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A retrospective study of the SARS-CoV-2 Alpha Variant: Epidemiological profile and impact of vaccination in Morocco

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ABSTRACT

Background: The Variant of Concern, such as the SARS-CoV-2 Alpha Variant, was first identified in Morocco on 29 December 2020. The present study aimed to analyze the epidemiological profile, and the vaccination status of patients with the Alpha Variant during the COVID19 pandemic in Morocco. **Methods:** A retrospective analytical study was conducted in the Rabat-Sale-Kenitra Region, central of Morocco and included all reported cases of Alpha Variant. The data analysis was anonymized, compiled in Excel, and processed by SPSS software. **Results:** The 545 Alpha Variant patients were registered in the study area. Mean age and sex ratio (Male/Female) were 38±18 years and 0.73 (230/315), respectively. Average cumulative incidence of new cases during 4 months and 7 days was 25.32 per 1000000 persons. Vaccinated population was 81 (14.86%) versus a non-vaccinated population of 464 (85.14%). The cure and fatality rates were 99.45% and 0.55%, respectively. **Conclusion:** The analysis showed that patients over the age of 38 with comorbidities are at high risk of developing symptoms if they contract the SARS-CoV-2 variant. In contrast, we found that the second dose of the SARS-CoV-2 vaccine was a protective factor for the symptomatology, the hospitalization and also attenuate the effects of the disease.

Introduction

On March 11, 2020, the World Health Organization (WHO) declared the Coronavirus Disease 2019 (COVID-19) a global pandemic [1,2], presenting an unprecedented public health challenge. Many reported cases involved serious health conditions, with some resulting in death [3-5]. Early clinical profiles often included symptoms

of viral pneumonia such as fever and cough, while severe cases could lead to dyspnea and bilateral pulmonary infiltration [6,7]. These symptoms typically developed within a week of onset and could worsen subsequently [6,7]. The initial phase of the pandemic was marked by high mortality, especially among the elderly (e.g., those aged 80 years and over), compounded by the absence of

targeted treatments for the novel coronavirus [7,8]. Millions of confirmed COVID-19 cases were reported globally from numerous countries [9].

In Morocco, the pandemic also had a significant impact [10]. Following the global trend, Moroccan authorities launched a national vaccination campaign in January 2021 [10]. Concurrently, new SARS-CoV-2 variants were emerging. The B.1.1.7 lineage, designated the Alpha Variant by the WHO and classified as a Variant of Concern (VOC), was first reported in England and subsequently spread to many countries [11,12]. This variant was first identified in Morocco within the Rabat-Sale-Kenitra Region (RSKR), specifically in Sale, on December 29, 2020 [13]. Further analysis of the epidemiological situation in the RSKR from January to May 2021 revealed that the Alpha Variant accounted for over 80% of positive SARS-CoV-2 cases processed by laboratories, with a positivity rate of 4% [13].

The emergence and rapid predominance of the SARS-CoV-2 Alpha Variant in the RSKR, coinciding with the initial phase of the COVID-19 vaccination campaign, underscored the need for a detailed characterization of its impact. Therefore, this study aimed to: (1) describe the epidemiological and clinical characteristics of patients infected with the SARS-CoV-2 Alpha Variant in the RSKR, and (2) evaluate the association between COVID-19 vaccination status and disease outcomes in this specific population.

Materials and Methods:

Study Design and Data Collection

This study employed a comprehensive retrospective analytical design. Data for analysis were extracted from regional and prefectural/provincial epidemiological databases and supplemented by information from individual case investigation forms.

The study was conducted in the Rabat-Sale-Kenitra Region (RSKR) of Morocco (Figure 1). Of the 545 patients with SARS-CoV-2 Alpha Variant from six provinces and prefectures, the distribution was as follows: Kenitra 252 (46.24%); Sale 160 (29.36%); Sidi Kacem 77 (14.13%); Sidi Slimane 37 (6.79%); Skhirate-Temara 16 (2.94%) and Khemisset 3 (0.55%).

