



## ORIGINAL ARTICLE

## COVID-19 vaccines and Epidemic Trends of COVID- 19 in Palestine Running title: COVID- 19 trends in Palestine

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Received: 09/02/2022

Accepted: 09/05/2022

Published: 01/10/2022

### OPEN ACCESS

#### Doi:

<https://doi.org/10.52865/KYQN9708>

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**Funding:** Nil

**Competing Interests:** The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

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### ABSTRACT:

**Background:** Coronavirus disease 2019 (COVID-19), is rapidly spreading globally due to high transmissibility and pathogenicity.

**Aim:** The purpose of this study is to determine the growth rate and CFR of COVID-19 in Palestine, as well as to compare them in the pre and post-vaccination periods.

**Methods:** A retrospective analytical design was used. The data of daily confirmed cases and daily deaths were taken from the Worldometer statistics, WHO websites, and MOH report for the two politically split regions of Palestine, the Gaza Strip, and the West Bank. The data was gathered to include one hundred days before initiating vaccination against the disease, beginning on December 7, 2020, and ending on June 25, 2021. The growth rate and case fatality rate were calculated using related formulas and the Microsoft Excel program was used to analyze the data.

**Results:** During the study period, there were 217386 cases of COVID-19 and 2772 deaths in Gaza and the west bank. The high growth rate was found in two months December 2020 (38.3%), and March 2021 (30.8%), and was declined in May and June 2021. The case fatality rate, on the other hand, fluctuated throughout the research period. During the study period, the number of patients with COVID-19 and the number of deaths from this disease is decreasing in Palestine.

**Conclusion:** The intervention measures in Palestine seem to be effective in controlling the COVID-19 epidemic and reducing the reproduction rate in the study period. Continuous preventive measures and vaccination for the population are recommended.

**Keywords:** COVID-19; Worldometer; Case Fatality Rate; Growth Rate; Epidemic; trend; Palestine



## Introduction

The outbreak of coronavirus disease (COVID-19) began in late 2019 in Wuhan, China (Graham et al., 2020; Lu, 2020; Wu et al., 2020). It is rapidly spreading around the world due to its high transmissibility and pathogenicity (Zhou et al., 2020; Munster et al., 2020). However, since the end of February 2020, the rate of increase in confirmed cases in the rest of the world has been faster than in China (Verity et al., 2020; WHO, 2020). The COVID-19 infection causes mild symptoms in the majority of infected patients, such as fever, coughing, and shortness of breath (Çalica Utku et al., 2020). In the elderly and patients with comorbidities; however, the disease progresses to severe pneumonia and multiple organ failure, with a 14% mortality rate (Shams et al., 2022).

The Palestinian territories are divided into three areas separated geographically; the West Bank, Gaza Strip, and East Jerusalem. The estimated total Palestinian population is 13 million, of them about 5 million live in Palestine (3,008 in WB and over 2 million in GS). According to Worldometer there are 516,370,388 cases, 6,274,294 deaths, and 471,090,455 recovered cases (Worldometers. 2022). In Palestine, there are 581,940 COVID- 19 cases, 5,353 deaths, and 576,242 recovered cases (Worldometers. 2022).

Vaccines are one of the most successful and cost-effective human health interventions. Every year, global vaccination programs save the lives of up to 4-5 million people, according to the WHO (WHO, 2020). Vaccination programs, in addition to providing individual protection, strive for herd immunity (immunization of a large proportion of the population to protect unvaccinated, immunologically naive, and immunocompromised individuals by reducing the percentage of vulnerable hosts to a level below the transmission threshold) (Mallory et al., 2018).

Palestine started vaccination of health care workers in February 2021. The first shipment of 37,440 doses of the Pfizer COVID-19 vaccine and 24,000 doses of the Astra Zeneca COVID-19 vaccine from the COVAX facility was reached on March 17, 2021, as part of the first wave allocation, to cover 20% of the Palestinian population (UNICEF, 2021).



The case fatality rate (CFR) is defined as "the proportion of patients with a specific disease or condition who die within a given time period" (Yoshikura, 2012). The CFR plays an important role in managing public health strategies at the national and international levels (Rajgor et al., 2020). The purpose of this study is to determine the growth rate and CFR of COVID-19 in Palestine, as well as to compare the pre and post- vaccination periods.

