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Description	一般講演要旨

An Analysis of Impact of COVID-19 =Assessment of Damage and Preparation for Next Pandemics=

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Abstract

The SARS-CoV-2 (COVID-19) virus that emerged from Wuhan, China in late 2019 spread quickly around the world, soon becoming a pandemic and eventually claiming at least seven million lives globally, with almost every country in the world sustaining severe social and economic damage. This study analyzes the effects of COVID-19 from three different perspectives. First, it examines the social damage that the global community sustained as a direct result of the COVID-19 pandemic. Second, it examines the effects the COVID-19 pandemic had on the global economy and industries, with a focus on the pharmaceutical industry in particular. Third, it analyzes the effects of the COVID-19 pandemic on the IPRs (intellectual property rights) system. This study also provides recommendations to world governments regarding preparations for the next pandemic.

1. Introduction

The COVID-19 pandemic began in Wuhan, China in late 2019 and quickly spread around the world. On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus SARS-CoV-2 (COVID-19) outbreak “a global pandemic” [1]. According to the WHO dashboard, the virus infected a total of 776,205,140 people and killed 7,064,380 (as of Sept. 22, 2024) [2].

The COVID-19 pandemic not only posed a public health threat, but economic and social threats as well. The spread of the virus disrupted global supply chains, caused pronounced volatility in financial markets, created consumer-demand shocks, and generated a wide array of adverse impacts in critical industrial sectors such as manufacturing, transportation, and tourism [3].

After the deadly virus triggered previously unthinkable lockdowns, upended economies worldwide, and killed at least seven million people, the WHO declared on May 5, 2023, that COVID-19 no longer qualified as a global emergency [4]. Over the past 20 years, the world has experienced other pandemic crises. These included the first SARS outbreak in 2003, the H1N1 influenza pandemic in 2009, the MERS coronavirus in 2011, Ebola in 2014-2016, and mosquito-borne Zika in 2016 [5]. However, COVID-19 was first and foremost, constituting a ferocious pandemic and a human tragedy that swept across the globe, resulting in a massive health crisis, disproportionate effects on social order, and colossal economic losses [6].

This study analyzes the effects of COVID-19 on the world economy, industries, and society, and also considers some recommendations for future pandemics.

2. The impact of COVID-19 on the world economy

2.1 Developed Countries vs. Developing Countries

The COVID-19 pandemic triggered unprecedented global public health and economic crises. The ensuing economic fallout was severe, with global output decreasing by 3.4% in 2020, the deepest global recession since World War II, and considerably worse than the global financial crisis (GFC) of 2008 [7]. However, the situation varied by region and country.

In most of the regions, GDP growth declined significantly due to COVID-19. The effect was approximately -6.45% for advanced countries. China and India were at the extremes when compared to world region averages. The effects on emerging and developing regions were -4.57% and -8.96% [8].

There were gaps between the North and South and between developing and developed countries. There were several reasons for these differences. First, in emerging and developing nations, many households and firms were ill-prepared to withstand an income shock of that scale and duration.

Additionally, more than 50% of households in emerging and developing economies were unable to sustain basic consumption for more than three months in the event of income losses. Similarly, the average business could cover fewer than 55 days of expenses with cash reserves. Additionally, many households and firms in emerging economies were already burdened with unsustainable debt levels before the crisis and struggled to service their debts once the pandemic and associated public health measures led to sharp declines in incomes and business revenues [9].

3. Impacts on Industries

3.1 Impacts on Tourism

The COVID-19 epidemic has severely affected the world economy, leaving no industry unaffected. However, the most affected sector has been travel and tourism because of the partial and full lockdown situations worldwide [10].

Before COVID-19, travel and tourism had become one of the most important sectors in the global economy, accounting for 10% of global GDP and more than 320 million jobs worldwide. By 2019, the number of sector employees had reached 1.5 million. However, the travel and tourism industry and other associated sectors have fallen to a small fraction compared to pre-COVID times [11].

According to Japan's Ministry of Economy, Trade, and Industry (METI), among the life and leisure-related industries, restaurant and hotel business sales revenues decreased by 21.5% and transportation-related business sales revenues decreased by 11.7% in 2020 [12].

3.2 Pharmaceutical sector

Unlike most industry sectors, the pharmaceutical industry achieved comparatively good financial results during the COVID-19 pandemic period. Table 1 shows the financial results of the Top 10 pharmaceutical companies in the world [13].

Table 1. Top 10 Pharmaceutical Companies' Financial Results (2021)

Ranking FY2021	Ranking FY2020	Company name	Country	revenues 2021 (1 mil \$)	revenue Change (%)
1	7	Pfizer	US	81,288	94.0
2	3	AbbVie	US	56,197	22.7
3	2	Roche	Swiss	52,571	10.7
4	4	JJ	US	52,080	14.3
5	1	Novartis	Swiss	51,626	6.1
6	6	BMS	US	46,385	9.1
7	5	Merck	US	42,754	-0.6
8	8	Sanofi	France	39,419	9.1
9	11	AstraZeneca	UK	37,417	40.6
10	9	GSK	UK	33,722	9.3

Source: Nikkei Bio Annual Book FY2021

There were two factors. First, to mitigate the damage caused by the pandemic, governments worldwide allocated substantial funds to pharmaceutical companies and academic institutions, leading to the development of vaccines, treatments, and diagnostics. For example, on April 19, 2020, the U.S. government launched "Operation Warp Speed," an initiative to develop and produce vaccines against the SARS-CoV-2 virus as quickly as possible [14].

