



# How Saudi Arabia Experience Corona: A Monthly Analysis Data

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## Abstract

This study provides evidence of the situation in Saudi Arabia during the COVID-19 pandemic. The Saudi government has taken significant action in response to the outbreak by putting in place measures to restrict the ability of the virus to spread. Cases, recoveries, and deaths were meticulously documented using MOH and/or WHO official sources. Our findings indicate that the number of confirmed cases and fatalities between May 2020 to November 2021 has decreased significantly, and the rate of recovery has been consistently strong. Furthermore, our study examined the rates of new cases and deaths in Saudi Arabia during the pandemic using Spearman's rank correlation coefficient. Overall, our findings indicate a moderate link between new cases and death rates due to the country's rigorous control during the pandemic and availability of an advanced health care system. In addition, our study documented the country's nationwide vaccination campaign conducted with locations set up in many major cities. As of May 2022, a total of 64 million doses of the vaccine had been delivered to citizens and anyone with permanent residency in the country to control the spread of the disease. According to the data that has been given in this study, advanced health care system, widespread immunization efforts, and public awareness campaigns in the Kingdom of Saudi Arabia were effective in limiting the virus's capacity to spread further during COVID-19 pandemic.

**Keywords:** COVID-19, SARS-CoV-2, coronavirus, immunization, vaccine, Saudi Arabia.

## Introduction

Coronaviruses are a diverse group of viruses that can cause a range of diseases in humans and animals, varying from mild to severe. First isolated in the 1960s from individuals with upper respiratory tract infections, human coronaviruses (HCoVs) are responsible for a variety of respiratory illnesses [1]. Among the six known HCoVs, severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV), and SARS-CoV-2 (the cause of COVID-19) are the most widely recognized [2].

Middle East respiratory syndrome (MERS) is a severe respiratory disease caused by a novel beta coronavirus with single-stranded, positive sense RNA (MERS-CoV) that has a mortality rate of more than 35% [4,3]. The first case of MERS was identified in Saudi Arabia in June 2012 [5]. Transmission of MERS-CoV between dromedary camels and humans seems to be partially explained by direct or indirect contact, while transmission in the general population appears to be relatively inefficient ( $R_0 < 0.7$ ) [6], however, the virus appears to be transmitted very efficiently among particularly vulnerable populations. Common initial symptoms of MERS-CoV include fever  $>38^\circ\text{C}$ , cough, dry cough, chills or rigors, sore throat, and headache [7].

The first case of severe acute respiratory syndrome (SARS-CoV) occurred in China in November 2002 [8], and the virus subsequently spread to 26 countries, resulting in 8098 SARS cases and 774 deaths by July 2003 [9]. Transmission of the virus appears to occur through close contact with an infected individual and may be facilitated by droplet spread. However, the efficiency of infection seems to be relatively low, with an infectivity index of 3 [10].

Towards the end of 2019 and early 2020, several cases of a novel coronavirus infection emerged among humans in Wuhan, China. All human-isolated SARS-CoV-2 viruses were found to be genetically similar to coronaviruses obtained from bat populations, specifically those from the genus *Rhinolophus*. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 as a pandemic disease [11]. As of July 28, 2020, the global confirmed cases have surpassed 16 million with a mortality rate of around 4%, as reported by the WHO. These numbers have inevitably increased until effective treatments were found and mitigated through an effective vaccination strategy [12].

SARS-CoV-2, a novel beta coronavirus, shares 79% genome sequence identity with SARS-CoV and 50% with MERS-CoV [13]. It has a diameter of approximately 125 nm and a relatively large ~30 kb positive-sense single stranded RNA genome). The virion is spherical, enveloped, non-segmented, and covered in spike-like

proteins made up of three proteins: Spike protein (S), Envelope protein (E), and Membrane protein (M). The name coronavirus is derived from the crown-like spikes on its surface, mainly composed of protein S [12]. COVID-19 symptoms can be categorized as systematic and respiratory symptoms, similar to SARS-CoV and MERS. Systematic symptoms consist of fever, dry cough, fatigue, headache, sputum production, hemoptysis, acute cardiac injury, hypoxemia, lymphopenia, and diarrhea. Respiratory symptoms include sneezing, rhinorrhea, sore throat, pneumonia, ground-glass opacities, RNAemia, and acute respiratory distress [14]. According to recent research, the estimated basic reproduction number ( $R_0$ ) of SARS-CoV-2 infection is approximately 2.2 [15]. This study aimed to examine the rates of new cases and deaths in Saudi Arabia during the pandemic using Spearman's rank correlation coefficient.

