The Impact of COVID-19 on the Medical Industry Based on Ratio Analysis

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Abstract. Financial ratio analysis is widely used in conducting fair comparisons across time and between various businesses or industries from their financial statements. The outbreak of the COVID-19 pandemic affected the performance of most industry by closing off business operations in most economies across the globe. This study investigates the impact of COVID-19 pandemic on the performance of the medical industry based on ratio analysis in terms of three leading pharmaceutical companies (i.e., Pfizer, Moderna, and BioNTech). According to the analysis, the performance of the healthcare sector was poor during the pandemic period, calling for appropriate contingency planning to help prepare the industry appropriately for any similar disruptions in the future. In brief, it is notable that the pandemic had a negative impact on the medical industry. The ratio analysis presents a negative trend in growth of the industry stakeholders during the pandemic period. This is an indication of the negative outlook of the industry. These results shed light on guiding further exploration of investments on medical industry before, during and after the pandemic COVID-19.

Keywords: COVID-19; Pharmaceutical industry; Financial ratio analysis; pandemics' economic impact.

1. Introduction

The COVID-19 pandemic was first reported in December 2019 in Wuhan, China before spreading across the entire globe during the 2020 fiscal year, affecting and infecting hundreds of millions in the process. Globally, there have been reported over 577 million cases of COVID-19 infections, from 6.4 million patients succumbed to the disease [1]. The outbreak of the pandemic caused a major strain on the existing healthcare facilities, as most were not well prepared to handle the excess capacity of patient influx caused by the pandemic [2]. In the same regard, the pandemic also exposed the lack of adequate preparedness of most healthcare facilities, including countries in the developing world, in handling emergency healthcare cases like the COVID-19 pandemic. This explains the high numbers of infection, and mortality rates associated with the outbreak.

The healthcare industry was equally disrupted by the pandemic, just like other industries were affected by the outbreak, resulting in poor financial performance and massive losses [3]. Due to the nature of infection of the disease, which was easily spread from one person to the next, most countries closed their borders to international travelers. However, even with the absence of patients from other countries, most countries were unable to contain their virus situation, with majority of their hospitals being filled beyond set capacity by patients suffering from the virus [4]. Some makeshift hospitals had to be put up to address the high demand for healthcare services from the patients infected by the virus. It was also a race against time as those infected faced a high risk of dying from the disease, given the fact that there was no known cure for the virus.

In this regard, most hospitals faced catastrophic financial challenges associated with the outbreak of the COVID-19 pandemic. In The United States, for instance, the American Hospital Association (AHA) reported that the financial impact of the pandemic on American hospitals was over $202.6 billion in lost revenues, an average of $50.7 billion monthly [5]. From a global perspective, it is notable that the industry's performance shrunk by 8% during the pandemic period, with poorer countries facing the most difficult financial challenges compared to the developed countries [6]. The main challenge that led to these losses in the healthcare sector was the lack of preparedness of most hospitals to address the COVID-19 pandemic, plus the influx of COVID-19 infected patients in most hospitals across the world.

Healthcare reports indicate that most countries faced difficulties in equipping their healthcare facilities with adequate healthcare equipment and material required to address or contain the pandemic [7]. Items such as Personal Protective Equipment (PPE) for healthcare workers handling COVID-19 patients, sanitizing supplies, toilet papers, and water, among other requirements for handling COVID-19 patients were in short supply. These deficiencies were universal across the globe, thus prompting healthcare organizations across the world to invent essential plans for pandemic preparedness [8]. It is clear from the outbreak of the pandemic is that hospitals were forced to concentrate on containing and supporting patients suffering from COVID-19 pandemic, of which most were not capable of containing, and in the process reduce their concentration on patients with other lesser life-threatening complications.

The pharmaceutical sector also suffered a major blow because most of its medicinal drugs and supplements were no longer in demand, as most healthcare buyers purchased drugs and equipment required in containing the pandemic [9]. Since not all pharmaceuticals were designed to produce COVID-19 containment supplies, the revenues of most companies suffered significantly during the pandemic period due to low sales volumes. Pharmaceutical companies made a comeback through the discovery of the COVID-19 vaccine, for which Moderna and Pfizer were among the pioneers in the global pharmaceutical industry.

