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*Coronavirus Pandemic*

# Demographic and epidemiological characteristics of COVID-19 epidemic in Albania

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## Abstract

Introduction: This study provides a general overview of the coronavirus disease 2019 (COVID-19) pandemic in Albania. The aim was to assess the spread of COVID-19 in the country by describing the demographic and epidemiological characteristics.

Methodology: We performed a 12-month national observational, epidemiological study. The data were extracted from the national digital system of Infectious Diseases Information and included all reported COVID-19 cases. Demographic data, number of tests, number of confirmed positive cases, and number of deaths were analyzed to build a general overview of the pandemic in Albania.

Results: The database comprised 251,139 tested individuals and 250,926 were reported as confirmed cases. The average age of the tested cases was 44.83 years; 19.8% of the studied individuals were 51–60 years old and this group had the highest proportion (51.7%) of females. The estimated prevalence of COVID-19 in Albania was 51.31% (110,397 cases). Tirana, the capital of Albania, had the highest percentage of COVID-19 positive cases (44.9%) with an incidence rate 3,879.02 individuals/100,000 inhabitants. The COVID-19 curve reached its peak in February 2021 with 54,046 cases. The mortality rate was 1.18/1000 inhabitants.

Conclusions: This demographic and epidemiological analysis provides a better understanding of the COVID-19 pandemic, and. the findings can contribute towards perception and re-investigation of the spread of COVID-19 in Albania, However, further studies covering longer periods and deeper analysis are needed for developing an epidemiological mathematical model, as a tool to develop and implement specific strategies for monitoring future pandemics.

**Key words:** Albania; COVID-19; healthcare; infections; pandemic.

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## Introduction

Albania faced many unprecedented health challenges due to the coronavirus disease 2019 (COVID-19) pandemic leading to severe economic, psychological, and social consequences. COVID-19 was characterized by rapid asymptomatic transmission, which took the entire healthcare system worldwide by surprise. Even the developed countries with advanced healthcare systems were not spared [1]. Albania is a small country in Europe and is part of the Western Balkans. It has a total surface area of 29,000 km$^2$ and a population of 2,793,592 inhabitants (as of 1 January 2022), most of whom are ethnic Albanians [2,3].

Albania confirmed the first two COVID-19 cases on 9 March 2020 [4]. The patients were members of the same family. They had returned from a trip to Italy and it was assumed that they were infected over there. On the same day, the government issued a restriction until 3 April 2020 on all flights and ferries coming from northern Italy [4]. The Ministry of Health, and Social Protection of the Albanian government, drafted the anti-COVID-19 strategy following the World Health Organization (WHO) directives and this was subsequently elaborated.

The number of COVID-19 cases has fluctuated since the beginning of the pandemic. No diagnostic method was considered the gold standard [5,6], however, reverse transcriptase polymerase chain reaction (RT-PCR) was the most common method used for testing; although, the number of tests was low. Albania had the lowest number (cumulative number/per million inhabitants) of registered deaths (2,433) from COVID-19 in the entire Western Balkans region [7]. Similar to other countries, Albania also applied restrictive measures, mostly following the policies and strategies of the neighboring countries. These measures included restricting the movement of people and public transport; restricting public gatherings, cultural and sports events, and restricting, some commercial activities. On the other hand, private enterprises, and

institutions that were allowed to continue their activity, adapted different work practices to adapt to the movement restrictions, social distancing, and hygiene measures. On 13 March 2020, the government extended "quarantine" to the entire country. The anti-COVID-19 vaccination campaign in Albania was named "Smiley Albania", and was launched on 11 January 2021 [8]. Following the recommendations of the WHO Strategic Advisory Group of Experts on Immunization and the European Technical Advisory Group, the Ministry of Health and Social Protection in Albania, prioritized vaccination of health professionals in the national vaccination plan [9]. The Ministry of Health and Social Protection reported that 3,072,710 doses of the vaccine were administered until 26 May 2023 [10].

