IMPACT OF COVID-19 ON PHARMACEUTICAL SECTOR RETURNS: PAKISTAN STOCK EXCHANGE

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ABSTRACT
This study investigates the impact of the COVID-19 pandemic on the most actively traded pharmaceutical equities on the Kenya Stock Exchange (KSE). The analysis is based on return data from pharmaceutical industry stocks over a six-month period—comprising three months prior to the outbreak (November 2019) and three months following the onset of the pandemic (April 2020). To determine whether there was a statistically significant difference in stock returns before and after the COVID-19 outbreak, an F-test was conducted. The Cumulative Abnormal Returns (CAR) method was employed to calculate equity returns. The results indicate that the p-values for the companies analyzed are less than 0.001, which is well below the significance threshold of 0.05. Therefore, the null hypothesis (H_0) is rejected. These findings suggest a significant change in the return patterns of pharmaceutical companies before and during the pandemic. It can be inferred that the COVID-19 outbreak had a substantial impact on the performance of the pharmaceutical sector in Kenya.
Keywords: COVID-19, Stock returns, Pharmaceutical sectors

INTRODUCTION

The unpredictable illness known as COVID-19 (Coronavirus Disease 2019) began spreading globally in late 2019. The first known case was reported in December 2019 in Wuhan, located in central China. On January 3, 2020, the Wuhan Health Committee reported 44 cases of viral pneumonia of unknown origin. Due to its role as a major transportation hub and the high volume of travel during the Chinese New Year period, Wuhan inadvertently facilitated the spread of the virus to other provinces in China as early as January 2020. The first three cases outside Wuhan were recorded on January 19, with two in Beijing and one in Guangdong. Wuhan suspended buses, underground, ferries and long-distance passenger services on January 23. Public health measures like curfews, school closures, and travel restrictions have been implemented by China to combat the trend. The World Health Organization (WHO) issued its first official warning about COVID-19 on January 30, 2020. As the virus continued to spread globally, the WHO declared COVID-19 a pandemic on March 11, 2020. Countries such as Japan, Italy, South Korea, France, Spain, Germany, and China recorded some of the highest numbers of confirmed cases. Most nations have limited international flights, quarantined high-infection areas, and issued special operating protocols to contain the coronavirus. These precautions demonstrated their significance. However, economic activity has plummeted and firm failure is rising in practically every country. Economic slowdowns have affected stock markets, commodity markets, and global trade. Thus, stock market dynamics and firm performance in these economies were affected.

Throughout its course, the COVID-19 pandemic has had profound effects on global stock markets and economies—including that of Pakistan. Like many sectors, Pakistan's stock market experienced significant disruptions during the outbreak. The pharmaceutical industry, in particular, was both directly impacted by the crisis and called upon to play a critical role in the public health response. According to the Pakistan Pharmaceutical Manufacturers Association (PPMA), the country hosts 759 pharmaceutical production units, collectively fulfilling approximately 70% of the nation's pharmaceutical demand. Among these, 25 multinational companies hold a market share comparable to that of domestic producers. Approximately 183 of these firms operate in the Sindh province. In the absence of an effective cure for COVID-19, the pharmaceutical sector has supported government efforts through research and development, exploration of potential treatments, and crisis management of drug supply chains. However, the pandemic has disrupted the availability and affordability of essential medicines, challenging the core objective of pharmaceutical systems—to ensure consistent access to vital drugs at reasonable prices.

As highlighted by Nayyereh Ayati and Parisa Saiyarsarai (2020), the industry continues to struggle with maintaining supply chain stability and market continuity. This study focuses on how COVID-19

has influenced Pakistan's financial markets, with a particular emphasis on pharmaceutical stock performance.

Problem Statement

While the global impact of COVID-19 across various sectors has been widely studied, the effects on Pakistan's robust pharmaceutical industry remain underexplored. This study aims to investigate the impact of the COVID-19 pandemic on stock returns in Pakistan, with a particular focus on the pharmaceutical sector.

Research Question

Does the COVID-19 pandemic have an impact on stock returns in Pakistan's pharmaceutical industry?

Objectives of the study

The primary objective of this study is to assess the impact of the COVID-19 pandemic on stock returns in Pakistan's pharmaceutical sector. It also aims to evaluate the broader effects of the pandemic on the industry's overall financial performance and market stability.