### Methodology Study Design

A retrospective analytical design was used.

### Method and Materials

The data of daily confirmed cases and daily deaths were taken from the Worldometer statistics and WHO websites for the two politically split regions of Palestine, the Gaza Strip, and the West Bank. The parameters were calculated based on the Worldometer statistics website (<https://www.worldometers.info/coronavirus/>), WHO website, and MOH reports (<https://www.corona.ps/details>)

**Total active cases:** Registered daily from the Worldometer website

**New cases:** Registered daily from the Worldometer website

**Daily recovered cases** = (Total active cases in same day+ new cases) – total active cases next day

**Deaths:** Registered daily from the Worldometer website

**Cumulative cases**= Total active cases yesterday+ new cases

**Cumulative deaths cases** = daily deaths+ total deaths yesterday

*Case Fatality Rate (CFR) and growth rate were calculated using their formulas*

**CFR**= (Deaths/ the confirmed cases) \*100

**Growth rate**= (new-old/old) \*100



Microsoft Excel was used to analyze the data. A comparison was conducted to gather information about the pandemic trend pre and post-vaccination.

The data was collected to include 100 days before starting the vaccination campaign and continue 100 days after the starting vaccination campaign (7th of December, 2020 to 25 of June 2021). The 100 days period was chosen solely to equalize the two periods as we completed data collection and began the analysis process.

### Missing Data

There was missed data in six days of the category of the new cases, and eight cases in the death cases category. These days exist from the period 13th of May, 2021 to the end of data collection 25th of June, 2021 period. Missed data were managed using the method of means of nearby points (four points) for each day.

### Ethical Considerations

Ethical approval was obtained from the Palestinian Health Research Council (PHRC/HC/894/21).

### Results Surveillance





The risk assessment decreased in January, and February as the total number of active cases was (8136) and (14634) respectively. However, it is high in March as the number of cases increased to 24297 by the end of March. Then, the number of active cases started to decrease during April (20880) and dropped to (4077), and (2728) at the ends of May, and June respectively .

### Growth Rate

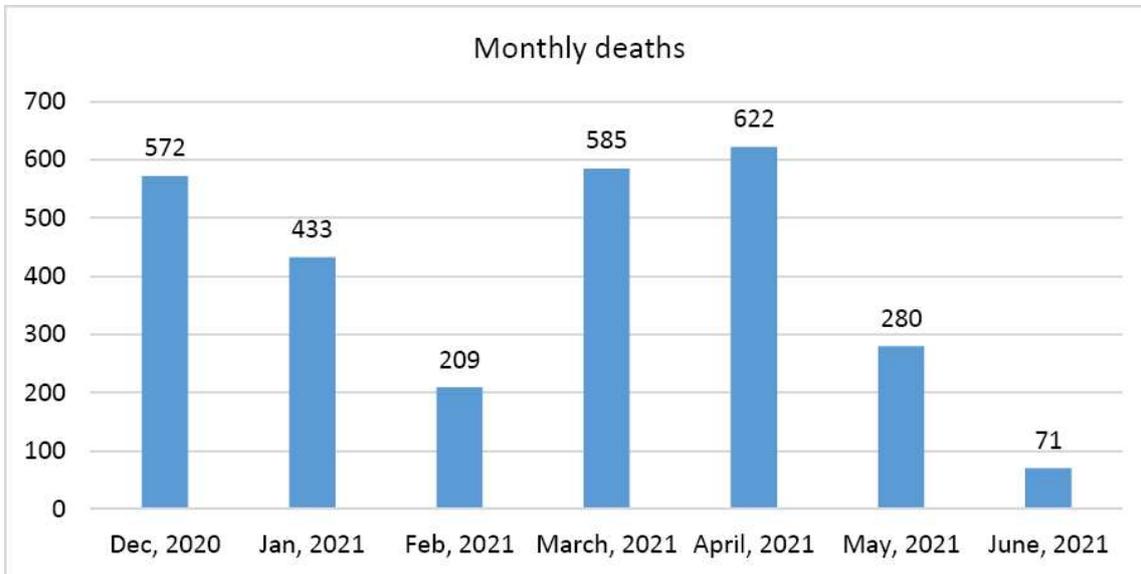
During the study period, Palestine registered 217386 cases of COVID- 19. Figure (1) showed the growth rate of the total COVID- 19 cases pre and post-starting the vaccination campaigns in the opt (17, March 2021). The cut of point (green arrow) shows the starting vaccination point. It is obvious that the growth rate was high in December (38.3 %) of 2020 but then fell to 14.2 % and 15.2 % in January and February of 2021, respectively. Following that, it increased by 15.2 % in February and will more than double to 30.8 % in March 2021.