## Materials & Methods

The present study compiled and organized the monthly data on confirmed COVID-19 cases, recoveries, and deaths in Saudi Arabia from March 2020 to April 2022. This data was obtained from the Saudi Ministry of Health and the World Health Organization (WHO) and organized in a matrix format with each row indicating the date and each column representing the number of newly confirmed cases, accumulated cases, accumulated recoveries, and accumulated deaths.

## Results

### Cases rates

The incidence of COVID-19 in Saudi Arabia was highest in the last week of June 2020 and lowest in the last week of January 2021, as illustrated in (data not shown). A total of 573 cases of COVID-19 recorded in Riyadh in March 2020, increased to 38,384 cases in January 2022. Fortunately, there were reductions in number of cases reported in November 2021 to 357 cases. In Jeddah, 223 new cases were reported on March 2020, increased to 19770 cases in January 2022. While in Makkah, a total number of 294 cases were reported on March 2020. The highest number of cases reported in the city was 9836 on May 2020 and the lowest number was 76 cases in November 2021. Furthermore, some cities in Saudi Arabia reported low numbers of new cases in March 2020, including Al Khobar with 28 cases, Tabuk with 6 cases, Madinah with 75 cases, Jazan with 9 cases, and Buriyadah with 5 cases, while Hail did not report any new cases.

### Death rates

Regarding death records among Saudi Arabia cities, there is high incidence of covid-19 deaths in last week of June 2020, while the lowest deaths in last week of Jan 2021 (data not shown).). The highest number of deaths were reported on July 2020 in Riyadh with 462 deaths. In Jeddah, the highest incidence of deaths were 336

deaths reported on June 2020. In June 2020, 196 deaths were reported in Makkah. In October 2020, 167 number of deaths was reported in Abha. The lowest incidence rate of deaths was reported in Al Khobar, Tabuk, Madinah, Arar, Jazan, Buriyadah and Hail.

## Riyadh

**Table-1**

Date	Cases	Recovery	Deaths
Mar2020	573	22	1
April 2020	3948	1155	6
may 2020	16,186	13,170	23
June 2020	25,946	20,603	329
Jul 2020	6704	12,697	462
Aug 2020	2105	4987	166
Sep 2020	1084	1849	94
Oct 2020	1009	2143	42
Nov 2020	1640	2070	21
Dec 2020	1055	1178	14
Jan 2021	1370	1420	15
Feb 2021	2946	2791	11
Mar 2021	4348	3665	20
Apr 2021	9928	8315	36
May 2021	9158	9962	37
Jun 2021	5941	6713	68
Jul 2021	7214	6995	62
Aug 2021	2817	3861	32
Sep 2021	607	620	12
Oct 2021	490	362	6
Nov 2021	357	460	2
Dec 2021	2167	1109	2
Jan 2022	38,384	28,824	5
Feb 2022	17680	26677	5
Mar 2022	1448	2706	2
Apr2022	620	1720	1
Total	165,725	166,074	1474

- The highest number of cases was in January 2022 and the lowest number was in November2021.
- The highest number of deaths was in July 2020 and the lowest was in (April2022, March 2020).

