

ORIGINAL RESEARCH ARTICLE

The Pattern of Coronavirus Cases in South Africa compared with the United States of America and South Korea

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Abstract

The coronavirus pandemic has spread worldwide, causing massive deaths of people in different countries. The study sought to find successes and failures in preventing the spread of the disease. This study results would assist states in identifying practical measures that can be used to avoid the spread of the pandemic. The cross-sectional study used a comparative analysis method. The study employed cross country comparison to conclude the effectiveness of the various measures implemented by different countries. Seven key phrases were searched, and the results were considered for analysis and presentation. The data were analyzed using the paired sample t-test and spearman's correlation coefficient. The USA and South Africa are on the exponential growth phase for the total number of infections per day. At the same time, South Korea and Taiwan were able to contain the virus. Western Cape is the epicenter of coronavirus cases in South Africa. The extensive production of face masks, quarantine measures, banning overseas travel, physical distancing, monitoring self-isolating individuals may help to contain the virus. In South Africa, banning the interprovincial movement may keep the spread to a minimum. Rapid implementation of preventive measures in the early stages is vital in preventing the spread of the pandemic. (*Afr J Reprod Health 2020 (Special Edition); 24[2]: 108-116*).

Keywords: Coronavirus, Google, Internet, USA, South Africa, South Korea

Résumé

La pandémie de coronavirus s'est propagée dans le monde entier, provoquant des morts massives de personnes dans différents pays. L'étude a cherché à trouver des réussites et des échecs dans la prévention de la propagation de la maladie. Les résultats de cette étude aideraient les États à identifier les mesures pratiques qui peuvent être utilisées pour éviter la propagation de la pandémie. L'étude transversale a utilisé une méthode d'analyse comparative. L'étude a utilisé une comparaison entre pays pour conclure à l'efficacité des diverses mesures mises en œuvre par différents pays. Sept phrases clés ont été recherchées, et les résultats ont été pris en compte pour l'analyse et la présentation. Les données ont été analysées en utilisant le test t de l'échantillon apparié et le coefficient de corrélation de Spearman. Les États-Unis et l'Afrique du Sud sont en phase de croissance exponentielle pour le nombre total d'infections par jour. Dans le même temps, la Corée du Sud et Taiwan ont pu contenir le virus. Le Cap occidental est l'épicentre des cas de coronavirus en Afrique du Sud. La production extensive de masques faciaux, les mesures de quarantaine, l'interdiction des voyages à l'étranger, la distanciation physique, la surveillance des individus auto-isolants peuvent aider à contenir le virus. En Afrique du Sud, l'interdiction du mouvement interprovincial peut réduire la propagation au minimum. La mise en œuvre rapide de mesures préventives dès les premiers stades est essentielle pour empêcher la propagation de la pandémie. (*Afr J Reprod Health 2020 (Special Edition); 24[2]:108-116*).

Mots-clés: Coronavirus, Google, Internet, États-Unis, Afrique du Sud, Corée du Sud

Introduction

The deadly COVID-19 pandemic was first reported in Wuhan, China, in December 2019¹. In the USA, the COVID-19 first case was reported on the 21st of January 2020. On the 4th of June 2020, the USA had the highest number of total coronavirus infections (1 823 220), followed by

Brazil (555 383) and the Russian Federation (441 108). The failure of the USA to contain the disease is attributed to the low rate of testing during the initial onset of the pandemic due to the shortage of testing kits¹. Hence, the USA did not quickly get a clear picture of the daily infection rate.