LITERATURE REVIEW

The Efficient Market Hypothesis (EMH), proposed by Eugene Fama in the early 1960s, asserts that financial markets are informationally efficient, meaning that asset prices reflect all available information at any given time. According to EMH, investors cannot consistently achieve returns that exceed average market performance through stock selection or market timing, as any mispricing is quickly corrected by market participants.

The theory assumes that even if only a portion of investors act on new information—buying undervalued assets and selling overvalued ones—prices will adjust accordingly, moving toward their true value. This mechanism makes it difficult to consistently "beat the market," rendering aggressive investment strategies largely ineffective.

EMH suggests that the most effective investment strategy is to maintain a low-cost, diversified portfolio through passive management. While some analysts support fundamental and systematic analysis of individual stocks, others point to the occasional success of quantitative trading strategies as exceptions rather than the norm.Recent study on COVID-19's effects on the banking industry confirms our theory that exchange-rate shocks are temporary. This hypothesis test is required for the efficient market hypothesis (EMH). This idea says traders will look for ways to profit if markets

fail. Cointegration tests measure inefficiencies.

The World Health Organization (WHO) officially declared COVID-19 a global pandemic on March 11, 2020. The coronavirus belongs to a broad and diverse group of viruses known to cause illnesses ranging from the common cold to more severe respiratory conditions (Yang, 2020). In Pakistan, the first confirmed case of COVID-19 was reported on February 26, 2020, and by the time this study commenced, the number of confirmed cases had reached approximately 13,000.

The extent to which COVID-19 impacts Pakistan's economy largely depends on how rapidly the virus spreads and the effectiveness of the precautions taken to contain it. According to estimates by the Asian Development Bank (ADB), the pandemic could cost Pakistan between $4.95 billion and $16.38 billion, equating to roughly 1.57% of its Gross Domestic Product (GDP). Additionally, more than 946,000 individuals reportedly lost their jobs as a direct result of the pandemic, further straining a country that had already been undergoing economic recovery for two years (Sarwar, 2020). Manojkrishnan C G and Aravind M (2020) found that animals can spread coronavirus. China first detected the virus in 2019. Antivirals for Coronavirus infections are not yet available. Chinese suppliers of raw materials and intermediate goods are extremely important to the Indian pharmaceutical industry. COVID-19 is disrupting supply for this company, according to Economic Times (2020). Along the line in 2020 It was said that China supplies 70% of India's activated medicinal components. Even though the country disclosed its first Covid-19 fatality and had 80 positive cases, the stock market panicked on March 13, 2020.

According to Fama (1970), markets are influenced by new information and exhibit nostalgic behavior in response to past trends. Momentum investing—which involves buying stocks that have recently performed well and selling those that have underperformed—is supported by strong empirical evidence. Stock prices are often determined by investors' expectations of company earnings (Manojkrishnan C. G. & Aravind M., 2020).

Globally, India's pharmaceutical industry ranks third in terms of volume and fourteenth in terms of value (Gopalakrishnan, 2017). This growth has been largely attributed to deregulation policies and increased foreign institutional investment (Manojkrishnan C. G. & Aravind M., 2020). Pharmaceuticals also constitute a significant portion of overall stock market returns (Lynch, 2019).

Pandya (2017) suggested that adopting a contrarian investment approach—taking positions opposite to market trends—can help investors maximize both short-term and long-term gains. Aravind (2016) found that momentum strategies are more suitable for short-term investments in pharmaceutical stocks, while contrarian strategies may yield better results over the long term.

Morrin (2002) conducted a study on pharmaceutical companies listed on the New York Stock

Exchange and concluded that the sector tends to attract more conflicted investors than impulsive ones. Similarly, Firoozabadi (2019) observed that excessive herding behavior negatively affects returns in the pharmaceutical industry, except during periods of economic recession.Based on Ellison's 2001 work this analysis suggests that current events can affect pharmaceutical stocks in the short term. Year 2018 According to Schumacher an example also showed that removing a successful drug off the market can lower a pharmaceutical company's stock price. Stock returns underperformance is worse and lasts longer than abnormal returns (Hwang, 2013). Our study suggests that COVID-19's bad news should benefit pharmaceutical companies. In 2014 Hi, Kebriaeezadeh. Another study found that inflation, net profit margin, operational period, and working capital affect pharmaceutical equity returns. This question does not address market fluctuations. Masoumi (2019) states that GDP and money supply shocks can boost pharmaceutical company returns. Kim (2009) claims that a research-and-development-focused paradigm would improve the pharmaceutical industry. This will lead to new drug development and pipeline expansion. India's pharmaceutical industry's future depends on swift innovation, line changes, and successful legislation.