## Jeddah

**Table 2**

Date	Cases	Recovery	Deaths
Mar2020	223	40	1
Apr 2020	3674	464	36
May 2020	10980	10158	124
June 2020	10301	9865	336
July 2020	4669	5985	172
Aug 2020	1672	3334	142
Sep2020	1552	2894	152
Oct2020	378	618	89
Nov2020	602	448	91
Dec2020	503	420	65
Jan2021	549	501	29
Feb2021	485	503	29
Mar2021	748	478	26
Apr2021	2812	2092	37
May 2021	4602	3901	47
June 2021	5490	5916	62

July 2021	2707	2774	62
Aug2021	1518	2091	30
Sep2021	292	179	23
Oct2021	249	194	7
Nov2021	284	284	0
Dec2021	1391	591	2
Jan2022	19770	17347	4
Feb2022	3785	6164	3
Mar2022	660	1158	3
Apr2022	723	1713	2
Total	80619	80112	1574

- The highest number of cases was in January 2022 and the lowest number was in march 2020
- The highest number of deaths was in June 2020 and the lowest was in November 2021

## Makkah

Table 3

Date	Cases	Recovery	Deaths
Mar2020	294	82	2
Apr2020	5499	494	73
May 2020	9836	11251	143
June 2020	9160	7159	196
July 2020	4122	7500	102
Aug2020	2267	2499	123
Sep2020	1638	2331	104
Oct2020	1068	1469	70
Nov2020	751	600	61
Dec2020	329	522	33
Jan2021	320	342	14
Feb2021	421	341	11
Mar2021	819	598	8
Apr2021	1387	1200	19
May 2021	2269	1956	17
June 2021	2857	2825	41
July 2021	1644	2028	41
Aug2021	562	316	76
Sep2021	106	57	39
Oct2021	80	79	1
Nov2021	76	61	2
Dec2021	1183	240	4
Jan2022	9511	8366	6
Feb2022	1402	1402	7
Mar2022	284	484	3
Apr2022	430	1336	6
Total	58315	55538	1202

- The highest number of cases was in January 2022 and the lowest number was in November 2021
- The highest number of deaths was in June 2020 and the lowest was in October 2021

## Alkhobar

Table 4

Date	Cases	Recovery	Deaths
Mar2020	28	1	0
Apr2020	266	45	2
May 2020	1652	1300	2
June 2020	3415	1404	7
July 2020	1788	3288	2
Aug2020	284	620	2
Sep2020	195	406	0

Oct2020	77	101	0
Nov2020	55	115	7
Dec2020	47	27	4
Jan2021	97	88	3
Feb2021	142	149	0
Mar2021	164	115	2
Apr2021	302	253	4
May 2021	217	260	10
June 2021	496	361	3
July 2021	648	635	2
Aug2021	156	352	0
Sep2021	23	10	0
Oct2021	32	29	0
Nov2021	28	32	1
Dec2021	135	74	0
Jan2022	2118	1709	1
Feb2022	784	1229	1
Mar2022	62	73	0
Apr2022	12	87	0
Total	13223	12763	53

- The highest number of cases was in June 2020 and the lowest number was in April 2022
- The highest number of deaths was in May 2021 and the lowest was in (March 2022, April 2022, 2021 Dec, Oct 2021, Sep 2021, Aug 2021, Feb2021, Oct 2020, Sep 2020, Mar 2020).

## Tabouk

Table 5

Date	Cases	Recovery	Deaths
Mar2020	6	0	0
Apr2020	220	43	1
May 2020	491	592	2
June 2020	656	634	12
July 2020	1263	1630	29
Aug2020	916	864	13
Sep2020	191	446	10
Oct2020	49	45	9
Nov2020	138	124	1
Dec2020	126	130	3
Jan2021	98	53	3
Feb2021	38	32	0
Mar2021	133	73	3
Apr2021	387	278	1
May2021	441	470	3
June 2021	296	378	0
July 2021	263	210	3
Aug2021	207	289	1
Sep2021	33	52	0
Oct2021	26	25	1
Nov2021	19	16	0
Dec2021	61	43	0
Jan2022	755	533	1
Feb2022	731	838	0
Mar2022	81	195	0
Apr2022	19	41	1
Total	7644	8034	97

- The highest number of cases was in July 2020 and the lowest number was in march 2020
- The highest number of deaths was in July 2020 and the lowest was in (June 2021, Mar 2020, Feb 2021, Sep 2021, Nov 2021, Dec 2021, Feb 2022, Mar 2022).