With this in mind, the current value of the medical industry as an investment is examined in this paper. The rest part of the paper is organized as follows. The data and methodology used to assess the pandemic's effects on the medical industry will be covered in Section 2. Utilizing the aforementioned techniques, Section 3 will examine ratios using tables and diagrams and comparing the performance of each company's' ratios, then explaining the results, and providing investment recommendations based on the results.

2. Data & Method

The focus of the research is on the pharmaceutical sector of the medical industry to help decipher how the medical industry was affected by the outbreak of the pandemic. The investigation centered on using financial ratios of these companies to determine how each company performed in the period leading the pandemic, during the pandemic, and after the pandemic, and establish the specific implication of the pandemic on their financial performance. In the current case, the three companies whose financial performance during the pandemic period is investigated include Moderna, Pfizer, and BioNTech. The data used for the research is collected from MacroTrends, a financial analysis database that specializes in evaluating and reviewing the financial performance of companies in different industries across the world pandemic [10]. The financial ratios of these companies are measures for four years from 2018 before the outbreak of the pandemic, i.e., from 2019 and 2020, when the full impact of the pandemic was felt globally, and 2021, when the world began to recover from the harsh implications of the pandemic.

The financial ratios are preferred for this study because of their significance in detailing the performance of a company, and deducing the financial health and stability of the company as at a particular financial period. Financial ratios are also simple in conducting trend analysis in the historical performance of the companies under review by checking and comparing the changes in each ratio during a given fiscal year [11]. In the same regard, the ratios also provide an appropriate framework for conducting a comparative analysis of financial performance of companies in the same industry over a given period, by highlighting their successes or failures in specific key performance indicators, including the liquidity, profitability, efficiency, and gearing.

The financial ratios used were measured in the following four aspects, including valuation of the companies in terms of P/E ratio, P/B ratio, and asset growth, growth of the companies in terms of revenue growth, EPS growth, EBIT, and EBITDA growth, profitability of the companies in terms of gross margin, net margin, and asset turnover ratios, and the liquidity of these companies in terms of quick ratio and current ratios, as well as payout ratios, including dividend, and dividend per share. Each ratio category provided an intricate analysis of the performance of each company for each specific area, such as profitability ratios indicating the profits or losses made by the firms during the pandemic period compared to the pre-COVID and post-COVID periods.

3. Empirical Analysis

3.1 Indicators' Evolution

The profitability analysis of the three companies during the four-year period indicates that the performance varied significantly as shown in Table. 1, especially in 2020, when the implications of COVID-19 had become extreme in the world. In the case of Moderna, the company reported massive losses both in 2019 and 2020, an implication of the pandemic. The same trend is also evident in BioNTech performance, whose financial also indicated a dip during the 2020 and 2019 fiscal years. On the contrary, Pfizer reportedly had better performance during this period, unlike its counterparts who were reporting losses.

Table. 1 Profitability Ratios.

Company	Ratio	2021	2020	2019	2018
Moderna	Gross Margin	85.83	99.00	100	100
	Operating Margin	71.98	-95.02	-910.00	-305.96
	ROE	86.26	-29.17	-43.75	-25.14
	ROA	49.46	-10.18	-32.34	-19.61
BioNTech	Gross Margin	84.66	87.70	84.01	89.27
	Operating Margin	80.54	-17.087	-167.16	-42.21
	ROE	86.54	1.11	-36.31	-18.08
	ROA	65.06	0.66	-22.46	-7.39
Pfizer	Gross Margin	62.08	79.63	80.31	77.99
	Operating Margin	23.91	19.81	16.41	13.89
	ROE	28.99	10.50	16.93	6.06
	ROA	12.38	4.32	6.41	2.42

Table. 2 Liquidity Ratios.

Current Ratio	2021	2020	2019	2018
Moderna	1.76	1.435	7.89	7.05
BioNTech	4.33	2.75	4.05	3.56
Pfizer	1.40	1.35	0.88	1.58

Table. 3 Valuation Ratios.