The Pakistan Stock Exchange (PSX) KSE-100 shares index rose 0.68 percent, or 231.03 points, to 34,350.42 points, and the KSE-30 index rose 0.57 percent, to 15,00. 89 points. Pharmaceutical companies were large spenders, according to expert Ahsan Mehanti. These enterprises import raw materials and risk currency fluctuation. The KSE-100 share index of the Pakistan Stock Exchange (PSX) benchmark closed at 45,726.68, down 0.44 percent or 204.32 points. The number of shares rose from 531.065 million Friday to 543.645 million. At 19,019.75 points, the KSE-30 share index declined 0.47%. Mehroz Khan, Pearl Securities' research analyst, says pharmaceutical companies have received high interest after Pakistan approved AstraZeneca's COVID-19 vaccine for emergency use. The pharmaceutical sector profited greatly when The Searle Group, Ferozsons, AGP, and Glaxo closed. Due to the pandemic, investors are betting on revenue growth next quarter. Friday was the finest day for pharmaceutical stocks. Investors expected the federal government to decrease corporation taxes in the next budget and the economy to boom in 2020 and 2021.

Economic lawmakers worry that the pharmaceutical industry's COVID-19 actions will cascade. This study examines pharmaceutical stock returns during the COVID-19 pandemic to further understanding.

THEORETICAL FRAMEWORK

The theoretical model supports the independent covid-19 variable that can impact changes in

pharmaceutical sector stock returns.
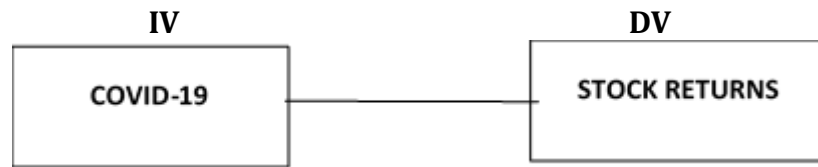
Testable Hypothesis

Examining how COVID-19 affected the pharmaceutical industry's return activities in Pakistan is the main goal of this research. For this reason, the following idea has been proposed:

H1: Any statically significant deference was not found among the pre- and post-COVID-19 stock returns of pharmaceutical businesses.

H2: A large difference is seen in the stock revenue of pharmaceutical industries after and before COVID 19.

DATA & METHODOLOGY

Data Collection

This research uses data from the Pakistan Stock Exchange (PSX) website, specifically the KSE 100 Index at www.PSX.Com.pk. One stock market index was kept. This research will evaluate just KSE 100 Index pharmaceutical businesses to achieve its purpose. The stock exchange lists 13 pharmaceutical companies. We will collect data from 10 of these 13 companies. The picked firms are:

- Abbot Laboratories (Pakistan) Limited (ABOT)
- AGP Limited (AGP)
- Ferozsons Laboratories Limited (FEROZ)
- IBL HealthCare Limited (IBLHL)
- Otsuka Pakistan Limited (OTSU)
- The Searle Company Limited (SEARL)
- Macter International Limited (MACTER)
- Highnoon Laboratories Limited (HINOON)
- GlaxoSmithKline (Pakistan) Limited (GLAXO)
- Sanofi-Aventis Pakistan Limited (SAPL)

Daily closing stock prices for each selected company were collected from the "Historical Data" section of the Pakistan Stock Exchange website (www.dps.psx.com.pk). The data spans a six-month period from November 2019 to April 2020, allowing for a comparative analysis of stock behavior before and after the onset of COVID-19 in Pakistan.