Evidence suggests that the socio-demographic characteristics of a country play a crucial role in changing the curve of the epidemic [11–13]. Monitoring policies and strategies should be designed to minimize health inequalities. In this context, it is important to highlight that at the regional level, the socio-economic aspects and the characteristics of the geographical areas should also be considered [14–17]. The Western Balkans Regular Economic Report (2022) reported that the economy in the Western Balkan region, including Albania has experienced a turbulent external environment since the COVID-19 pandemic began, placing households, firms, and governments under acute stress. This was further intensified by the impact of the war in Ukraine and the energy crisis in Europe [18].

This article presents a general overview of the COVID-19 pandemic in Albania, analyzing the demographic and epidemiological characteristics of the Albanian population, the health system, and the response of the authorities to the challenges created by this virus.

## Methodology

*Ethical consideration*

This research was carried out in the framework of a national project approved by the National Agency for Scientific Research and Innovation, the Ministry of Education and Sports of Albania, and the University of Elbasan.

*Study design, setting, data sources, variables, and participants*

We performed a 12-month study of the national observational, epidemiological data from 9 March 2020 (the date of the first recorded COVID-19 case in Albania) to 28 February 2021. All the socio-demographic and epidemiological data were extracted from the Infectious Diseases Information (SISI) database of the Institute of Public Health and the Ministry of Health and Social Protection. We included all cases reported in the given time period after removing all identifiers. A statistician and a physician reviewed all the demographic and epidemiological data to check for errors.

The data recorded included demographic data, number of tests, confirmed positive cases, hospitalization, and deaths. The final dataset comprised of 251,139 individuals tested for COVID-19. To obtain an overview of the spread of COVID-19 in Albania, we reported on the trends of laboratory-confirmed cases of COVID-19, and deaths per 100,000 populations, in addition to trends based on gender and age.

The statistical analysis served to build a general overview of the pandemic in Albania. We used descriptive statistics to summarize the number of the suspected, tested, and confirmed cases categorized by gender, average age, and geographic distribution. In addition, the data were analyzed based on the type of sample used in testing and the positivity of the samples. Furthermore, the number of tested cases based on the different diagnostic methods were analyzed. The distribution of confirmed cases and deaths was reviewed by geographical area, and time (weeks and months). We categorized the demographic data into groups spanning 10 years of age. The data were analyzed with descriptive statistics and frequency distributions using IBM SPSS version 26 (IBM Crop, Armonk, NY).

## Results

*Demographic data*

The study sample of 251,139 individuals was divided into age groups of range 10 years. The mean ± standard deviation of age of the individuals who were tested for COVID-19 was 44.83 ± 18.59 years, the minimum age was 0.1 months, and the maximum was 113 years (Table 1).

Babies (0–11 months of age) were the least tested group and comprised 0.59% (1,484/251,139) of the

**Table 1.** Age (in years) of the individuals included in the study.

| | |
|---|---|
| Mean | 44.83 |
| Standard error of mean | 0.037 |
| Median | 45.00 |
| Mode | 30 |
| Standard. deviation | 18.59 |
| Range | 114 |
| Minimum | 0.1 |
| Maximum | 113 |