Furthermore, the USA has a burden of chronic conditions where forty percent of the

population has chronic conditions². Each person will have two or more chronic conditions. In addition, Kessler *et al.* and Hales *et al.* observe that more than one hundred million Americans are obese^{3,4}. The study by Van Cleare⁵ observed a surge in chronic diseases among children in America from the 1990s. The data from China, South Korea, Italy, and Iran suggest that the case fatality rate increases sharply with age and is higher in people with COVID-19 and underlying comorbidities such as obesity and other chronic conditions that are prevalent in the USA⁶. The case fatality rate refers to the proportion of coronavirus deaths compared to the total number of people diagnosed with coronavirus for a specified period. Targeted social distancing for people with multiple medical conditions could be the most effective way to reduce mortality in the USA and other nations. The prevalence of multiple chronic conditions in the USA could be among the several factors contributing to extensive deaths due to the infection by the current coronavirus pandemic. The outbreak of COVID-19 in New York City resulted in hospitals having too many patients than the available resources. The community healthcare workers did not play a part in addressing the epidemic by helping outpatients in earlier stages of the disease. This lack of community workers led to a surge in patients in advanced stages of the disease in the hospitals, and high mortality was experienced^{7,8}. South Korea, which announced the first coronavirus case on the same day with the USA, had 11629 cases on the 4th of June 2020. The successful control of the deadly virus in South Korea is attributed to the extensive tests carried out quickly and accompanied by preventive measures, including early school closures⁹. The South Korean government also conducted interviews and cellphone surveillance to track down the recent contacts of new coronavirus patients and ordered those contacts to self-isolate¹⁰. South Korea drew its lessons from 2015, when the Middle East Respiratory Syndrome (MERS), which had no treatment or vaccine, spread through the clinics and hospitals. There were no testing kits in the early days of the epidemic, and the information about the viral spread was not made available to the public by the

government¹¹. After the previous outbreak of SARS, Singapore learned to develop a detailed plan of action that assisted it in dealing with the coronavirus. The country took rapid action after the outbreak began; it banned Chinese travelers and implemented screening and quarantine measures before the WHO recommended recommendations. The elderly and the vulnerable were ordered to stay at home strictly. The personal protecting lifesaving equipment was available, and immediate large-scale testing was done^{12,13}. Singapore maintained a lower death percentage by identifying and quarantining infected individuals before the development of the symptoms¹⁴.

In Zimbabwe, the outbreak of the coronavirus was first reported on the 20th of March 2020. On the 7th of June 2020, according to the Zimbabwean Ministry of Health and Child Care¹⁵, Harare and Masvingo had the highest total numbers of the confirmed case (99 and 39 respectively) as well as active cases (81 and 39 respectively). The country succeeded in containing the virus by quarantining returning citizens and residents and imposing strict lockdown rules. However, the over-dependence of importation of essential commodities from mainly South Africa, the epicenter of the virus in Africa, leaves the country at a high risk of infection through importing the virus from neighboring countries. Furthermore, cases of escaping the quarantine centers put a large number of people at risk of contracting the disease. An upsurge in the number of coronavirus cases in developing countries like Zimbabwe is likely to have devastating effects since the country's health care system was already struggling before the onset of the virus.

The National Institute for Communicable Diseases¹⁶ reported that the first coronavirus cases in South Africa were a female who had returned after traveling to Italy, a couple that returned from Germany, and a man who had traveled to Italy and Austria. The country took long to close its borders, to test and quarantine travelers. Due to the slow reaction to the pandemic, the number of coronavirus cases is escalating beyond the country's health care capability, posing a threat to some of its neighbors who predominantly rely on South Africa for essential goods. The imposed lockdown measures slowed down the spread of the

virus. South Africa experiences acute shortages of testing kits and personal protective equipment for health care workers¹⁷. However, the consequences of the immediate easing of the lockdown and early opening of schools are yet to be observed. This article aims to explore why some countries are failing to contain the virus while others are succeeding. It further explores the distribution of coronavirus in South Africa to come up with suggestions that will assist South Africa and other countries in similar conditions to effectively deal with the pandemic before it causes massive destruction to the human population. South Africa was selected because it is the epicenter of the virus in Africa and has the potential of spreading the pandemic to its neighboring countries, which have many migrants in South Africa.

