social concerns due to the uncertainties it contains (virus variation, different virus forms and effects). In order to cope with all these, studies on this subject have been supported, experiences have been shared, and publications have started to increase. At this point, the process of analyzing the current situation of an event and harmonizing them with environmental conditions is called Interaction (SWOT) Analysis (Mallick *et al.* 2021, Bazyar *et al.* 2021). SWOT Analysis is one of the basic methods to be used in the best use of resources and talents and the development of new strategies with a conscious and systematic evaluation. SWOT analysis,

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which is one of the basic processes of strategic management, is seen as an analysis technique that contributes to the evaluation of the internal and external environment (Zhou *et al.* 2021, Wang and Wang 2020). This analysis is carried out in 4 stages. With this method, it identifies the strengths, weaknesses, opportunities and threats of a plan implemented in 4 stages or a new plan to be implemented in the future. In this study, a SWOT analysis of environmental changes in the world during the COVID-19 epidemic was made and various strategies were proposed and evaluated according to the results. The data of the research was collected from academic studies, business activities and financial reports and news in the media. The fact that such a study has been carried out on an environmental basis for the first time before and in this process reveals the difference of the study. Although there are similar studies in the literature, an integrated evaluation was carried out in this study. Both the biology of the COVID-19 process and the physical and mental effects on humans have been observed in terms of a single health and ecological effect. In particular, changes related to the environment and human health caused by the virus during the pandemic process can be evaluated with different analyzes.

MATERIALS AND METHODS

The research strategy, Han *et al.* (2023) was formed as in the study. Within the scope of one health, the effects of two environmental factors (natural and human-induced) categories and quarantine were evaluated. SWOT analysis approach was used in the evaluations. SWOT Analysis is a strategic technique used to identify the strengths, weaknesses, opportunities and threats of processes. Within the scope of this analysis, the strengths, weaknesses, opportunities and threats of the COVID-19 process against possible environmental situations are revealed. In the first part of the research, a comprehensive literature review was carried out from 2020 to 2021.

In this context, researches were conducted in international (Scopus, Science direct, Wiley, Springer, Google Scholar, etc.) and national (YÖK thesis database, DergiPark, Ulakbim etc.) databases. For this purpose in databases *"COVID-19"* OR *"SARS-CoV-2 "* OR *"mental health"* OR *"air pollution"* OR *"wastewater"* AND *"medical mask"* OR *"quarantine"* OR *"isolation"* OR *"environmental effect"* OR *"pandemic"* OR keywords such as *"SWOT analysis"* were searched (Figure 1). In the second part, SWOT analysis was analyzed in 3 categories (quarantine-mental health, biological and environmental problems).

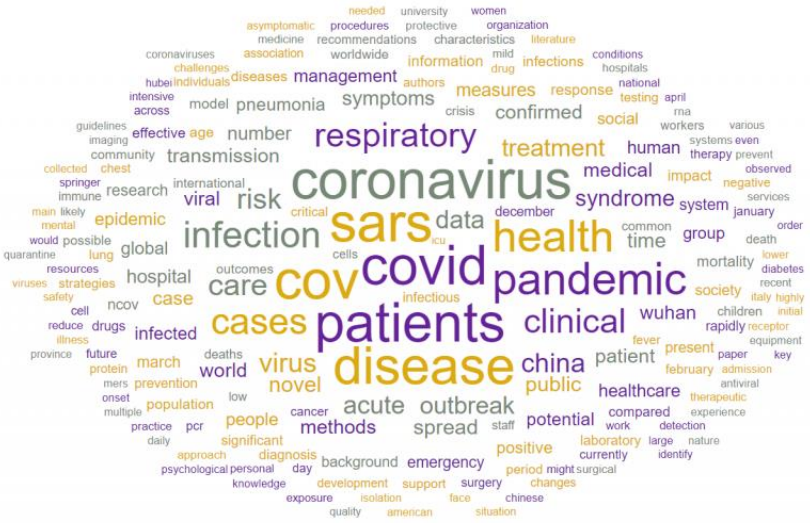


Figure 1. Word clouds: the most frequently used words and terms (Aristovnik *et al.* 2020).