Company	Ratio	2021	2020	2019	2018
Moderna	EBIT Margin	71.98	-95.02	-910.00	-305.96
	EBITDA Margin	73.53	-89.91	-864.99	-288.94
	Book value per share	35.10	6.42	3.49	4.65
BioNTech	EBIT Margin	80.54	-17.087	-167.16	-42.21
	EBITDA Margin	80.93	-9.05	-135.95	-24.98
	Book value per share	57.01	6.49	2.44	1.39
Pfizer	EBIT Margin	23.91	19.91	16.41	13.89
	EBITDA Margin	30.29	31.05	30.47	28.96
	Book value per share	13.78	11.40	11.46	11.15

Table 2 displays the liquidity of pharmaceutical companies was put to test during the pandemic period, as most of them had limited financial resources and cash reserves to handle emergency cases, particularly the ever growing demand from COVID-19 patients. For instance, the current ratio of Moderna drops from 7.89 in 2019 to 1.435 in 2020, while that of BioNTech drops from 4.05 in 2019 to 2.75 in 2020. Pfizer still reports amazing performance during this period, as it maintains an average performance of its current ratios.

The valuation ratios of the three companies are also affected negatively by the pandemic as shown in Table 3, as noted from the EBIT, and EBITDA margins reported by the companies during the 2020 fiscal period. Moderna reported negative entries for EBIT and EBITDA of -96.02 and -910 in 2020 and 2019 respectively, and -89.91 and -864.99 for the same period. On the other hand, while BioNTech also reported negative entries for EBIT and EBITDA of -17.087 and -167.16 respectively for 2020 and 2019, and -9.05 and -135.95 for the same period. Surprisingly, Pfizers financials were positive in both cases. In fact, they reported a positive trend.

The efficiency of the companies to utilize their resources was tested in 2020 as summarized in Table 4, where their performance in most asset turnover ratios reported a major dip, especially for Moderna and BioNTech companies. Pfizers performance remanded exemplary on most counters measuring the efficiency ratios. The stability of the companies, however, was not adversely affected by the outcomes of the COVID-19 pandemic, as the three firms maintained the same range of solvency ratios across most of the counters that were tested.

Last, as the debt/capital and debt/equity ratios indicate the total debt of a company as a percentage of company’s total capital and equity (seen from Table. 5). Moderna and BioNTech both have a extremely low Long-term debt/capital and Debt/equity ratio, only Pfizer’s Long-term debt/capital and Debt/equity ratio is relatively high compares to the other two firms.

Table. 4 Efficiency ratios.

Company	Ratio	2021	2020	2019	2018
Moderna	Asset turnover	0.75	0.11	0.04	0.07
	Receivables turnover	5.82	0.58	11.18	10.73
	Inventory turnover	1.82	0.17	0	0
BioNTech	Asset turnover	1.199	0.208	0.136	0.195
	Receivables turnover	1.532	2.899	8.571	6.434
	Inventory turnover	5.794	0.925	1.481	2.365
Pfizer	Asset turnover	0.448	0.270	0.244	0.256
	Receivables turnover	7.081	5.263	6.040	5.087
	Inventory turnover	3.402	1.058	1.139	1.197

Table. 5 Debt ratios.

Company	Ratio	2021	2020	2019	2018
Moderna	Long-term debt/capital	0.041	0.044	0.031	0
	Debt/equity ratio	0.042	0.043	0.033	0
BioNTech	Long-term debt/capital	0.0142	0.1441	0	0
	Debt/equity ratio	0.0253	0.1751	0.0037	0
Pfizer	Long-term debt/capital	0.3185	0.3691	0.3617	0.3404
	Debt/equity ratio	0.4962	0.6276	0.8219	0.6547

3.2 Comparison of Performance

The above trend analysis established that there was a major difference in the performance margins of the three companies during the pandemic, when compared to the other years before and after the pandemic. These trends are mostly visible in Moderna and BioNTech companies, as opposed to Pfizer, whose performance appears not to be adversely affected by the outbreak of the pandemic. The following illustrations show the graphical representation of the firms’ performance on most indicators, during the pandemic and after the pandemic. One common ratio was selected for comparative analysis in each case.

As shown in Fig. 1, through the comparison of profitability ratio from 2018 to 2021, it clearly displayed that the profitability of Moderna and BioNTech was negative before the pandemic starting from 2018, and decreased more in 2019 which was during the pandemic. Then gradually recovered from 2020 then experienced an enormous growth in 2021. However, Pfizer wasn't affected too much by the pandemic, since it was increasing gradually after the pandemic.