This program provided approximately US\$ 7.7 billion in funding for the development of COVID-19 vaccines to six pharmaceutical company and institution groups: Johnson & Johnson, AstraZeneca and Oxford University, Moderna, Novavax, Merck and IAVI, and Sanofi and GSK [14]. In Europe, the EU supported COVID-19 vaccine development by allocating a portion of its €660 million "Horizon 2020" funding for COVID-19 research to the promotion of COVID-19 vaccine programs [15].

Additionally, Germany, a leading EU country, allocated €750 million to three vaccine developers: BioNTech, CureVac, and Desau (IDT) [16].

In 2020, the Japanese government compiled a stimulus package called “The First Supplemental Budget of 2020: Countermeasures for the COVID-19 Pandemic” and provided research funds for several Japanese pharmaceutical companies that were developing COVID-19 vaccines. These included Takeda and Daiichi Sankyo [17].

Second, during this period, pharmaceutical companies (and research institutes) successfully developed drugs and vaccines using new modalities. Boston Consulting Group (BCG) identified 18 different new modality types that have been developed, classifying them into the five following categories [18]:

a. Antibodies: The oldest of the new modalities. The first monoclonal antibody (mAb) was approved by the U.S. FDA in 1986. Since then, more than 100 mAbs have been developed and marketed, including Humira, the most commercially successful.

b. Proteins and peptides: These include proteins with enzymatic or targeting activity, as well as vaccines, and target a broad range of therapeutic areas. One fast-growing class of medications in this category is glucagon-like peptide 1 agonists.

c. Cell therapies: Immune cell therapies have been used to treat various cancers since the FDA approved the first chimeric antigen receptor T cell (CAR-T) in 2017. Currently, cell therapies are also being developed for endocrine, musculoskeletal, and dermatological conditions.

d. Gene therapies: This category has the potential to be curative, as it treats disease by modifying genetic material. These therapies are introduced either directly into a patient or into harvested cells from a patient which are then modified and transplanted back into the patient’s body.

e. Nucleic acids: This group includes mRNA, which is well known for its prominent role in two highly efficacious COVID-19 vaccines, Pfizer/BioNTech’s Comirnaty and Moderna’s Spikevax [19], [20].

Eli Lilly’s drug Bamlanivimab and Regeneron’s REGEN-COV (a combination of casirivimab and imdevimab) are monoclonal antibody treatments [21], [22].

In the pharmaceutical field, small chemical entities were the mainstream of new drugs; however, many pharmaceutical firms have recently begun developing new drugs based on new modalities such as antibodies, proteins/peptides, cell therapies, gene therapies, and nucleic acids.

4. Unequitable Distribution of Vaccines

As explained in Section 3, due to the great technological efforts of pharmaceutical companies and academic institutes, and the generous funding provided by governments and organizations, COVID-19 vaccines were developed within one year of the WHO’s declaration of the COVID-19 pandemic. COVID-19 vaccination rapidly began in December 2020.

However, although vaccination was quickly conducted in advanced countries, developing countries could not obtain the vaccines because rich advanced countries pre-purchased large amounts of COVID-19 vaccines. While COVID-19 vaccines were developed rapidly, the vaccine distribution was far from equitable. According to Our World in Data, as of March 2022, 62.6% of the world population had received at least one dose of a COVID-19 vaccine. A total of 10.67 billion doses have been administered globally, and 32.88 million were administered daily during that period. However, only 12.3% of the people in low-income countries have received at least one dose [23].

Observing “vaccine diplomacy” practices and inequitable distribution of the COVID-19 vaccines, the Indian and South African governments jointly submitted a proposal calling for a waiver of intellectual property rights (IPRs) related to COVID-19 vaccines, treatment, and diagnostics to the World Trade Organization (WTO) in October 2020 [24]. This won support from more than 60 countries and several regional organizations, and the Indian and South African governments along with these other countries and several regional organizations jointly submitted a revised proposal calling for a waiver of IPRs related to COVID-19 vaccines, treatments, and diagnostics to the WTO in May 2021 [25].

At the WTO’s Ministerial Council 12 in June 2022, the WTO decided to waive IPRs related to COVID-19 vaccines, but not treatments and diagnostics. Additionally, member countries agreed to decide how to deal with treatments and diagnostics within six months [26].

5. Conclusion

Almost all countries sustained heavy blows from the COVID-19 pandemic. It affected the world economy, almost all industries, and human society. Many people died, experienced symptoms, lost

jobs, and sometimes experienced mental health issues such as anxiety.

However, some industries such as the pharmaceutical industry reported good financial results partly because the governments, regional and other organizations provided generous funding for solving and ending the pandemic.

In May 2023, the WHO declared that COVID-19 is no longer a pandemic, yet many people believe another pandemic will come in the future. Thus, people should prepare for upcoming pandemics.

At international forums, representatives from countries worldwide have begun discussing concluding a “Pandemic Treaty,” with representatives from the North and South having already met more than 10 times [27].

Considering the lessons learned from the recent pandemic (COVID-19), people worldwide must conclude a “Pandemic Treaty” to implement rapid and coordinated measures against pandemics, more rapid development of vaccines and treatments, and realize equitable distribution of vaccines, treatments, and diagnostics [28].

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