The study population included all confirmed SARS-CoV-2 Alpha variant cases recorded within this region during the specified study period. Data were collected for the period

from January 1, 2021, to May 7, 2021. The primary data source was the epidemiological surveillance system database of the Regional Directorate of Health and Social Protection (RDHSP) for the RSKR. This region encompasses seven prefectures and provinces: Rabat, Sale, Skhirate-Temara, Khemisset, Kenitra, Sidi Kacem, and Sidi Slimane.

Data collection specifically covered the epidemiological wave attributed to the SARS-CoV-2 Alpha variant within the study period. To ensure the robustness and representativeness of the findings, all officially reported and investigated Alpha variant cases during this period were included, constituting an exhaustive sample for the region.

Study sample and eligibility criteria

This study included an exhaustive sample of all SARS-CoV-2 Alpha variant cases officially recorded in the Rabat-Sale-Kenitra Region (RSKR) during the study period (January 1 to May 7, 2021). Case identification adhered to the national case definitions for the SARS-CoV-2 Alpha variant established by the Moroccan Ministry of Health and Social Protection. Records with incomplete essential data, as per predefined exclusion criteria, were excluded from the analysis.

The following inclusion criteria, based on the national case definitions, were applied:

- **Suspected Case:** Any individual, symptomatic or asymptomatic, with an epidemiological link to a known Alpha variant cluster or a confirmed Alpha variant case.
- **Probable Case:** Any suspected case confirmed by molecular testing (Reverse Transcriptase-Polymerase Chain Reaction, RT-PCR), rapid antigen test, or a positive CT scan, who also had an epidemiological link to a confirmed or probable Alpha variant case.
- **Confirmed Case:** Any individual with a positive RT-PCR test where subsequent sequencing or specific screening identified the Alpha variant.
- All age groups were included.
- All deaths attributed to the Alpha variant within the study population were included.

Data Quality Control and Management

The research protocol detailed data documentation procedures. Incomplete records, as defined by the exclusion criteria, were systematically omitted from the final dataset. Data preparation involved three main steps: data integration from various sources, comprehensive data cleaning to identify and rectify inconsistencies or errors, and data transformation where necessary for analysis. Data were initially compiled in Microsoft Excel and subsequently imported into IBM SPSS Statistics for analysis. An initial check for missing data was performed using SPSS.

Data analysis

Statistical analyses were performed using IBM SPSS Statistics. Quantitative variables were described using means and standard deviations (SD) or medians and interquartile ranges (IQR), as appropriate for their distribution. Categorical variables were presented as frequencies and percentages (n, %). Comparisons between categorical variables were conducted using the Chi-square (χ^2) test or Fisher's exact test, where applicable based on expected cell counts. Odds Ratios (OR) with their 95% Confidence Intervals (CI) were calculated to assess associations. For all statistical tests, a two-sided p-value < 0.05 was considered indicative of statistical significance.

Ethical considerations

All patient data were anonymized and handled with strict confidentiality to protect patient privacy throughout the study. The research protocol ensured the anonymity and confidentiality of all processed data.

This study was based on routinely collected public health surveillance data, for which formal ethical approval from an institutional review board was deemed exempt according to national guidelines. Authorization to access and utilize the anonymized data for research purposes was obtained from the Regional Directorate of Health and Social Protection of Rabat-Sale-Kenitra on November 21, 2021 (Approval No. 6272).

Results

Spatiotemporal distribution of SARS-CoV-2 Alpha Variant recorded cases

A total of 545 SARS-CoV-2 Alpha variant patients were recorded in six provinces and prefectures, with the highest number of cases being registered in the RSK region in Kenitra and Sale (Figure 1).

The distribution by time showed the highest number of cases in April, followed by March, with an increase in cases from the 1st to the 7th day of May. The same results were observed in the cumulative incidence, with the highest incidence occurring in March and April, followed by an increase in the first seven days of May. And the average cumulative incidence of new cases during 4 months and 7 days was 25.32 per 1000000 persons (Figure 2A & 2B, Table 1).