**Table 2.** Demographic data of individuals included in the study.

| Variables | Total number | Percentage | Negative cases | Positive cases | Undetermined cases | Case fatality | Hospitalized cases |
|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | |
| Male | 122089 | 48.6 | 68745 | 53286 | | 198 | 5172 |
| Female | 128955 | 51.3 | 71825 | 57076 | | 100 | 3782 |
| Missing data | 95 | 0.0 | 60 | 35 | | | |
| Total | 251139 | 100.0 | 140570 | 110397 | 112 | 298 | 8954 |
| **Age groups** | | | | | | | |
| 0–11 months | 1484 | 0.59 | 985 | 497 | 2 | 1 | 371 |
| 1–10 years | 5269 | 2.1 | 4165 | 1100 | 4 | 0 | 764 |
| 11–20 years | 14973 | 5.96 | 10142 | 4824 | 7 | 2 | 289 |
| 21–30 years | 41663 | 16.6 | 25771 | 15881 | 11 | 7 | 491 |
| 31–40 years | 46699 | 18.6 | 28027 | 18653 | 19 | 13 | 589 |
| 41–50 years | 39185 | 15.6 | 22325 | 16839 | 21 | 13 | 753 |
| 51–60 years | 45470 | 18.1 | 23621 | 21832 | 17 | 43 | 1481 |
| 61–70 years | 34173 | 13.6 | 15512 | 18640 | 21 | 73 | 2008 |
| 71–80 years | 16600 | 6.61 | 7437 | 9154 | 9 | 95 | 1614 |
| 81–90 years | 5053 | 2.01 | 2304 | 2748 | 1 | 47 | 552 |
| ≥ 91 years | 357 | 0.14 | 162 | 195 | 0 | 4 | 32 |
| **Residence** | | | | | | | |
| Tirana city | 114034 | 45.4 | 64905 | 49641 | 53 | 7 | 3138 |
| Others cities | 136533 | 54.6 | 75718 | 60756 | 59 | 291 | 5675 |

tested cases; 33.5% (497/1,484) of them were positive. The age group 1–10 years old had the least number of positive cases. Only 0.14% (357/251,139) of cases that were tested were individuals ≥ 91 years old, and 54.62% (195/357) of these cases were positive. The age data was missing for 631 cases; 140 cases among these were positive for COVID-19 (Table 2). The highest number of cases tested from March 2020 to February 2021 was in the 31– 40 years group (18.6%), while the highest positivity rate was in the 71–80 years' group (55.1%). There were differences in the case positivity rates between men and women. Out of a total of 251,139 tested cases, 48.6% were men and 51.3% were women. Test positivity was significantly higher in women (51.7%) compared to men (48.3%) (Table 2).

Among the women, 44.26% (57,076/128,955) were COVID-19 positive cases, while among the men 43.64% (53,286/122,089) were positive. A strong significant association was observed between the gender (men and women) distribution and the positivity obtained from COVID-19 analyzed cases ($\chi^2 = 10.00$, $p = 0.007$).

We used National Institute of Statistics in Albania (INSTAT) data to estimate the female and male populations for 2020 [19]. The incidence of COVID-19 in females (at the national level) per 100,000 inhabitants was 4,012 cases, while the incidence in males was 3765 cases per 100,000 inhabitants.

*Geographic distribution of COVID-19*

The prevalence of COVID-19 was 44.0% (110,397/251,139), and the incidence during this 1-year period was 3,879.02 individuals for a population of 100,000 inhabitants.