**Almadinah****Table 6**

Date	Cases	Recovery	Deaths
Mar2020	75	0	6
Apr2020	4028	311	26
May 2020	5508	8256	18
June 2020	4091	3770	48
July 2020	2727	3039	18
Aug2020	1475	2010	14
Sep2020	3540	1503	6
Oct2020	1894	2137	2
Nov2020	1098	1329	2
Dec2020	253	427	20
Jan2021	136	126	8
Feb2021	140	123	24
Mar2021	182	117	30
Apr2021	371	372	15
May2021	852	624	8
June2021	409	599	15
July 2021	598	459	29
Aug2021	317	470	5
Sep2021	77	92	8
Oct2021	52	58	1
Nov2021	55	55	0
Dec2021	220	112	1
Jan2022	4620	3932	2
Feb2022	1585	2191	0
Mar2022	354	514	0
Apr2022	407	431	0
Total	35064	33057	306

- The highest number of cases was in May 2020 and the lowest number was in October 2021
- The highest number of deaths was in June 2020 and the lowest was in February 2022, Mar 2022, Apr 2022, Nov 2021).

**Jazan****Table 7**

Date	Cases	Recovery	Deaths
Mar2020	9	0	0
Apr2020	56	24	1
May 2020	21	35	1
June 2020	348	240	10
July 2020	983	592	16
Aug2020	1529	1165	23
Sep2020	337	719	55
Oct2020	194	174	52
Nov2020	47	249	29
Dec2020	28	94	11
Jan2021	42	30	5
Feb2021	37	36	0
Mar2021	66	52	3
Apr2021	139	86	2
May 2021	244	201	13
June 2021	520	498	16
July 2021	560	520	23
Aug2021	443	557	15
Sep2021	42	22	14
Oct2021	25	25	6
Nov2021	11	7	1
Dec2021	31	26	1

Jan2022	1919	1371	2
Feb2022	1077	3670	2
Mar2022	115	207	3
Apr2022	85	89	1
Total	8908	10689	305

- The highest number of cases was in Jan 2022 and the lowest number was in March 2020
- The highest number of deaths was in Sep 2020 and the lowest was in (Mar 2020, February 2021).

## Hail

**Table 8**

Date	Cases	Recovery	Deaths
Mar2020	0	0	0
Apr2020	32	2	0
May 2020	321	142	0
June 2020	1131	453	3
July 2020	2411	2254	22
Aug2020	1311	1640	24
Sep2020	548	581	21
Oct2020	407	366	25
Nov2020	368	479	21
Dec2020	75	142	10
Jan2021	96	97	5
Feb2021	79	104	1
Mar2021	273	140	3
Apr2021	434	446	9
May 2021	285	306	15
June 2021	272	359	26
July 2021	886	571	17
Aug2021	410	691	7
Sep2021	46	34	4
Oct2021	14	12	2
Nov2021	9	9	3
Dec2021	20	29	2
Jan2022	774	523	1
Feb2022	752	913	2
Mar2022	73	160	1
Apr2022	17	32	1
Total	11044	10485	225

- The highest number of cases was in July 2020 and the lowest number was in March 2020
- The highest number of deaths was in June 2021 and the lowest was in (March 2020, Apr 2020, May 2020).

## Buriydah

**Table 9**

Date	Cases	Recovery	Deaths
Mar2020	5	0	0
Apr2020	165	25	1
May 2020	592	270	3
June 2020	1254	824	12
July 2020	1857	2173	26
Aug2020	952	1035	33
Sep2020	176	505	23
Oct2020	215	184	25
Nov2020	236	260	14
Dec2020	81	163	9
Jan2021	75	47	5
Feb2021	111	97	4
Mar2021	158	139	5
Apr2021	200	215	7
May 2021	252	283	7

June 2021	373	431	7
July 2021	563	453	9
Aug2021	330	456	7
Sep2021	65	68	3
Oct2021	38	31	2
Nov2021	24	14	1
Dec2021	48	38	2
Jan2022	1096	684	2
Feb2022	758	1048	0
Mar2022	95	216	2
Apr2022	29	46	0
Total	9748	9705	209