The country reported its first confirmed COVID-19 case in February 2020. Accordingly, the pre-COVID-19 period is defined as ranging from November 1, 2019, to January 30, 2020, while the post-

COVID-19 period covers February 1, 2020, to April 30, 2020.3.2 Research Design

This research relies on several secondary data sources. A balanced panel data set is employed to conduct a panel data regression analysis using a fixed effects model, in order to examine the impact of COVID-19 on stock returns. This methodological approach enables the study to control for unobserved heterogeneity across firms and over time.

To estimate the stock returns of ten selected pharmaceutical companies, the study applies the Cumulative Abnormal Return (CAR) methodology, which allows for the assessment of abnormal market behavior surrounding significant events.

Methodology

This study examines the daily return data of ten pharmaceutical sector portfolios listed on the Pakistan Stock Exchange (KSE) over a six-month period, from November 2019 to April 2020. To evaluate the impact of COVID-19 on the sector's performance, the Cumulative Abnormal Return (CAR) methodology was employed.

The dataset is divided into two distinct periods:

• Pre-COVID-19 period: November 1, 2019 – January 31, 2020

• Post-COVID-19 period: February 1, 2020 – April 30, 2020

Each period contains three consecutive months of daily closing prices, making up a balanced panel of six months in total (November through April). The data were organized in an Excel spreadsheet with four columns: date, company name, month, and daily closing price.

To analyze the market's reaction to COVID-19, an independent sample F-test was conducted for each of the ten selected pharmaceutical companies. This parametric test was used to statistically determine whether there was a significant difference between the average stock returns in the pre- and post-COVID-19 periods.

Data Analysis

Here we have the calculation for the new day's pricing, P1, and the pricing from the prior day, P0. Ri stands for the return of specific stocks. Before and throughout the COVID-19 pandemic, the table shows the steady income of several pharmaceutical companies. Three months before the collapse, All Pharma announced positive returns. All stocks, with the exception of FEROZ and ABOT pharmaceutical, had negative returns throughout the research period. In spite of this, FEROZ and ABOT saw a positive return trend throughout the COVID-19 pandemic. For a grand total of 0.0010, ABOT Company and FEROZ Pharma both generated a profit of 0.002.

The second step is to apply the formula to the Fixed Effect model

$Yit = \beta 1Xit + ... + \beta kXkt + \alpha i + uit$

$COVit = \beta 1SRit + \beta kPit + \alpha i + uit$

- αi (i=1....n) is the unknown intercept for each entity (n entity-specific intercepts).

- COVit is the COVID_19 Independent variable (IV) where i= entity and t= time.

- SRit represents STOCK RETURNS one dependent variable (DV),

- $\beta 1$ is the coefficient for that DV,

- βk is the coefficient for the DVs,

- P,it represents PRICE dependent variables (DV),

- uit is the error term

Table 1: Output of Pharmaceutical stocks while COVID 19 disaster

Stocks		Earlier to Disaster (November 2019 to January 2020)	Crisis Period (February 2020 to April 2020)
Abbot Laboratories (Pakistan) Limited **(ABOT)**		0.0048	0.0010
AGP Limited **(AGP)**	Ferozsons	0.0044	-0.0023
Laboratories Limited **(FEROZ)**	IBL	0.0046	0.002
HealthCare Limited **(IBLHL)**	Otsuka	0.0110	-0.0030
Pakistan Limited **(OTSU)**	The	0.0178	-0.0051
Searle Company Limited **(SEARL)**	Macter	0.0017	-0.0007
International Limited **(MACTER)**	Highnoon	0.0047	-0.0040
Laboratories Limited **(HINOON)**	GlaxoSmithKline	0.0052	-0.0013
(Pakistan) Limited **(GLAXO)**	Sanofi-Aventis	0.0070	-0.0007
Pakistan Limited **(SAPL)**	**KSE-100**	0.0024	-0.0021
		0.0031	-0.0034

KSE-100 daily return records, in addition to pharmaceutical frameworks, were computed by means of the formula. $Ri = Ln(P1/P0)$

RESULTS

An individual F-test was conducted for each of the ten selected pharmaceutical companies. Before drawing general conclusions, this section presents the test results for each company separately, allowing for a more detailed interpretation of firm-level variations.

The total number of observations across both the pre- and post-COVID-19 periods was N = 1,077, capturing stock return data during the timeframe associated with the initial pneumonia-like outbreak later identified as COVID-19.