**Table 3.** Distribution of cases according to the testing status, type of sample, laboratory, and diagnostic methods.

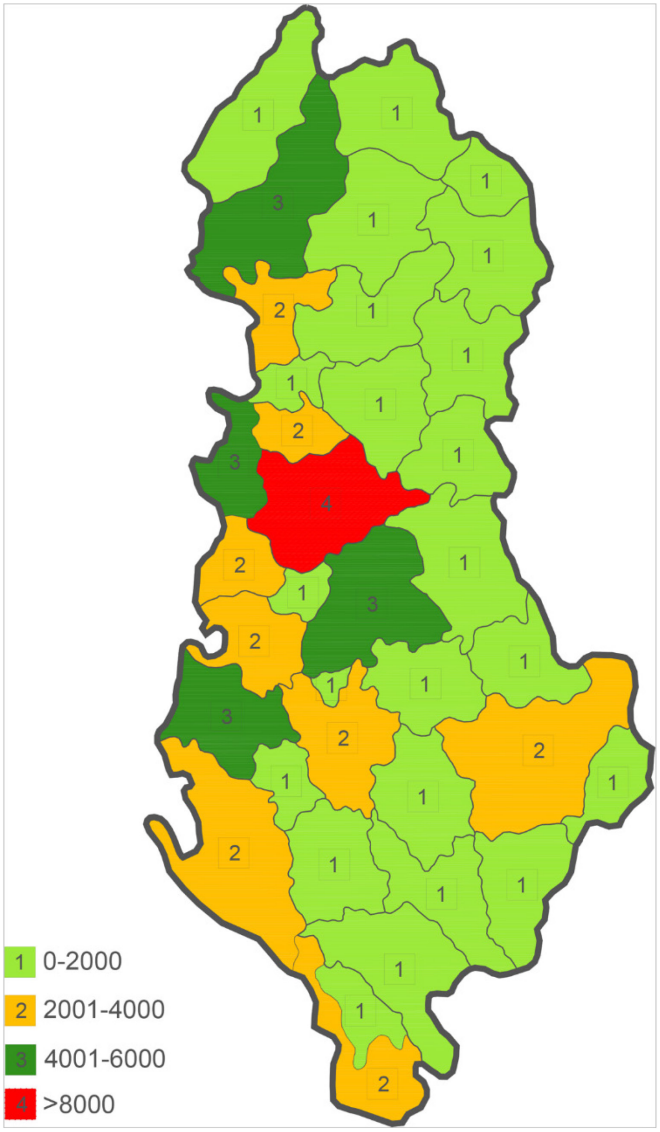
| Variables | | Number of cases | Total percentage of number of cases converted | Negative cases | Positive cases | Undetermined cases |
|---|---|---|---|---|---|---|
| **Type of case** | COVID-19 Case | 235911 | 93.9 | 129979 | 105825 | 100 |
| | Contact | 15228 | 6.1 | 10644 | 4572 | 12 |
| **Type of sample** | Nasopharyngeal swabs | 132151 | 52.6 | 78547 | 53551 | 53 |
| | Nasopharyngeal aspirates | 169 | 0.07 | 150 | 19 | 0 |
| | Nasal swabs | 115813 | 46.1 | 59849 | 55908 | 56 |
| | Serum antibodies swabs | 2211 | 0.9 | 1654 | 554 | 3 |
| | Pharyngeal swabs | 617 | 0.24 | 336 | 281 | 0 |
| | Other | 171 | 0.07 | 87 | 84 | 0 |
| **Laboratory** | Institute of Public Health | 207261 | 82.5 | 116437 | 90733 | 91 |
| | Private laboratories | 43871 | 17.41 | 24186 | 19664 | 21 |
| **Type of test** | RT-PCR | 167422 | 66.7 | 91320 | 76055 | 47 |
| | ECLIA | 2046 | 0.81 | 1517 | 526 | 3 |
| | ELISA | 215 | 0.08 | 183 | 32 | 0 |
| | Rapid test | 81442 | 32.4 | 47599 | 33781 | 62 |
| | Missing data | 7 | 0.002 | 4 | 3 | 0 |

COVID-19: coronavirus disease 2019; ECLIA: electrochemiluminescence immunoassay; ELISA: enzyme-linked immunosorbent assay; RT-PCR: reverse transcriptase polymerase chain reaction.

Out of the 251,139 cases tested, complete data was available for 250,567, whereas data was missing for 572, which were subsequently excluded from the analysis. The city of Tirana had the highest percentage of tested cases, but not the highest positivity. Among the cases tested in Tirana between March 2020–February 2021, 45.5% (114,034/250,567) were suspected cases, and the positivity was 43.53% (49,641/114,034). This was followed by the city of Durrës which comprised 4.7% (11,827/250,567) of total analyzed cases and a positivity 46.9% (5,548/11,827). Only 4.2% (10,638/250,567) of the tested cases were from Shkodër, and the positivity rate was 39.39% (4,191/10,638). The numbers of cases tested from other cities were much lower than the three cities mentioned above, but the positivity varied for each of them. It is worth pointing out that a significant number of cases were tested in various private-sector laboratories. Almost 93.9% (235,911/251,139) of the cases were presented as suspected cases, while 6.1% (15,228/251,139) were presented as contact with a COVID-19 positive person. Among the tested cases 44.86% (105,825/235,911) of those presented with 'case status', and 30.02% (4,572/15,228) of those presented with 'contact status' were positive (Table 3).