- The highest number of cases was in July 2020 and the lowest number was in March 2020
- The highest number of deaths was in August 2020 and the lowest was in (Mar 2020, Feb 2022, April 2022)

## Abha

**Table 10**

Date	Cases	Recovery	Deaths
Mar2020	11	0	0
Apr2020	24	35	0
May 2020	62	58	0
Jun 2020	1806	514	5
Jul 2020	2080	2865	4
Aug 2020	683	996	10
Sep 2020	240	275	98
Oct 2020	217	227	167
Nov 2020	88	45	22
Dec 2020	90	60	16
Jan 2021	45	51	7
Feb 2021	47	32	5
Mar2021	59	50	4
Apr 2021	257	180	14
May 2021	393	426	15
Jun 2021	816	561	9
Jul 2021	1194	1185	10
Aug 2021	335	595	21
Sep 2021	30	12	13
Oct 2021	8	12	3
Nov 2021	12	6	2
Dec2021	34	24	0
Jan2022	2117	1419	2
Feb2022	1178	1736	4
Mar2022	212	367	2
Apr2022	114	138	0
Total	12152	11869	433

- The highest number of cases was in Jan 2022 and the lowest number was in October 2021
- The highest number of deaths was in October 2020 and the lowest was in (March 2020, Apr 2020, May 2020, Dec 2021, Apr 2022).

## Arar

**Table 11**

Date	Cases	Recovery	Deaths
Mar2020	2	0	0
Apr2020	26	7	0
May 2020	55	52	0
June 2020	116	125	11
July 2020	476	370	13
Aug2020	189	206	31
Sep2020	342	247	8



Oct2020	170	145	4
Nov2020	79	100	4
Dec2020	32	78	2
Jan2021	90	122	0
Feb2021	92	98	0
Mar2021	253	130	3
Apr2021	274	271	4
May 2021	258	364	8
June 2021	221	193	1
July 2021	390	315	3
Aug2021	185	270	1
Sep2021	25	74	1
Oct2021	6	9	0
Nov2021	0	9	1
Dec2021	59	32	0
Jan2022	368	295	0
Feb2022	393	500	0
Mar2022	39	85	0
Apr2022	2	3	1
Total	4142	4100	96

- The highest number of cases was in July 2020 and the lowest number was in November 2021.
- The highest number of deaths was in August 2020 and the lowest was in (Mar 2020, Apr 2020, May 2020, Jan 2021, Feb 2021, Oct 2021, Dec 2021, Jan 2022, Feb 2022, Mar 2022).

### Immunization in the KSA

Saudi Arabia has been very keen to provide vaccines for the Corona virus in abundance in most cities, and they are considered free for all citizens and residents. The high vaccination rates are an indication of the Kingdom's keenness on public health and the awareness of citizens and residents about the epidemic.

**Table 12**

Date	Vaccines
Dec 2020	96,502
Jan 2021	344,465
Feb 2021	392,072
March 2021	3,599,533
Apr 2021	4,911,419
May 2021	4,864,301
Jun 2021	3,672,578
Jul2021	8,986,886
Aug 2021	10,265,432
Sep 2021	4,985,527
Oct 2021	3,602,147
Nov 2021	1,723,939
Dec 2021	3,449,341
Jan 2022	7,566,030
Feb 2022	2,493,797
March 2022	1,617,053
April 2022	1,574,890
May 2022	396,835
Total	64,542,747

### International Examples

**Table 13**

Country	Relationship between new cases/ new deaths Spearman equation	
UK	R=0.51	Moderate correlation
Saudi Arabia	R=0.65	Moderate correlation
USA	R=0.74	Strong correlation

## Discussion

The purpose of this study was to assess the impact of COVID-19 in Saudi Arabia. The number of newly diagnosed cases, recovered cases, deaths as well as the national immunization rate in 10 major cities from December 2019 to May 2022 were documented. To the best of our knowledge, this study provides the first insights into the pandemic using data obtained from the Ministry of Health (MOH) and/or the World Health Organization (WHO) official sources. Although it is not yet conceivable to foresee the pandemic's long-term implications, the Saudi government's measures and actions to halt the outbreak and protect public health have been effective.