The article is guided by two theories: The Theory of Reasoned Action and the Theory of Planned Behaviour. According to these theories, a person's health behavior is determined by her/his willingness to perform the routine¹⁸. The person's intention to act is predicted by her/his attitude towards the behavior. The intention to perform a response such as maintaining physical distance, putting on the mask, and staying at home can be induced by providing sufficient information to the public on how the virus spread and how deadly it is. Furthermore, the social and environmental surroundings and a person's control over it can be used to predict behavior¹⁸. Increased knowledge through the use of videos, audios, and text messages in various media platforms may help to modify attitudes, beliefs, and behaviors. In the current issue of coronavirus, increased knowledge of the countries that are failing to contain the pandemic and lessons from countries that were successful in controlling the disease can provide directions on how to effectively deal with the epidemic. Increased knowledge of how the disease spreads and how it can be controlled can help change people's attitudes, beliefs, and behaviors, resulting in mitigating the spread of the virus.

Methods

The study employed a comparative case study to evaluate the efficacy of various countries' different interventions in the fight against the coronavirus.

The study employed both cross country as well as a cross-province comparison for South Africa to conclude the effectiveness of the various measures which were implemented by different countries. To assist data collection, the Google search engine was used to search for the seven key phrases: "Coronavirus," "COVID-2019," "SARS CoV-2," "coronavirus in South Africa," "coronavirus in the USA," "coronavirus in South Korea," "coronavirus in Taiwan,". The search retained results, and those data form from reliable sources such as WHO and the National Institute for Communicable Diseases, which was analyzed for the study. The data were analyzed using the paired sample t-test and spearman's correlation coefficient. The paired sample t-test was conducted to determine any significant differences between the total coronavirus cases, deaths, and recoveries for the two days in different provinces in South Africa. Spearman correlation coefficient was also conducted to determine if there was any relationship between the total number of reported cases and deaths or recoveries.

Discussion of the findings

Coronavirus cases in South Africa were searched on the 31st of May and the 4th of, and the total number of coronavirus cases, deaths, and recoveries in different provinces were retrieved and analyzed on SPSS version 26. The mean number of coronavirus cases over the two days was calculated for each province. The mean number of cases for each of the two days under consideration was also calculated, and the results are indicated in Table 1.

Results

In Figure 1, the number of coronavirus cases rose exponentially from below hundred on 21 March to more than 1.8 million on 31 May 2020, indicating a total failure to stop the spread of the virus. An exponential increase of coronavirus cases from below hundred on 19 February 2020 to above 7000 on 10 March 2020 (Figure 2). The number of coronavirus cases then increased at a slower rate up to 3 April, and then the graph almost leveled off on 31 May 2020, showing that South Korea had successfully contained the virus.

Table 1: Total number of coronavirus cases and breakdown of deaths and recoveries per Province for 31 May and 4 June 2020^{16,22}

Province	Total coronavirus cases			Total number of Deaths			Total number of Recoveries		
	31 May	4 June	Mean	31 May	4 June	Mean	31 May	4 June	Mean
Eastern Cape	4111	4936	4524	82	95	89	2123	2460	2292
Free State	285	322	304	8	9	9	123	128	126
Gauteng	4231	4845	4538	33	33	33	2060	2222	2141
KwaZulu-Natal	2565	2869	2717	52	55	54	1248	1260	1254
Limpopo	192	206	199	3	3	3	144	146	145
Mpumalanga	131	144	138	0	0	0	86	86	86
North West	187	364	276	1	1	1	45	59	52
Northern Cape	82	95	89	1	1	1	31	33	32
Western Cape	22567	27 006	24787	525	651	588	11431	14 915	11431
Unknown	6	5							
Total	34357	40 792		705	848		17291	21311	
Mean	3818.78	4531.89		78.33	94.22		1921.22	2367.67	
Standard deviation	7243.25	8666.46		169.92	211.29		3670.87	4808.04	