Figure 1 presents the distribution of positive cases across the county. The number of positive cases varied from 28 in Peqin to 6,539 in Tirana. Notably, the peak of positive cases was recorded during the fifth week of 2021, with a total of 16,988 suspected cases undergoing testing, of which 9,222 yielded positive results (Figure 2).

**Figure 1.** Distribution of COVID-19 positive cases by county.




*COVID-19 testing in Albania*

The lowest number of tested cases (28 cases) were in March 2020. The numbers of tests fluctuated from the 10th week onwards and there was a visible increase in the number of cases after the 50th week. Following that, there was a drastic decrease in the number of tested cases reaching only 671 tested cases per week in the 9th week of 2021 (Figure 3).

COVID-19 positivity varied based on the type of sample tested: 40.52% (53,551/132,151) for nasopharyngeal swab; 11.2% (19/169) for nasopharyngeal aspirates; 48.28% (55,908/115,813) for nasal tampon; 25.07% (554/2,211) for the samples

**Figure 2.** The number cases tested by week.

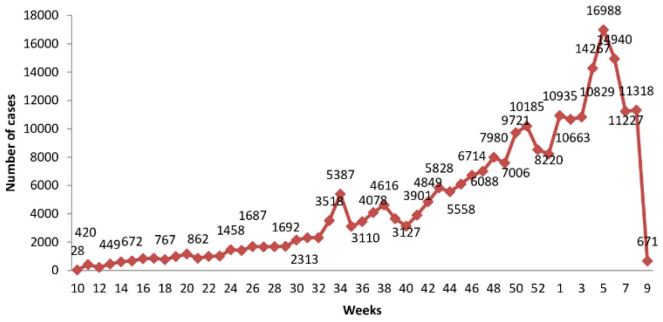
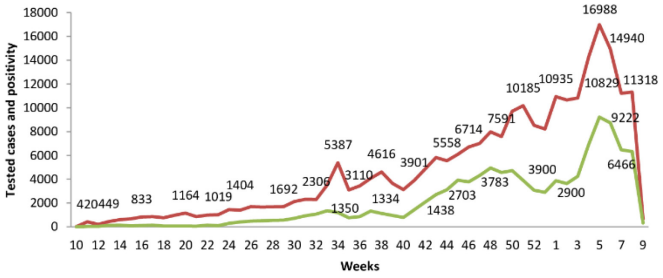



**Figure 3.** Weekly positivity from March 2020-February 2021.



analyzed from the serum extracted from the patient's blood (serum antibodies swab); 45.54% (281/617) for samples from pharyngeal swabs, and 49.1% (84/171) for other types of samples (Table 3).

Serological tests developed in 2020 enabled the detection of IgM and IgG antibodies specific to COVID-19 in patients' blood samples. Notably, the data revealed that a total of 2,211 patients, representing 0.9% of the overall sample (n = 65,535), underwent serological testing using blood or serum samples. In the miscellaneous category, a total of 171 samples, representing 0.07% of the overall total (n = 251,132), comprised specimens obtained from various sources, including endotracheal aspirates, broncho alveolar lavage, gastric material, wound swabs, and sputum samples. Public laboratories such as the Institute of Public Health tested 82.5% samples (207,261/251,132) of suspected cases were tested and the positivity was 43.78% (90,733/207,261). Private sector laboratories tested 17.5% (43,871/251,132) of suspected cases and 44.83% (19,664/43,871) were COVID-19 positive (Table 3).