Survey evaluation

In order to contribute to the SWOT analysis process, a questionnaire study was conducted with questions for 4 categories (Table 1). The results of the survey revealed the awareness of individuals and their thoughts on the

relationship between COVID-19 and environmental problems. Participant profiles were selected from individuals with a high education level and between the ages of 20-50 (Hayashi *et al.* 2022). The survey was applied as a hybrid (face-to-face and online) to a group of 137 people in a university and a private educational institution. The survey contains 18 questions with different structures qualitative (yes/no questions) and quantitative.

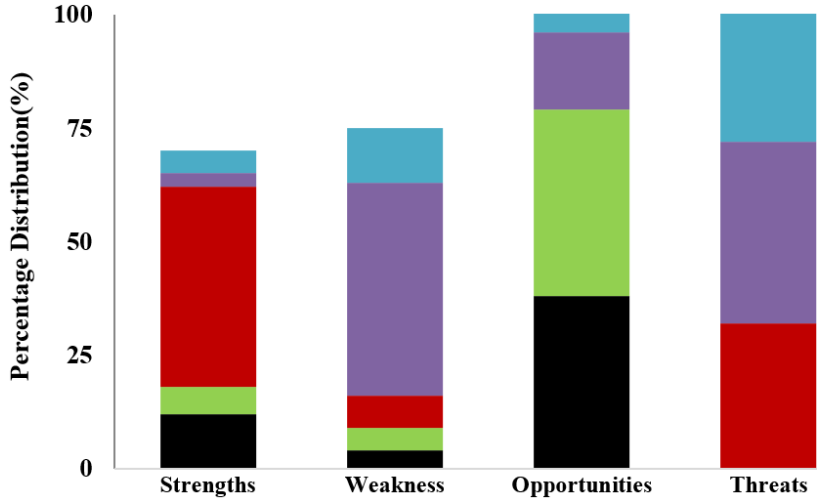
Table 1. Survey-based preliminary study.

Strengths:	**Weaknesses:**
➢ What are the advantages of the COVID-19 period? ➢ What are the relationships between the pandemic and human activities? ➢ How can you better manage the COVID-19? ➢ How do you relate COVID-19 and environmental pollution? ➢ What do you consider important for the environment?	➢ What are the disadvantages of the COVID-19 period? ➢ By which factors can COVID-19 spread? ➢ What do you foresee as the weak point of the pandemic? ➢ What are the environmental weaknesses in the pandemic?
Opportunities:	**Threats:**
➢ What good opportunities are available from the COVID-19 period? ➢ What are the new and influential trends that countries can try? ➢ How should the development of legal practices be according to the pandemic? ➢ Which COVID-19 impact contributes to societies?	➢ What problems are people facing with COVID-19? ➢ Worried about the concept of one health? ➢ How do developing technologies and treatments affect fear in minds? ➢ What are the possible environmental problems after the pandemic? ➢ Could any of your weaknesses threaten quality patient care?

RESULTS AND DISCUSSION

Survey-based preliminary study

A SWOT analysis was tried to be created by taking this survey as a reference like a trailer of a movie. Percentage distribution according to the answers given to the survey questions is given in Figure 2. According to Figure 2, the vast majority of participants think that the COVID-19 process indirectly contributes positively to the environment. In addition, the interesting point in the survey results is that the use of disposable plastics, masks and disinfectants raises concerns. According to Figure 2, participants state that COVID-19 has a positive effect in terms of air and noise. In addition, all participants agree that the process is negative mentally. The use of plastic and masks is foreseen to the environmental damage of COVID-19. According to the "yes/positive-no/negative" answers given by the survey participants to the questions, the percentage distribution was obtained with Microsoft® Excel® according to the specific statistic means and standard deviations (%5 confidence limits, ≤1 margin of deviation etc.). Our study results are consistent with survey-based studies in the literature on the COVID-19 process and ecosystem (Jetoo and Lahtinen 2021, Hidalgo-Triana et al. 2022).