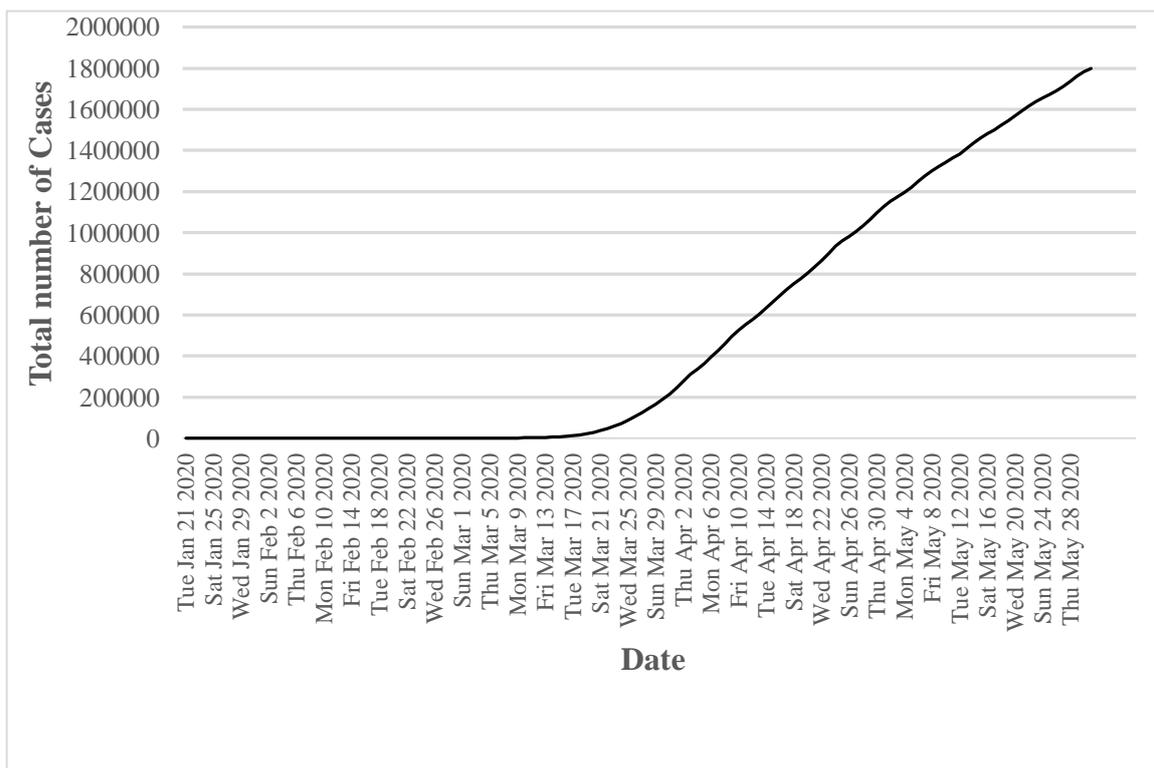


Figure 1: Total Number of Coronavirus Cases in the United States from January to May 2020¹

An exponential increase in the number of coronavirus cases is observed from April 23, 2020, where the total number of coronavirus cases is below 5000 to above 30 000 on the 31st of May 2020, indicating the failure to contain the virus in

that period (Figure 3). On the 31st of May, the Western Cape Province had the highest number of coronavirus cases (M = 24787) followed by Gauteng (M = 4538) and Eastern Cape (M = 4524).