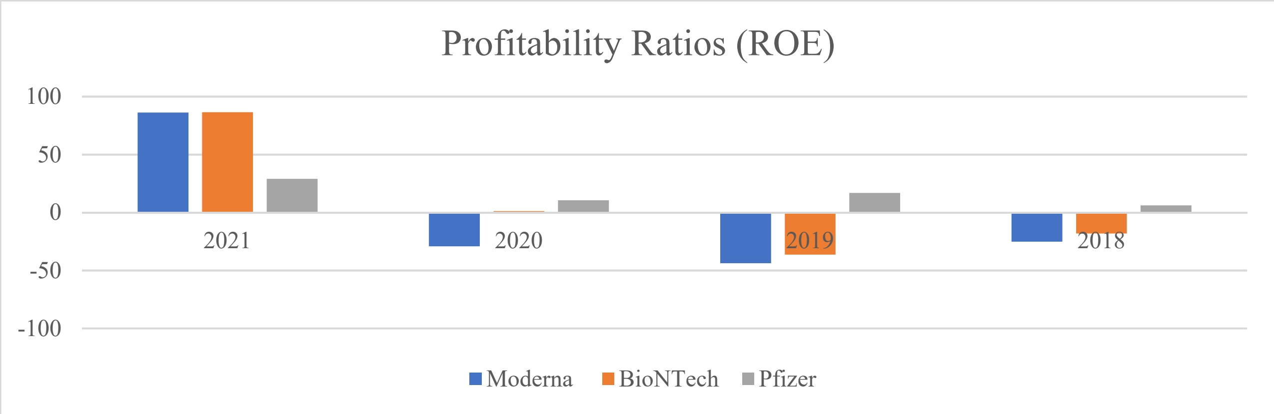

Fig. 1 Profitability Ratios.

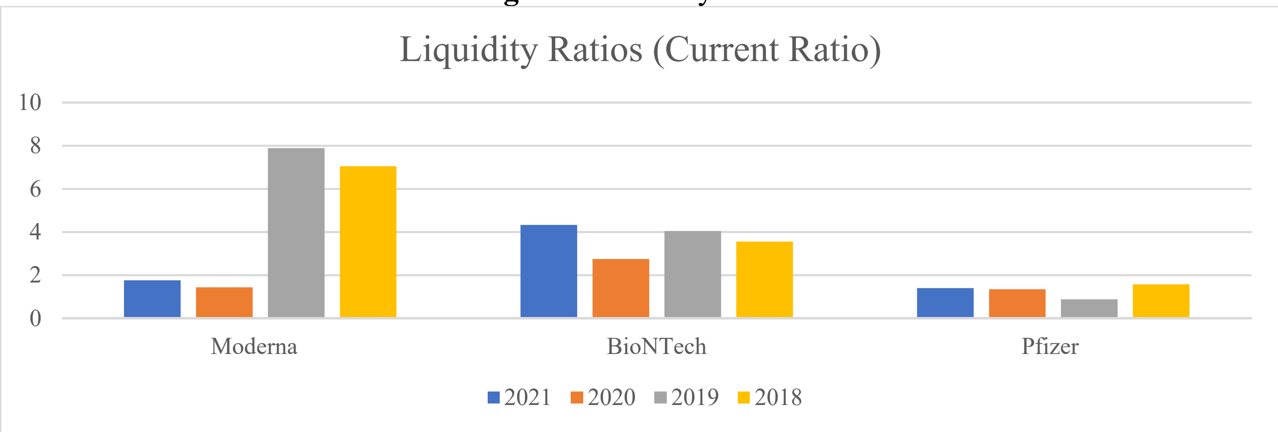

Fig. 2 Liquidity Ratios.