Of the 167,422 tests performed with reverse transcriptase polymerase chain reaction (RT-PCR), 45.43% (76,055/16,7422) were positive. Among the 2,046 cases tested with ECLIA (electrochemiluminescence immunoassay), the positivity was 25.7% (2,046/2,046); while 215 cases were tested with ELISA (enzyme-linked immunosorbent assay) and the positivity was 14.9% (32/215). A significant number (81,442 tests) were performed using rapid tests and the positivity was 41.48% (33,781/81,442) (Table 3).

*Hospitalization and deaths from COVID-19 in Albania*

A total of 8,956 cases with various COVID-19 symptoms were hospitalized (Table 4). We assumed that every patient who died was tested and was included in the database. Based on our analysis, the mortality rate was 1.18 per 1,000 populations (298 cases in total). Out of these, 241 patients were confirmed as having COVID-19; the. other fatal cases were COVID-19 negative (56/298) or undetermined (1/298). The Chi square value of comparison between positive/negative cases and hospitalized/non-hospitalized cases was 70.19 which was significant ($p < 0.0001$). Similar observations were made when comparing positive/negative cases and fatal/non-fatal cases ($\chi^2 = 176.9$, $p < 0.0001$). The COVID-19 case fatality rate in our sample was 0.22%. Children were the least affected. The number of cases increased significantly for the age group of ≥ 51 years. The highest number of deaths (31.9%) was in the age group of 71–80 years. The death rate was 15.8% in patients aged 81–90 years, and 1.34% in patients ≥ 91. The most hospitalized cases were among the 61–70-year-old patients. Figure 4 presents the distribution of hospitalized cases and fatal cases based on the age groups and Figure 5 illustrates the fatal cases by week during the study period indicating the 5th week of 2021 as the week with the highest number of deaths from COVID-19.

Among the 3,082 hospitalized cases, there were 57.7% men and 42.3% women. 66.44% of men and 33.56% of women died (Table 2). Figure 4 presents the number of fatal cases during the weeks studied.

**Figure 4.** Hospitalized and fatal cases by age group.

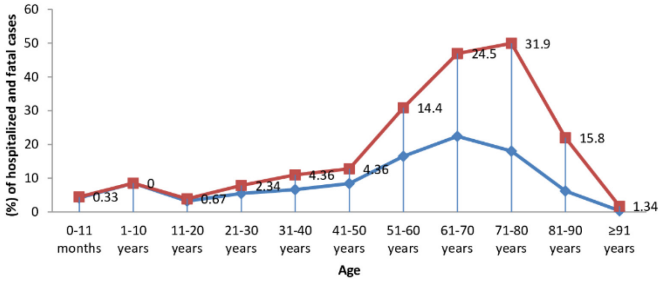



**Figure 5.** Weekly fatal cases of COVID-19 during March 2020-February 2021.

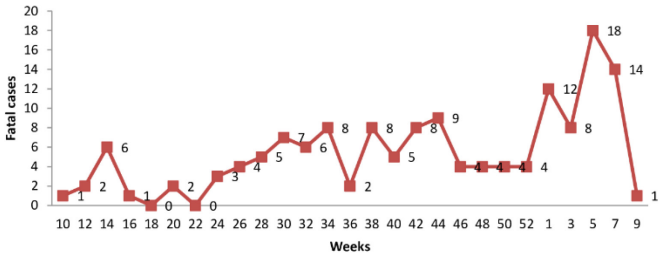



**Table 4.** Hospitalized and fatal cases.

| COVID-19 test result | Hospitalized | | Chi square | Fatal cases | | Chi Square |
|---|---|---|---|---|---|---|
| | Yes | No | *p-value* | Yes | No | *p-value* |
| Negative | 5258 | 76399 | $\chi^2 = 70.19$ < 0.0001 | 56 | 18580 | $\chi^2 = 176.9$ < 0.0001 |
| Positive | 3686 | 62973 | | 241 | 14685 | |
| Undefined | 12 | 55 | | 1 | 6 | |
| Total | 8956 | 139427 | | 298 | 33271 | |

COVID-19: coronavirus disease 2019.