In the past decade, Covid-19 has emerged as one of the most critical global health issues, with varying degrees of intensity in different countries, leading to serious health and socioeconomic concerns. Saudi Arabia was one of the countries affected by the virus, with the first confirmed Covid-19 case reported by the Saudi Ministry of Health in March 2020. The number of confirmed cases in the country gradually increased, causing panic among individuals, families, and the government. To curb the spread of the virus, the government took extensive assessment and control measures, such as suspending religious, recreational, sports, and commercial gatherings. Thereafter, the infection rate has declined and recovery rate increase and mortality rate was moving to its minimum rate.

Our results showed a significant increase in the number of fatalities during June and July of 2020. We also observed a higher incidence of cases in larger, metropolitan areas with high population densities, such as Riyadh, due to the presence of large commercial centers and entertainment venues. Conversely, smaller areas with lower population densities demonstrated a lower incidence of COVID-19 cases.

To lessen its spread, extensive assessment and control measures were later implemented, including the suspension of religious, recreational, sporting, and commercial gatherings. Further restrictions were implemented on March 5, 2020, when Saudi Arabia announced that the Grand Mosque in Makkah and the Prophet's Mosque would be closed for sterilization purposes and decrease the gathering.

Despite all restrictions, the incidence and death cases were on the rise. According to our data, the number of deaths peaked in June and July 2020. As a result, Saudi Arabia declared a work suspension in all government departments and private institutions to prevent the spread of infection, with the exception of security, catering and pharmacies, food stores, gas stations and health sector. As a result, by September 2021, practically all control measures had been discontinued, and COVID-19 had spread to a visibly low level.

We also observed a high number of COVID-19 incidences in developed and large cities, such as Riyadh. That might be due to its enormous populations, numerous complexes, shopping malls, and entertainment venues. On the contrary, in small areas, we found a decrease number of cases due to its small population. In fact, most COVID-19 patients with severe illness have increased levels of IL-1b, which is associated with ARDS [16]. Similarly, early blockade of the IL-1 receptor was found to be a Promising therapeutic Strategy against inflammation development of the cytokine storm, leading to respiratory failure in COVID-19 patients [17]. Recently, it has been reported that increased levels of IL-6 enhance the inflammatory process and contribute to cytokine storm thereby worsening prognosis [14]; however, targeting IL-6 receptors (IL-6r) with a specific monoclonal antibody (Tocilizumab) has been shown to mediate an effective therapeutic option in COVID-19 patients who are at risk of developing cytokine storms [18].

The current data documented different trends in disease incidence, recovery and death rate. Given the fact that same restriction measures and same protective protocols was applied in all parts of the Kingdom, this variation in trend could be due to differences in the citizen's compliance to the protective measure. In addition, there are many differences in the population density among different cities. The diversity of the nationalities of the residents is quite variable among Saudi counties. Another contributing factor is the different cultures between the individuals. This can lead to different adherence to the protocols, different epidemiological distribution of an endemic due to genetic and other factors. This diversity would lead to different attitude, knowledge and different practice towards the disease. Another factor could be due to failure of access to reporting system in some small cities or due to lack of knowledge despite the effort spend in public education [19-21]. This study outlined the epidemiological status of COVID-19 in KSA concerning the rate of infection, death rate and recovery rate. It has shown the rate of active disease to be fluctuating over time. This reflects the implementation of successful healthcare system and treatment protocol. In addition, restriction of international travel and household quarantine helped in the slowdown of the spread of disease. As the number of cases increase, new measures were established and put in place immediately. All school's pre-school and universities were converted to online courses [22]. Online shopping and postal delivery was applied in most organisations. The authorities of every administration or province were allowed to take further measures appropriate to the circumstances. For example, the government of Saudi Arabia stopped issuing Umrah visas to all foreign visitors, which was later followed by suspending Umrah to everyone to combat the spread of Covid 19 [22].