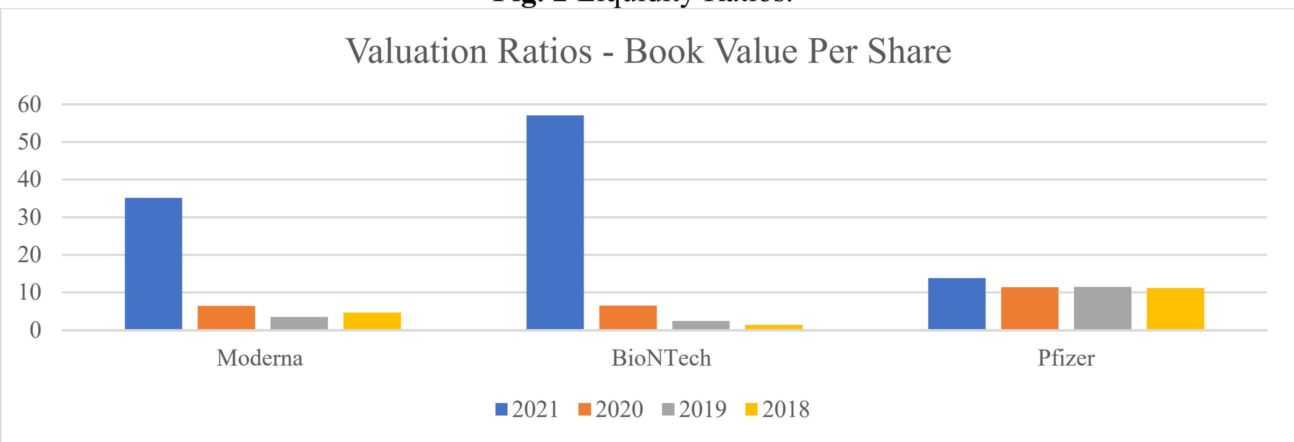

Fig. 3 Valuation ratios.

Seen from Fig. 2, BioNTech had a relatively very high liquidity ratio between 2 and 6 from 2018 to 2021, Moderna had an extremely high liquidity ratio in 2018 and 2019 but it decreased to around 1 to 2 in 2020 and 2021, Pfizer had the lowest average liquidity ratio from 2018 to 2021 which were all around 1 to 2 which displayed that BioNTech was more capable of paying short-term debt.

As illustrated in Fig. 3, the valuation ratio also illustrated a clear trend from 2018 to 2021, the COVID-19 apparently influenced the valuation of 3 pharmaceutical companies. Pfizer had a relatively stable valuation ratio above 10 since 2018, it increased a bit gradually after the recover of COVID-19. Meanwhile, BioNTech and Moderna has a comparatively low valuation ratio from 2018 to 2020 which but they both increased a lot in 2021 because of the recover of pandemic.

As depicted in Fig. 4, the efficiency ratio also depicted a similar trend with valuation ratios, Pfizer's performance on efficiency ratio was relatively stable before and during the pandemic and the recover of COVID-19 didn't boost Pfizer's efficiency ratio too much. In opposite, Moderna and BioNTech initially has relatively low efficiency ratio starting from 2018, then COVID-19 worsening their efficiency ratio. Afterwards, the recover of the pandemic boost Moderna and BioNTech's' efficiency ratio tremendously.

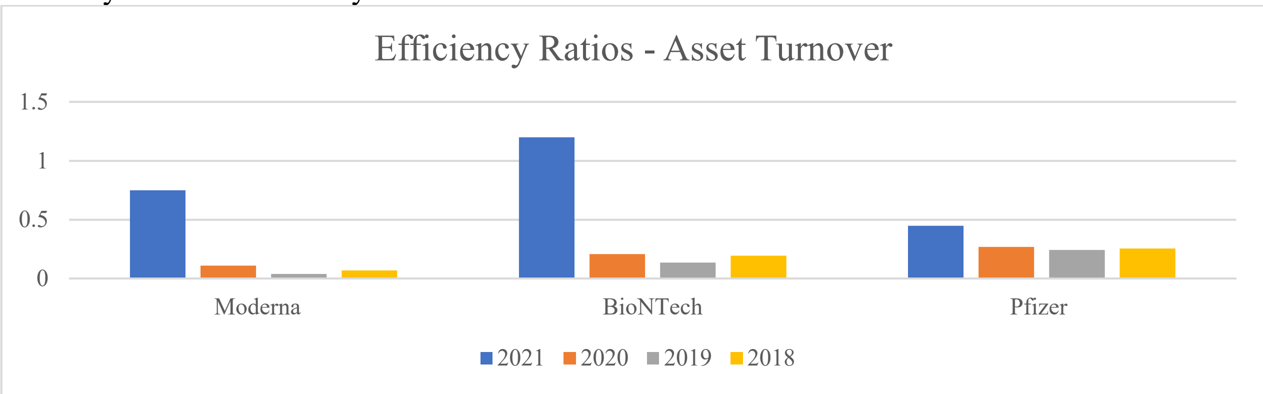

Fig. 4 Efficiency ratios.