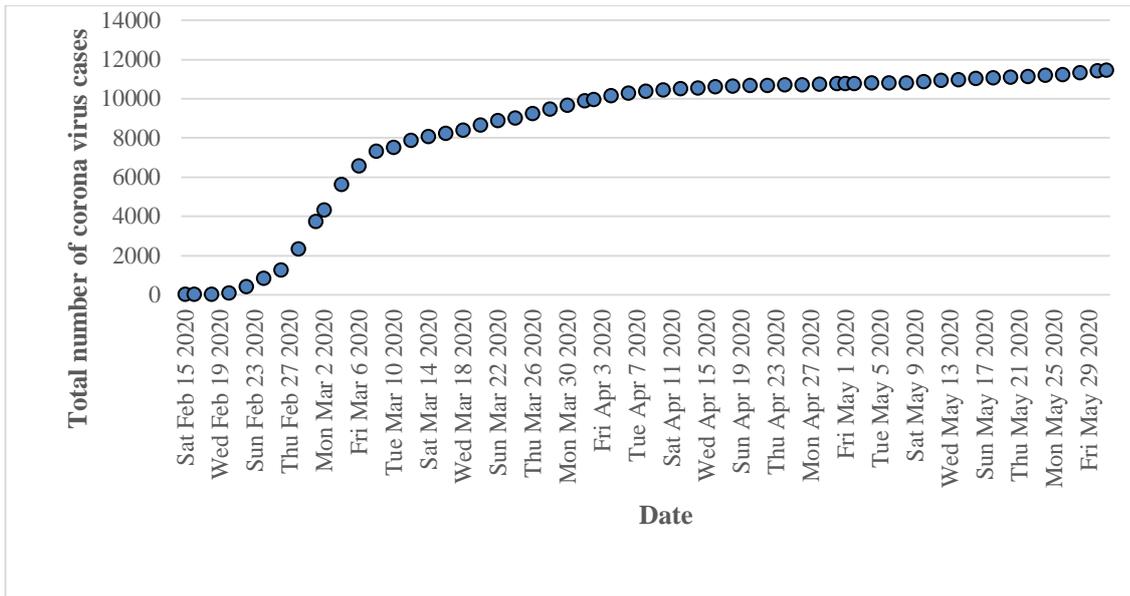


Figure 2: Total Number of Corona Cases in South Korea from February to May 2020²⁰