	Strengths	Weakness	Opportunities	Threats
Disposable plastic	5	12	10	44
Medical mask	3	47	17	40
Mental Health	44	7	0	32
Noise Pollution	6	5	41	0
Air Pollution	12	4	38	0

Figure 2. Percentage distribution evaluation of the relationship between COVID-19 and environment.

Isolation and Quarantine Application

According to Shereen *et al.* (2020), and Brooks *et al.* (2020), one of the oldest and most effective methods used to reduce the spread of infectious diseases during pandemics is quarantine. In the COVID-19 epidemic, travel bans in all countries of the world were carried out in designated places such as mandatory homes or hotels for a period of 14 days. On the other hand, "isolation" has been applied to reveal the distinction between those who are infected and those who are not. Isolation and quarantine are the most effective practices despite their extreme difficulties and thanks to them, the burden of the health sector is minimized. Another measure to prevent the spread of the virus is “social distancing” (Mamun and Griffiths 2020, Reger *et al.* 2020). It is preferred to reduce physical interactions (mask-distance, avoiding meetings, avoiding handshakes, avoiding crowds) between people. The type of measure that is difficult to implement is "lockdown", which includes the closure of schools, universities, public transport, taxis, railways, domestic and international flights, restaurants, temples, churches, mosques, cinemas (Brooks *et al.* 2020). Worldwide, these three methods applied to prevent the spread of COVID-19 may cause adverse effects in societies in terms of physical, psychological, social and economic aspects. Especially with social distance, isolation and quarantine, people can be exposed to very serious psychological problems such as anxiety, stress, fear, over-reactive behavior, guilt, anger, boredom, sadness, anxiety, irritability, helplessness, loneliness, insomnia and depression (see Figure 3) (Chiappini *et al.* 2020, Newman and Zainal 2020).

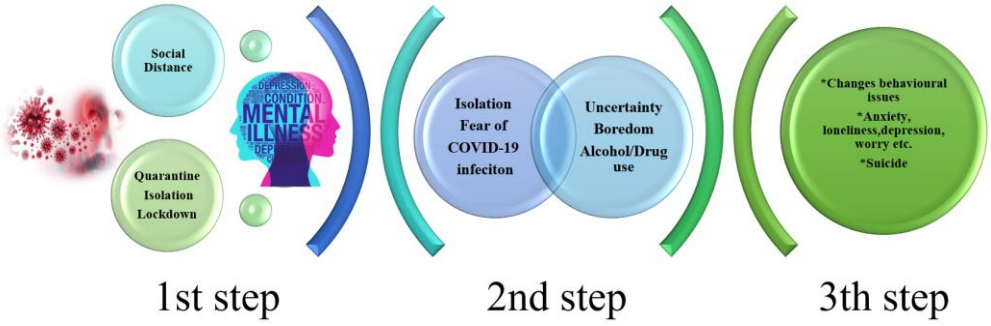


Figure 3. COVID-19 effect on physical and mental health.

SWOT analysis can also be applied for preventive measures (quarantine, isolation, isolation, and social distance) applied to minimize the COVID-19 pandemic and protect the physico-mental health of individuals. In their study, Clemente-Suárez et al. (2021) examined the levels of socio-mental health and the economy's impact from the COVID-19 process. Figure 4 expresses the effects of quarantine, isolation, isolation, and social distance based on SWOT analysis. Increases in obesity data have been observed with the change in living habits with COVID-19. Increases in obesity data have been observed with the change of living habits with COVID-19. Changes have occurred in the eating and drinking patterns of individuals due to factors such as quarantine and isolation processes, getting used to the disease, and anxiety-fear. However, low physical activities have increased the number of obese people in all countries of the world.