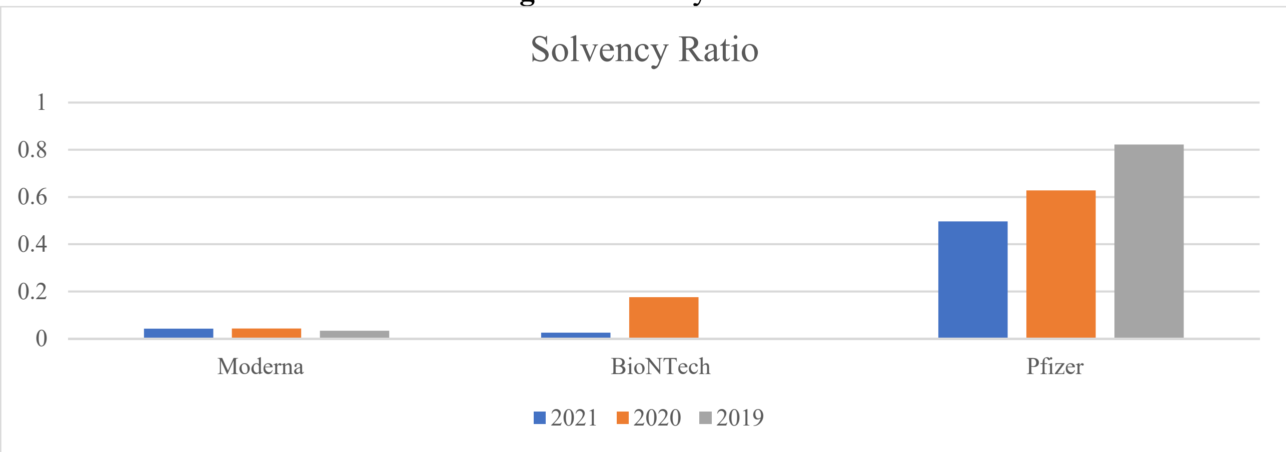

Fig. 5 Solvency ratios.

Fig. 5 exhibts the evolution of Solvency ratios. According to the results, the solvency ratio of Moderna and BioNTech are both extremely low from 2019 to 2021 which refers that they might have insufficient financial health while meeting their long term debt. Pfizer has a comparatively higher solvency ratio than the other 2 firms but still with a decreasing trend.

Among the three companies, Pfizer maintained a positive performance during the pandemic period, and a steady rise in profitability ratios, while the other two reported negative entries during the 2020, 2019, and 2018 financial years. The companies reported poor performance in their liquidity margins during the 2020 and 2019 financial years, except for Pfizer which maintained an almost average margin of performance. The performance of Moderna and BioNTech reports major shifts in 2020 and 2019 during the pandemic period, compared to that of Pfizer, which remains relatively stable. The performance was poor in 2020, 2019, and 2018 for Moderna and BioNTech, as opposed to Pfizer. The performance was poor in 2020, 2019, and 2018 for Moderna and BioNTech, as opposed to Pfizer.

3.3 Explanation

The performance of the three companies suggests that the COVID-19 pandemic had a negative impact on their performance, particularly on Moderna and BioNTech whose performance dipped during the two years. However, it is notable that their performance was already poor prior to the outbreak of the pandemic, and this only worsened during the pandemic period. On the other hand, it appears that Pfizer maintained a stellar stable performance throughout the period, probably because it was already doing well before the pandemic. Whereas the recovery of the two companies' post-pandemic is impressive.

3.4 Implication for Investment Suggestions

It would be recommended that the affected companies have proper measures to contain their financial performance's reaction to have changes in their market dynamics, as noted in the case of the COVID-19 pandemic that affected their performance. For future investment, a worthwhile investment recommendation should contain a high profitability ratio, liquidity ratio, valuation ratio, efficiency ratio and solvency ratio with a stable trend, certain events might boost any ratios in short term, but in long term investment might not be considered as a worthwhile investment.