There was no fatality during weeks 18–19 and 21–23. During other weeks, the number of deaths varied from 1 to 12; and the average number of deaths per week was 5.62. The highest number of deaths were recorded in weeks 4, 5, and 6 of 2021 respectively, with 17, 18 and 17 fatal cases. The highest number of deaths per week was during the 5th week of 2021 with 18 deaths. In 2020, the highest weekly mortality rate was observed during week 31, with a total of 12 fatalities reported. The average of number of patients hospitalized per location in the country resulted in 238 cases, with the minimum number of cases from the city of Devolli (8 cases) and a maximum number of hospitalized cases (3,138 cases) in the city of Tirana. (Table 2).

*COVID-19 vaccination in Albania*

85% of the 251,139 patients included in the study did not receive the vaccine; 3.3% received one dose of the vaccine, and 11.7% received two doses of the vaccine (Table 5). The vaccination program in Albania had started with the Pfizer vaccine and it was the most frequently administered vaccine—45.4% of the those who received the first dose and 47.8% those who received two doses were administered the Pfizer vaccine (Table 5).

## Discussion

To the best of our knowledge, this is the most extensive socio-demographic epidemiological report on the COVID-19 pandemic in our country, featuring the most detailed database available We analyzed the officially reported cases of COVID-19 in the Infectious Diseases Information database based on the guidelines of the Institute of Public Health and the Ministry of Health and Social Protection to describe socio-demographic and epidemiological characteristics of COVID-19. As a small developing country, Albania relied on the strategies of neighboring countries to adequately respond to the COVID-19 pandemic. Calleja and colleagues [20] assert that the centralized public health administration is an advantage for small countries and makes it possible to quickly respond and adapt to crises that may occur in the country, but with the tendency to depend on their larger neighbors and on the networks they belong to, for trade, food, medical supplies, and politics. Although the prevalence of COVID-19 was high, mortality was very low, which could be due to greater access to healthcare, even though it was centralized. The number of COVID-19 cases fluctuated since the beginning of the pandemic. The disease was first detected in Albania in March 2020 and then spread slowly in the population. The lowest number of COVID-19 tests were also in March 2020. Subsequently, the testing increased exponentially every month. The Albanian authorities adopted restrictive measures such as quarantine of patients who tested positive for COVID-19, identifying and testing contacts of the positive cases, and isolating anybody with risk of infection. These enhanced surveillance and restrictive measures were in place for three months to flatten the curve of the COVID-19 pandemic. The health system was challenged due to the emigration of health personnel during the pandemic [21]. The Albanian government responded by putting together a workforce to provide support and help. This workforce included retired professionals and students at the end of their medical studies. Shortage of personal protective equipment was also a major concern during the pandemic

Our results indicated that COVID-19 affected both genders and every age group in our country, with almost the same geographical spread as reported by other authors [22]. A strong significant association was observed between gender distribution and the results from COVID-19 tests ($\chi^2 = 10.00$, $p = 0.007$, 95% CI 0.000–7.56).

Our study showed that males were the most affected and the mortality rate was also higher in them; this observation was similar to that as in the USA [23], Spain [24], the Netherlands [25], Italy [26], and Germany [27]. This fact is attributed to the protective effect of the X chromosome and female sex hormones [28,29]. Furthermore, our study confirmed previous findings that most of the hospitalized patients with COVID-19 in Albania were males [30].

The average age of the people who were tested in this study was 44.83 years old. This is lower than the