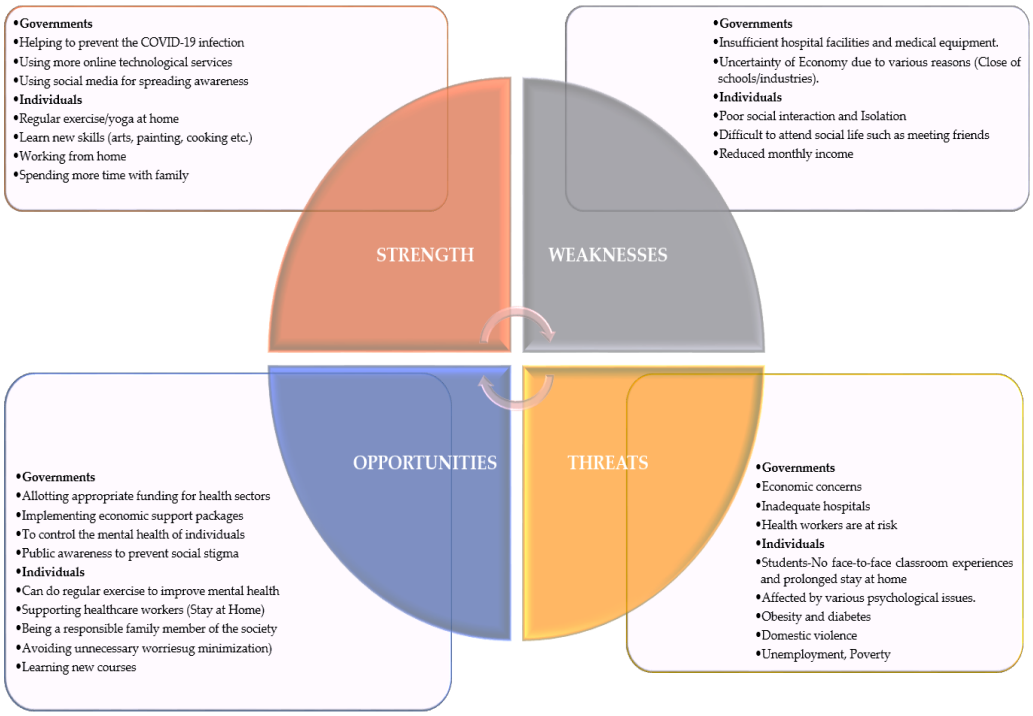


Figure 4. SWOT analysis for COVID-19 preventive measures and mental health.

Morphological and Biological SWOT Analysis

Before the pandemic, in many parts of the world, technological developments, sectoral and urban changes, energy situation, water scarcity, etc. pollution due to human activities. A solution was being considered for the elimination of environmental pollution. In this process, mild or severe curfew and social distance in COVID-19 were natural effects expected by the ecosystem. In particular, it was not expected that the living conditions (pH, surface type, temperature, etc.) of the COVID-19 virus, as in all viruses, would be a way to reduce environmental pollution (Ibn-Mohammed *et al.* 2021, Paital *et al.* 2020). The goals of the innovative analysis method such as SWOT are to determine the biological effects of SARS-CoV-2 and its own structural functions. In this case; strengths are features of SARS-CoV-2 that encompass pathogen behavior towards the host. Essentially, the biological forces and attributes that facilitate the pathogenicity, occurrence and spread of SARS-CoV-2 include (Babalola *et al.* 2020):

1. Being a new strain of coronavirus and capable of producing a productive infection in humans.
2. It has not been determined whether it is of natural or artificial origin. It develops in vivo after infection.
3. Three virulence factors (Nsp1, Nsp3c and ORF7a). Strong association be-tween SARS-CoV-2 and different proteins (ORF3b, ORF8, and ORF10) (Babalola *et al.* 2020).

4. In minimal doses, it is highly contagious for a short incubation period. Transmitted through saliva, it targets the lungs and leads to multiple organ failure.
5. According to different respiratory viruses, it can remain quite stable on various surfaces. It has the ability to reactivate and enter regular circulation.

Weaknesses are the features that put the target transmission, proliferation and environment at a disadvantage in the COVID-19 process (Porter *et al.* 2021). The weaknesses of COVID-19 are as follows:

1. It has a single spike protein (Angiotensin-2) receptor. Protease activity is an important issue during viral entry.
2. Low basic proliferation amount (R_0) of 3.8 (Babalola *et al.* 2020).
3. SARS-CoV-2 shows critical need for Porphyrin to inhibit human metabolism.