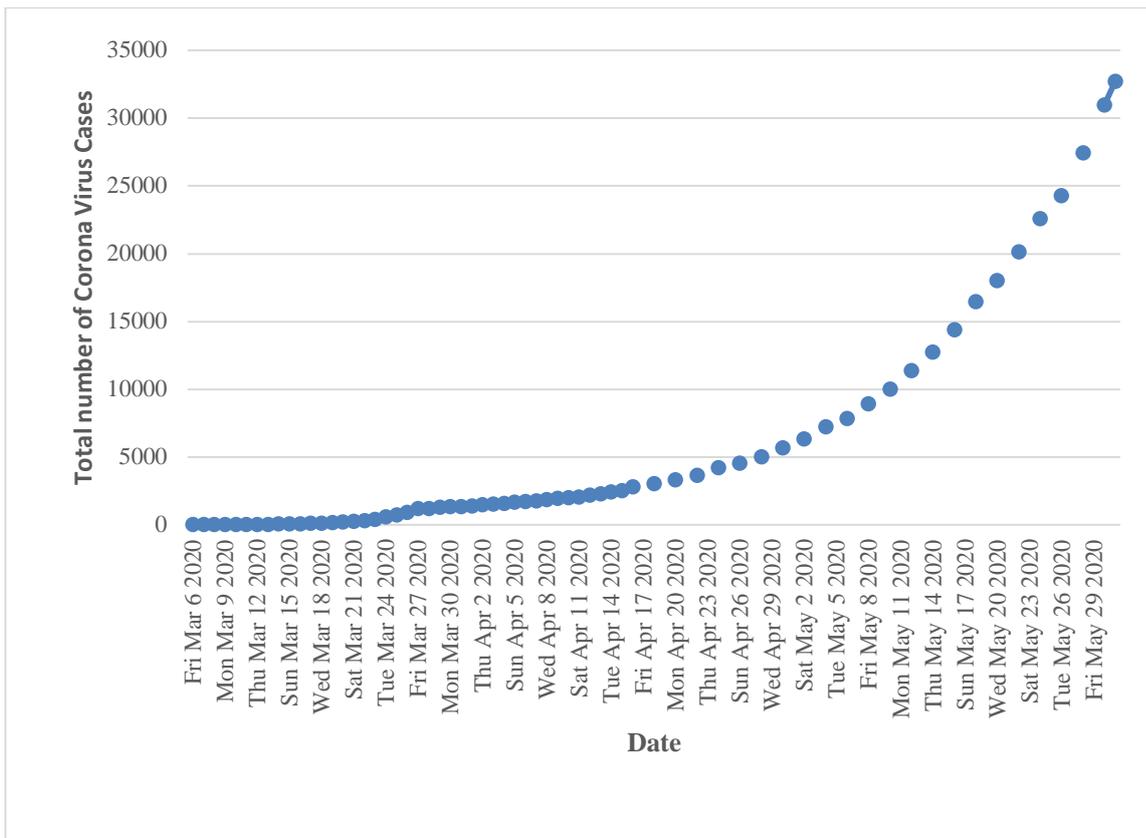


Figure 3: Total number of Corona Virus Cases in South Africa from March to May 2020²¹

There was an increase in the number of Coronavirus cases between 31 May and 4 June 2020. However, there was no statistically significant difference in the total number of coronavirus cases reported in different provinces on 31 May 2020 ($M = 3818.78$, $SD = 7243.25$) and 4 June 2020 ($M = 4531.89$, $SD = 8666.46$); $t(8) = -1.50$, $p = 0.171$. The large standard deviation is due to large differences in the number of total cases reported in different provinces.

Concerning deaths, Western Cape, Eastern Cape and KwaZulu Natal ($M = 588$, $M = 89$, $M = 54$ respectively) had the highest number of deaths over the two days under consideration. There was no significant difference in the total number of coronavirus deaths reported in different provinces on 31 May 2020 ($M = 78.33$, $SD = 169.92$) and 4 June 2020 ($M = 94.22$, $SD = 211.29$); $t(8) = -1.15$, $p = 0.284$. For the two days under consideration, the highest numbers of recoveries were observed in Western Cape ($M = 11431$), Eastern Cape ($M = 2292$) and Gauteng ($M = 2141$). There was no significant difference in the total number of coronavirus recoveries reported in different provinces on 31 May 2020 ($M = 1921.22$, $SD = 3670.87$) and 4 June 2020 ($M = 2367.67$, $S = 4808.04$); $t(8) = -1.170$, $p = 0.276$. The variables, total number of coronavirus cases in provinces, and the total number of deaths were found to be strongly correlated, $r(7) = .99$, $p < .01$. A strong positive correlation was also observed between the total number of coronavirus cases in the provinces and the total number of recoveries, $r(7) = 1.00$, $p < 0.01$. There are huge differences in the total number of coronavirus cases, deaths, and recoveries in different provinces.

Discussions

The results show a clear distinction between the total coronavirus cases in the United States of America and South Korea. The results of South Korea are consistent with observations made in Taiwan and Singapore. Taiwan's success is attributed to the ban in the export of face masks and the massive production of about 10 million masks per day²³. Besides, a 14-day quarantine period was imposed on all incoming travelers from all countries that had reported coronavirus