Descriptive Statistics

This study examines the effects of COVID-19 on pharmaceutical industry stock prices by looking at the return on investment (ROI) as a measure of the predictor variable, financial performance. The provided figure displays the outcomes of the descriptive analysis.

Table 2 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Price	1,087	268.5271	195.7926	37	830
Company returns	1,077	0.002834	0.032376	-0.1008	0.0723
covid19	1,087	0.414903	0.492932	0	1

The factors listed above are the ones that will determine how the COVID-19 pandemic would affect Pakistan's pharmaceutical sector. From the descriptive analysis, we can deduce that the table has the highest value, which is one, meaning that most companies in the company class return. In addition, based on the results shown above, the average return value for enterprises is 0.002834, which is lower than the threshold of 0.5. Our research shows that, in comparison to others, corporate returns are poor, with an estimate of 1077. Standard deviation is 0.032376, minimum is -0.1008, and maximum is 0.0723 for the firms. As a whole, ROI is (268.5271), standard deviation is (195.7926), minimum is 37, and maximum is 830.

Fixed Effect Model

If there is a positive or negative connection between two variables, the regression coefficient predictor will show it. As the value of the independent variance grows, the mean variability typically rises, as seen by a positive coefficient. As the independent variance increases, the dependent variables have reduced, according to the negative coefficient.

A coefficient result shows how the dependent variables have changed on average as a result of one measurement of the independent variables, with all other model variables being kept constant on a daily basis. It is possible to test the effect of each variation by separating yourself from the others, which is why these adaptable design techniques are typically helpful.

Table 3: Effect Model

R-sq:	Obs per group:	
within= 0.0103	Min	42
between= 0.0347	Avg	107.7
overall= 0.0087	Max	126

In table 3 R-square illustrates the sum of dependent variable variance described by independent variable. Observation per group min is 42, Avg is 107.7 and Max is 126.

Table 4: Fixed Effect Model

companyret~s	Coef.	Std. Err.	t	p>t	[95% Conf.	Interval]
covid19	-0.0069929	0.0021	-3.32	0.001	-0.01112	-0.00287
_cons	0.0057628	0.00132	4.36	0.000	0.003171	0.008355

The p-value from Table 3 allows us to reject the null hypothesis because the test result was 0.001 significant. COVID-19 has a significant impact on pharmaceutical stock returns, supporting h1. For the present panel data set, the Design model with fixed effects was chosen because the dependent variable's p-value is less than 0.05. The Dynamic model and random effects were insufficient to produce significant results. To establish the components' statistical regression results, the fixed effect model was employed. The regression table shows how independent variable changes affect dependent variable.

Ten organisations selected following COVID-19 have a standard deviation of -0.0069929 for the independent variable. P>t is 0.001, T is -3.32, and Err. is 0.0021. COVID-19 harms the pharmaceutical sector, as seen by the negative coefficient. Statistical significance is shown by a higher t-value. If it's under 0.05, your model passes. A test (F) determines if all model coefficients are not zero. >F = 0.0009 is less likely than 0.05. This validates our model. Rho, sigma_u, and sigma_e are 0.00570227, 0.00244708, and 0.0323. For interclass correlation, use "rho".

CONCLUSION

In the previous section, we analyzed the results of the F-tests conducted for each of the ten pharmaceutical companies to test the hypothesis regarding the impact of COVID-19 on stock returns. The dependent variable in this study was the standardized stock return, which we examined in the context of the COVID-19 outbreak.

The data was divided into two periods: the first three months represented the pre-COVID-19 phase, while the latter three months reflected the post-COVID-19 phase. In order to draw general conclusions about Pakistan's pharmaceutical sector, we evaluated the collective behavior of the majority of the selected companies.

Based on the findings, the following conclusions can be drawn:

The null hypothesis is rejected for most of the companies, as the p-values were below 0.001, significantly lower than the chosen significance level of 0.05.

There is a statistically significant difference in stock returns before and after the COVID-19 outbreak.

The overall effect of COVID-19 on pharmaceutical companies' stock returns was negative.

The outbreak influenced the behavior and market performance of companies in the pharmaceutical sector. COVID-19 had a notable and measurable impact on the Pakistani stock market, specifically within the pharmaceutical industry.