**Figure (1)** Growth rate of total COVID- 19 cases

### Mortality

### Case Fatality Rate



**Figure (2):** Monthly deaths

During the study period, there are 2772 deaths registered in Palestine as shown in figure2. The highest number of deaths were registered during December 2020 (572) March 2021 (585), and April (622), 2021



**Figure (3):** Case Fatality Rate



As shown in Figure 3, CFR in the research period grew by 0.93 % in December 2020, then by 1.11 % in January and February 2021, and by 1.14 % in March and April 2021. Following that, it was marginally reduced to 1.09 % in March and April 2021, and 1.08 % in March and April 2022. Then, in May and June 2021, there was a tiny increase to 1.13 and 1.14, respectively. During the research period, the overall CFR was 1.1. As a result, the mortality trend fluctuated and remained constant during the study period. notwithstanding an increase in the frequency of expansion of the total number of COVID-19 cases.

### Discussion

This study assessed the time trend of morbidity and mortality due to COVID-19 in Palestine one hundred days before starting vaccination and one hundred days after starting vaccination (7<sup>th</sup> December 2020 to 25<sup>th</sup> June 2021) taking the day 17 March 2021 as a separate point between the two-time lines. The growth rate trend was decreasing during January 2021 this drop has occurred as a result of the several new preventive measures which have been taken by the Ministry of Interior started on 5<sup>th</sup> December 2021. The first of these preventive measures is the closure of public institutions such as schools, universities, and mosques. Second, every Friday and Saturday, impose a complete curfew. Third, enforce an evening curfew every day. Fourth, continue to avoid popular weekly markets, take preventive measures in regular markets, and avoid crowding (MOI, 2021). This increase in the number of cases was expected by the MOH and MOI by the end of January. On March 25, the MOH in the West Bank reported that the West Bank is under immense pressure due to a strong wave of the new Coronavirus outbreak, in its new and more contagious forms. A parallel concern is that just about 2% of Palestinians have got the COVID-19 vaccination, even though immunizations are urgently needed for health workers and vulnerable groups (MOH, 2021). After applying the previous preventive measures and starting the vaccination of health workers and some vulnerable groups of old ages and chronic disease patients, the growth rate decreased to 21.2% in April and dropped to 4.3% and 1.6% in May and June respectively. On April 5, the Palestinian Authority declared an increase in the COVID epidemic curve and began vaccination of staff in the Ministry of Education to reopen schools (New Arabic website, 2021).



Regarding mortality, the CFR in this study is higher than the previously reported one 0.5% in Palestine (Al-Tamimi et al., 2020). In comparison with other Arab countries, it was reported to be 1.7% in Jordan (Al-Tamimi et al., 2020), 1.09% in Saudi Arabia (Boretti, 2020), and 6.48% in Egypt (Hassany et al., 2020). The overall CFR across Palestine remains at 1.1% according to WHO situation report 79 (WHO, 2021) and the rate is consistent with our results.

The lack of effective preventative measures against the coronavirus epidemic could be one of the reasons why the outbreak grew at a faster rate in the initial few weeks. The growth rate gradually dropped as physical separation measures, such as school closures and severe social interventions, were introduced.

### **Conclusion**

According to the findings of this study, the number of COVID-19 patients and deaths from this disease are decreasing in Palestine during the study period. The intervention measures in Palestine appear to be effective in controlling the COVID-19 epidemic and lowering the reproduction rate. Early strict intervention measures demonstrated evidence of disease containment and suppression. Furthermore, immunization initiatives were successful in lowering the COVID-19 trend. Continuity of preventative measures and vaccination for populations is recommended.

### **Study Limitation**

One of the limitations of this study is the presence of missing data as mentioned earlier in the method and materials part.

### **Data Availability**

The data used to support the findings of this study are available from the corresponding author upon request.

### **Conflicts of Interest**

The authors declare that they have no conflicts of interest concerning this work.



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