infections. The travelers were tested before disembarking the plane. Medical professionals, teachers, and students in Taiwan were banned from overseas travel. Thus, Taiwan dealt with the pandemic quickly and effectively due to the lessons they learned in 2003 when they struggled to deal with SARS²³. Taiwan also had a data management system that monitored individuals who were self-isolating after testing positive to the coronavirus. The successful control of the virus in South Korea is attributed to the extensive tests that were carried out quickly and were accompanied by preventive measures, which include early school closures⁹. Contrary, the USA reacted slowly by carrying out fewer tests due to shortages of test kits^{1,24}. The USA took a long time to implement quarantine measures that could have assisted them in keeping the disease under control⁹. The total coronavirus cases in Singapore and South Africa seem to be following a pattern similar to that of the USA. The two countries seemed to have managed to control the pandemic in the initial stages. However, they are failing to control the upward surge of the disease. South Africa imposed lockdown measures where all people were expected to stay indoors for more than a month, and all businesses and schools were closed²². However, activity resumed operating during the period of the rapid increase of the coronavirus pandemic. The Minister of Basic Education proposed to open schools as from the 1st of June, a period where there was an exponential increase in the number of coronavirus cases²⁵. The researcher's opined that it was a colossal mistake that could cost the lives of millions of South Africans because the virus multiplies faster in winter²⁶. The rate of testing reported by the Department of Health South Africa was about 20 000 per day in a population above 50 million²². The low rate of testing and the shortage of testing kits is consistent with what was observed in the USA, which ultimately resulted in millions of people getting infected. The opening of schools in a country with a low rate of testing and sometimes a shortage of personal protective equipment is likely to have a huge ripple effect in the pandemic in a country with limited capacity to deal with a high volume of coronavirus cases. During the outbreak of Spanish flu in 1918, South Africa

failed to react promptly and effectively, and more than 300 000 people died in a country that had a population of about 6 million. South Africa should draw its lessons from Taiwan and South Korea to mitigate massive deaths and avoid the replication of what was observed in 1918 during the outbreak of 'Spanish flu'.

There are huge differences in the total number of coronavirus cases, deaths, and recoveries. South Africa has to put in place stringent measures to mitigate the spread of the virus from the coronavirus epicenters of South Africa. Although efforts were made to stop inter-provincial movements, most of the people were not complying with the various regulations that were laid down to stop the spread of the pandemic. The characteristics of the population, that is, obedience or disobedience, play an essential role in the successful control of the disease. Audio-visual education campaign programs, preventing interprovincial movement, rapid testing, and quarantine of the infected, and providing sufficient personal protective equipment to the frontline health workers maybe some of the strategies that can save South Africa and other nations.

Limitations

Previous studies have shown that the quality of health information online is biased, misleading, and poor^{27,28}. An effort has been made to compare the quality of the information from different reliable sources to increase the credibility of the data. The study did not evaluate the behavior of people in response to the pandemic. Further studies may determine the effect of the population's behavior in response to the virus on the successful prevention of the disease.

Public Health Implications

Studies show that published articles are pivotal in recommending health safety guidelines to reduce the spread of the virus²⁹. Taiwan's success is attributed to the ban in the export of face masks and the massive production of about 10 million masks per day²³. Besides, a 14-day quarantine period was imposed on all incoming travelers from all countries that had reported coronavirus infections. The travelers were tested before

disembarking the plane. Medical professionals, teachers, and students in Taiwan were banned from overseas travel. Thus, Taiwan dealt with the pandemic quickly and effectively due to the lessons they learned in 2003 when they struggled to deal with SARS²³. Taiwan also had a data management system that monitored individuals who were self-isolating after testing positive to the coronavirus. The successful flattening of the curve in South Korea is attributed to the extensive tests that were carried out quickly and were accompanied by preventive measures, which include early school closures⁹. For the interventions to be effective, people need to abide and adapt to preventive measures. Delays in testing and taking other preventive measures may result in massive deaths, as was observed in the USA.

Conclusion and Recommendations

The massive production of cheap face masks, 14-day quarantine period imposed on travelers from other countries, banning of overseas travel, physical distancing, monitoring self-isolating individuals may be crucial in containing the spread of coronavirus. In countries like South Africa where there are large differences in the total numbers of people infected in different provinces, banning interprovincial movement is important in ensuring that the spread of the virus is kept to a minimum.

Authors' Contributions

Conceptualisation: MT and AS; Methodology: MT and AS; Resources: MT and AS; Original Draft preparation: MT; Final draft preparation and identifying suitable journal and submission: MT. All authors approved the article.

Conflicts of Interest

The authors declare no conflict of interest.

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