**Table 5.** Number of vaccination doses and types of vaccines.

| Type of vaccine | First Dose | | Second Dose | |
|---|---|---|---|---|
| | Total number | Percentage of number of cases converted | Total number | Percentage of number of cases converted |
| Sinovac | 11163 | 29.7 | 8721 | 29.7 |
| Sputnik | 1766 | 4.7 | 1436 | 4.9 |
| AstraZeneca | 7585 | 20.2 | 5166 | 17.6 |
| Pfizer | 17068 | 45.4 | 14023 | 47.8 |
| **Total Vaccination doses** | 8239 | 3.3% | 29316 | 117% |

age reported by WHO (51 years) [31], and studies in Wuhan (50 years) [32]. This is most likely due to the difference in population characteristics of the Albanians. The average age of the Albanian people as reported by INSTAT is relatively young, at approximately 38 years [33]. Although at first, it seemed that the elderly were the most affected, over time and with the appearance of many different types and subtypes of COVID-19, it was noted that even babies were no longer immune to this infection. People in the age group 51–60 old were at the highest risk of severe COVID-19 infection and death; which is similar to the global data reported by the Centers for Disease Control and Prevention (CDC) [34], and some other studies [35–37]. The number of hospitalized cases according to age group varied from the youngest to the oldest age group, with a peak in the 61–70 years' group. The opposite was observed in fatal cases. The increase in the number of fatal cases per age group was relatively small up to the age group 41–50 years; and then the number of fatal cases increased quite significantly reaching a peak in the 71–80 years' age group. This finding highlights the need for improved care for older people since the group is most impacted by COVID-19 mortality.

Comorbidities, chronic disease, and complications during hospital stay were identified as risk factors for mortality [38,39]. The fact that Albania had the lowest number of deaths from COVID-19 in the entire Western Balkans [40], can be explained by the small number of tests performed.

Albania launched the anti-COVID-19 vaccination campaign on 11 January 2021, with the theme "Albania Smiles". The first anti-COVID vaccination center was opened in Tirana, at the 'Air Albania' Stadium; subsequently a network of vaccination centers was established throughout the country, enabling the fastest coverage of the entire population in the country. In the beginning, the vaccine was applied to the most at-risk groups of population, such as medical staff and people over 85 years old. Many different types of vaccines were applied in our country [41]. Our study period included only one month of the vaccination campaign. Vaccines were not available at the beginning of the pandemic. It is to be mentioned that 85% of the population included in this study did not take the vaccine.

In terms of geographical distribution, the most affected cities were Tirana, Durres, and Shkoder, with the maximum number of cases in the largest urban areas in Albania. We argue that this was due to the population density, public transport, overwhelmed hospitals, and shopping centers. In addition, there is evidence that large cities are more vulnerable than smaller ones due to the enormous pressure on health care systems [42].

The monthly trend of COVID-19 cases, progressed gradually and reached its peak in February 2021 with the maximum number of cases (54,046 cases) and deaths (18 deaths) in the fifth week of 2021. The restrictive measures by the government taken to control the spread of the virus, and the fear of the virus appear to have been effective in slowing the spread of the disease.

The results of our study can contribute towards perception and re-investigation of the spread of COVID-19 in Albania, and can contribute data for future surveys. It is essential for the healthcare system to continuously transform to be prepared for future pandemics.

## Conclusions

Despite some limitations, this study provides an overview of the demographic and epidemiological characteristics of COVID-19 in Albania. These findings can contribute to the development of general guidelines for future outbreaks or epidemics. It is necessary to undertake further studies to explore the costs and benefits related to the policies and strategies against COVID-19 in Albania.

Our study had some limitations. Our data were downloaded from a digital system, with many missing data points. In addition, a significant number of cases had been tested in various private-sector laboratories, and the study duration was short. No statistical analysis was performed to show a causal relationship between the variables of interest and it was not possible to incorporate all the socio-demographic variables in the study.

Future research must include multiple logistic regression analyses to broaden the discussion on the relationship between COVID-19 parameters and variables, such as prior comorbidities and chronic disease. The implementation of a mathematical model should also be considered, to identify which policies or strategies should be designed based on the characteristics of the population to possibly flatten a COVID-19 curve or a similar pandemic in the future.

### Authors' contributions

EG: concept, study design, writing the manuscript; GK, BE, SH: data collection, manuscript drafting and revising critically for important intellectual content; ER, statistics and data interpretation. All authors reviewed the results and approved the final version of the manuscript.

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