4. Limitation & Prospect

The limitations of the study findings are drawn from the fact that only financial ratios were used in performing the analysis. Ratios are an effective in indicating the direction the performance of a company is taking in terms of the key performance indicators provided by the ratios. Nevertheless, it is inefficient in detecting some key parameters of the company's performance that it should not be entirely relied upon as a comparative measure. Key among these is the fact that no two companies are exactly the same. Therefore, comparing firms based on their financial ratios does not present the true picture of the financial performance of the two companies. In the current case, the performance of Pfizer has been completely different from that of its competitors, a fact that cannot be clearly explained by the financial ratios. The financial ratios are also limited in detailing the performance of the company especially when the firm being analyzed is large. The three companies analyzed are large established multinational corporations, making ratio analysis a shallow attempt at evaluating and comparing their overall performance.

Irrespective of the limitations of the financial ratios used in performing the comparative financial analysis of the three companies. It is obvious that the outbreak of the COVID-19 pandemic had a negative impact on the performance of the three companies. This is noted from the negative indices reported in the companies' financial reports during the pandemic period. The lack of preparedness for the pandemic explains the reason that most companies were adversely affected by the sudden change in market dynamics. However, the performance seems to have recovered in 2021, meaning that the future of the industry is still bright. Nonetheless, companies in the healthcare sector are advised to have in place appropriate contingency measures to contain these negative implications on their performance outlook in the event of unexpected market disruptions in the future.

5. Conclusion

In conclusion, this study investigates the impact of the COVID-19 pandemic on the healthcare industry. The analysis was performed by evaluating financial ratios of three companies operating in the pharmaceutical industry, namely Moderna, BioNTech, and Pfizer. Their performance was measured by different types of ratios from 2018 to 2021, detailing how they fared before, during, and after the pandemic. Based on the evaluation, the performance of these companies was adversely affected by the pandemic, especially for the case of Moderna and BioNTech. Nevertheless, the financial analysis failed to provide intricate details on the performance of the three companies, particularly regarding to the comparative analysis, considering their large size. Future outlooks of the industry should focus on preparing appropriate contingency measures to cushion industry players from adverse market developments in the future. Overall, these results offer a guideline for the investment of medical industry based on the analysis of 3 typical pharmaceutical firms' performance before, during and after the pandemic.

References

[1] Blumenthal D., Fowler E J, Abrams M., and Collins S R. COVID-19—implications for the health care system. New England Journal of Medicine, 2020, 383(15), pp.1483-1488.

[2] Barnett M L, Mehrotra A. and Landon B. E. COVID-19 and the upcoming financial crisis in health care. NEJM catalyst innovations in care delivery, 2020, 1(2).

[3] Sivakanthan S, Pan J, Kim L, Ellenbogen R and Saigal R. Economic impact of COVID-19 on a high-volume academic neurosurgical practice. World Neurosurgery, 2020, 143, pp .e561-e566.

[4] Shreffler J Petrey J and Huecker M. The impact of COVID-19 on healthcare worker wellness: a scoping review. Western Journal of Emergency Medicine, 2020, 21(5), p.1059.

[5] Synhorst D. C. et al. Healthcare encounter and financial impact of COVID‐19 on children's hospitals. Journal of Hospital Medicine, 2021, 16(4), pp.223-226.

[6] Kaye A. D et al. Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. Best Practice & Research Clinical Anaesthesiology, 2021, 35(3), pp.293-306.

[7] Ferneini E. M. The financial impact of COVID-19 on our practice. Journal of Oral and Maxillofacial Surgery, 2020, 78(7), pp.1047-1048.

[8] Farooq I. and Ali S. COVID-19 outbreak and its monetary implications for dental practices, hospitals and healthcare workers. Postgraduate Medical Journal, 2020, 96(1142), pp.791-792.

[9] Zhang Y. N. et al. Reduction in healthcare services during the COVID-19 pandemic in China. BMJ global health, 2020, 5(11), p.e003421.

[10] Cotrin P. et al. Healthcare workers in Brazil during the COVID-19 pandemic: a cross-sectional online survey. INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 2020, 57, p.0046958020963711.

[11] Zaki N. F. W. et al. Stress and psychological consequences of COVID-19 on health-care workers. Journal of Nature and Science of Medicine, 2020, 3(4), p.299.