REFERENCES

Jordan Schoenfeld 2020, 9. (2020). The Invisible Risk: Pandemics and the Financial Markets. *Available at SSRN 3567249*.

2020, E. T. (n.d.). Covid-19 Impact: Fears of Chinese API shortage hurt pharma players.

Aravind, M. (2016). Contrarian and Momentum Strategies: An Investigation with reference to Sectoral Portfolios in NSE. . *NMIMS Management Review*, Review, 29:102–117.

Banerjee, K. T. (2015). Innovations in the Indian pharmaceutical industry: The present scenario and an agenda for the future. . *Journal of Generic Medicines: The Business Journal for the Generic Medicines Sector,*, 12(2):50–59.

Ellison, S. F. (2001). Gradual Incorporation of Information: Pharmaceutical Stocks and the Evolution of President Clinton's Health Care Reform. . *The Journal of Law and Economics*, 44(1):89–129.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. The • Fama, E. F. 1970. Efficient Capital Markets: A Review of Theory and Empirical Work. .*The Journal of Finance,* , 25(2):383–417.

Firoozabadi, S. S. (2019). Impact ofHerding on Buy & Hold, Momentum & Contrarian Strategy in Tehran Stock Exchange. *International Journal of Finance and Managerial Accounting,*, 4(15):1–12.

Gopalakrishnan, M. M. (2017). A Study on Risk-Return Analysis of Pharmaceutical Industries in the Indian Stock Market. *Imperial Journal of Interdisciplinary Research,*, 3(5):1869–1874.

He, Q. L. (2020). The impact of COVID-19 on stock markets. *Economic and Political Studies, 8(3)*, 275-288.

Hwang, T. J. (2013). Stock Market Returns and Clinical Trial Results of Investigational Compounds:. *Event Study Analysis of Large Biopharmaceutical Companies. PLoS ONE,*, 8(8):1–8.

JohnHill. (31 January 2020). Financial markets: equities. 116.

Kebriaeezadeh, A. Z. (2014). Fundamentals and stock return in pharmaceutical companies: A panel data modelof the Iranian industry. . *Iranian Journal of Pharmaceutical Sciences,* , 9:55–60.

Kim, H. R. (2009). Formulation of a Success Model in Pharmaceutical R&D: Efficient Innovation Model. *Sage Open,*, 1–9.

Line, B. (2020). The covid-19 outbreak is unlikely to impact the credit rating of pharma companies, Our Bureau Mumba.

Lynch, H. P. (2019). The Revenge of the Stock Pickers. *Financial Analysts Journal,* , 75(2):34–43.

Manojkrishnan C G and Aravind M, I. (2020). COVID19: Effect on leading pharmaceutical stocks listed with NSE. *Pharm.Sci.*, 31-36.

Masoumi, M. A. (2019). Economic and non-economic determinants of Iranian pharmaceutical companies' financial performance:. *BMC Health Services Research*, 19(1):1–13.

Md Akhtaruzzaman, W. A.-Q. (January 2021). Is China a source of financial contagion? *Finance Research Letters Volume 38, J*.

Morrin, M. J. (2002). Taking Stock of Stockbrokers: Exploring Momentum versus ContrarianInvestor Strategies and Profiles. *Journal of Consumer Research,* , 9(2):188–198.

Nayyereh Ayati1 & Parisa Saiyarsarai1, 2. &. (2020). Short and long term impacts of COVID-19 on the pharmaceutical secto. *Journal of Pharmaceutical Sciences* , 799-805.

Pakistan stock exchange. www.psx.com.pk

Pandya, F. H. (2017). An Assessment for the Existence of Contrarian and Momentum Investment Strategies in NSE. *Pacific Business Review International,*, 9(10):55–64.

Schoenfeld, J. (2020). The Invisible Risk: Pandemics and the Financial Markets. *Available at SSRN 3567249*.

Schumaker, R. P. (2018). Analysis of Stock Price Movement Following Financial News Article Release. . *Communications of the IIMA,* , 16(1):1–22.

SHABBAR, S. (n.d.). pakistan pharmaceutical plight During Covid-19.

Suleman Sarwar. (19 May 2020). The impact of COVID-19 on Karachi stock exchange: Quantile on-quantile approach using secondary and predicted data. .

Yang, y. p. (2020). ,the deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China.