Environmental effects and SWOT analysis

Considering the viruses belonging to the coronavirus family and SARS-CoV-2, their degree of infectivity and their transformation into different forms vary according to different environmental parameters. In general, contamination levels decrease significantly with increasing ambient temperature (infectivity disappears in 15 minutes at 56°C). SARS-CoV-2 suddenly loses its infectivity at high relative humidity levels (Zhan *et al.* 2020, Biryukov *et al.* 2020). UV light and some biocidal products (75% ethanol, chlorine, per acetic acid, sodium hypochlorite etc.) reduce the effectiveness of COVID-19 (Kampf *et al.* 2020). The increase in temperature and the change of the climate cycle, air pollution increase respiratory tract infections, and the increase in climate change and air pollutants ($PM_{2.5}$, PM_{10}, CO, NO_2, and O_3) during the COVID-19 process emerges as a global public health problem (Shamsi *et al.* 2022, Kumar *et al.* 2021). Apart from water, air and soil pollution, noise also has an important potential. Noise, defined as unwanted sound caused by various anthropogenic (transportation, industrial activities) activities, is a major problem for the environment and human health (Espejo *et al.* 2020). The quarantine practices of countries around the world have not only reduced the traffic density, but also caused a significant decrease in sector-based activities (Gautam 2020, Ankit *et al.* 2020). These two changes have resulted in minimization of noise level in most regions. During the COVID-19 period, the increase in staying at home with the restrictions has activated the self-cleaning mechanism of nature and positive developments have been experienced in terms of biodiversity (such as the appearance of new species) (Figure 5).

Figure 5. SWOT effect of SARS-Cov-2 virus on different components of the environment.

They observed that under the isolation and quarantine practices caused by this sudden spreading and uniquely characteristic infection, minimized human activities resulted in a significant improvement in air quality by reducing environmental pollutant concentrations (Shakoor *et al.* 2020, Singh *et al.* 2021). In addition, it has been proven that carbon emissions have decreased worldwide during the current period of COVID-19 (Wang and Su 2020, Bashir *et al.* 2021). This decrease is due to both quarantine and the cessation of traffic and sector activities (Bilal *et al.* 2021, Eroğlu 2021, Bontempi and Coccia 2021). In terms of water, the entry of the SARS-CoV-2 virus into the cycle, its distribution and possible effects seem to be a negative environmental effect (Mancuso *et al.* 2021). In particular, it is possible for the virus to reach sewerage and wastewater treatment facilities from points such as time spent at home, infected patients, hospitals. In addition, agricultural irrigation with water containing virus content can be considered as another risk factor.

CONCLUSIONS

SWOT Analysis is an effective method for analyzing complex processes with its clarity, simplicity and structure that facilitates decision making. SWOT analysis is an assessment tool and is designed to address related issues. As with any methodology, SWOT analysis has its own limitations. First, there are too many views to consider. Lack of prioritization and clarity are limitations of this analysis. Also, a SWOT analysis is only as functional as the data generated. Major environmental factors, including temperature, humidity, and air pollutants, should be investigated in detail to determine the potential effects of COVID-19's infectivity and virus variability. In addition to some of the positive effects of COVID-19 on the environment, its negative effects should also be kept in the foreground. In particular, while positive changes have been seen with quarantine and isolation, these were largely short-term effects caused by the nationwide lockdown. Indeed, it is inevitable that the pandemic will have long-term negative effects on the environment in the future. The further increase in the use of disinfecting antimicrobial chemicals (soaps, detergents and other chemical cleaning tools), drugs and plastics (gloves, masks, PPE kits, syringes, etc.) will cause waste pollution and therefore other eco-systems to be affected. In particular, as a result of the study, SWOT analysis could be created in terms of environment, human and virus during the COVID-19

pandemic period. The situation of SARS-CoV-2 due to its biological structure, the effects observed in societies with quarantine and isolation (obesity and psychological conditions) and process-based environmental effects (positive-negative) were tried to be revealed by SWOT analysis. In terms of wildlife and species diversity, partially adapted quarantines should also be provided in the post-COVID-19 period. In this way, a habitat for new species can be created. Environmental scientists and environmental engineers must play an important role in analyzing and minimizing extreme environmental changes and processes such as pandemics on an international scale. The "one health" approach, which combines many scientific fields, should be kept at the forefront of future research.

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