According to our data, the number of confirmed cases and fatalities between May 2020 to November 2021 has decreased significantly and the rate of recovery has been consistently strong. Although this figure was shortly interrupted during the period between May and July 2021, consistent with SARS-CoV-2 second wave reports [23-28], the number of confirmed cases and fatalities resumed to drop the following months as prompt response and rigorous measures taken by the government, including the installation of a curfew throughout the nation, limits on travel, and regulations for keeping social distance, were successful in limiting the virus's capacity to spread further [29-30].

Moreover, our study examined the rates of new cases and deaths in Saudi Arabia, the United Kingdom, and the United States using Spearman's rank correlation coefficient. Our data show that the relationship between new cases and mortality is strongest in the United States, with a moderate link found in both the United Kingdom and Saudi Arabia. A stronger correlation between new cases and deaths may have been seen if the mortality rate were lower. Thus, possible contributors include variations in immunization rates, demographic make-up, and availability to medical care.

Following the KSA's implementation of the corona vaccine in December 2020, both a gradual decline in the new case numbers and an improvement in recovery rates were detected. There was an increase in COVID-19 incidence during the second wave in January 2020, along with a decline in the mortality rate. That might be due to the vaccine's impact. Our findings agreed with [31] study.

The great contributor to the containment of COVID19 in Saudi Arabia was due to vaccination. Vaccination was available immediately after its availability in the market. The vaccine was available for every person who live in the country free of charge. The vaccination system was very organized and easy to get to all citizens and residents. These preventive and control measures together with the implementation of successful healthcare and

COVID-19 vaccines/treatment protocols were effective ways to control the epidemic of COVID-19 in Saudi Arabia.

In December 2020, the Saudi Food and Drug Authority approved the Pfizer Covid-19 vaccine, and elderly people and frontline healthcare workers were prioritized in the first phase of vaccine distribution. The AstraZeneca vaccine was also approved in February 2021. Following the administration of these vaccines, there was a gradual decrease in the number of COVID-19 cases, and an increase in the recovery rate was observed. In January 2021, during the second wave, there was an increase in the number of cases, but a decrease in the death rate was observed, which can be attributed to the vaccine's effect.

Meanwhile, Saudi Arabia has made substantial headway towards its aim of making the COVID-19 immunization widely accessible in all of the country's major cities [30-32]. As of May of 2022, the Kingdom provided 64 million vaccine doses, a number that reflects the government's commitment to bettering citizens' health and the public's growing knowledge of the condition. The successes of the immunization program is attributed to the government's efforts to educate the people about the importance of the vaccine and its availability as well as the country's advanced healthcare system [30-33]. Government investments in healthcare infrastructure and technology have made mass vaccination considerably much easier for medical personnel. A nationwide vaccination campaign was conducted with locations set up in many major cities to fulfil the rising demand for the service. In addition, the government is leading the charge in spreading awareness about the need of immunizations in halting the spread of COVID-19 and keeping the people healthy as evidence suggests that vaccinations may help stop the spread of the COVID-19 pandemic [33].

According to the results of this study, immunization is an option for preventing the spread of COVID-19 and reducing the disease's impact on public health. As a country, Saudi Arabia clearly values public health, as seen by the high immunization rates for both adults and children. Immunization campaigns must continue, and the general population must remain vigilant in its observance of public health regulations. It is reasonable to predict that Saudi Arabia will be able to meet the difficulties posed by COVID-19 and improve its ability to respond to future health crises if the government, healthcare experts, and the general public continue to work together.

## Conclusion

This study provides evidence of the situation in Saudi Arabia during the COVID-19 pandemic. The Saudi government has taken significant action in response to the outbreak by putting in place measures to restrict the ability of the virus to spread. Cases, recoveries, and deaths were meticulously documented, and the number of confirmed cases and fatalities has decreased because of these efforts. Thus, it is not yet possible to predict the pandemic's long-term implications, measures and actions implemented by the Saudi government to stop the outbreak and protect public health have been effective.

## Conflict of Interest

There was no conflict of interest.

## Funding Statement

The entire financial burdens were burn by the researchers.

## Data Availability

Data would be available upon reasonable request by corresponding author.

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