The increase in cases at the beginning of May was one of the first signs of community transmission of the virus. Kenitra and Sale had the highest number of cases due to people not adhering to the measures, the types of activities carried out by the population, and the high population density of the cities.

Epidemiological and sociodemographic profile of SARS-CoV-2 Alpha Variant patients

The mean age of the patients was 38.72 ± 18.91 years, and the sample was predominantly female with a Male/Female ratio (230/315) of 0.73 (Table 1).

The Table 1, showed that symptomatic cases slightly outnumbered asymptomatic cases (55.05% versus 44.95%, respectively). Patients with comorbidities accounted for 14.5% of cases, compared to 85.5% without comorbidities. Of the patients tested by screening, 93.58% were probable Alpha variant patients, while 1.65% of those tested by sequencing were confirmed Alpha variant patients. The remaining patients tested positive by antigenic testing and CT scans revealed lung lesions with an epidemiological link to a confirmed new case. Additionally, 13.58% of patients with the SARS-CoV-2 Alpha variant were hospitalized, while 86.42% were treated at home. The recovery rate recorded during the study period was 99.45%. The case fatality rate during the same period was 0.55%, with three deaths. All of the deaths occurred in patients who were hospitalized and admitted to the intensive care unit (ICU). Most Alpha Variant clusters were familial rather than professional: 89.58% were familial and 10.42% were professional. The majority of cases were classified as mild (82.75%), followed by moderate (14.50%) and severe (2.75%) cases.

Regarding the vaccination status of patients, 14.86% of patients were vaccinated. Of these, 39.51% received the first dose of the anti-SARS-CoV-2 vaccine and 60.49% received the second dose (Figure 3, Table 1).

These results describe the SARS-CoV-2 Alpha variant, characterized by mild symptoms, a high recovery rate, and transmission primarily within families. Most patients were unvaccinated and had few or no comorbidities.

Associated factors of symptomatology in SARS-CoV-2 Alpha Variant patients

According to the bivariate analysis in Table 2, patients over 38 years old were twice as likely to be symptomatic, with a statistically significant association ($p=0.0022$). On the other hand, symptoms were observed five times more frequently ($p=0.0001$) in patients with comorbidities. Therefore, diabetic patients were 3.3 times more likely to present symptoms than non-diabetic patients ($p=0.006$). Similarly, patients with high blood pressure had almost three times more symptoms ($p=0.019$) than those without. Symptomatic patients infected with the SARS-CoV-2 Alpha variant were at a higher, statistically significant risk of progressing from mild to moderate cases ($p=0.0001$) and from mild to severe cases ($p=0.029$).

Our results showed that patients with chronic respiratory diseases who were infected with the SARS-CoV-2 Alpha variant developed symptoms more frequently than those without, and this observation was statistically significant ($p=0.002$).

Other characteristics did not show a significant association with symptomatology ($p>0.05$), despite the risks presented by symptomatic patients infected with the SARS-CoV-2 Alpha variant, such as hospitalization, vaccination status and history of SARS-CoV-2 infection.

Furthermore, the small number of cases in one of the categories of the independent variable meant that the odds ratio was undefined.

This analysis identified several key factors that predicted whether a patient infected with the SARS-CoV-2 Alpha variant would develop symptoms and, if so, how severe their illness would be. In summary, the results showed that older age and pre-existing comorbidities were major risk factors for developing symptoms, and that the presence of symptoms was a key indicator of more severe illness.

According to the final logistic regression model (Table 3), regardless of age, people with the SARS-CoV-2 Alpha Variant in addition to

comorbidities were the most vulnerable population to monitor.

Associated factors of symptomatology in vaccinated patients

The estimation of risk between the symptomatic and asymptomatic groups of vaccinated patients infected with the SARS-CoV-2 Alpha variant in Table 4 showed that symptoms were observed three times more frequently in vaccinated patients with comorbidities ($p=0.03$) than in those without. Vaccinated patients with diabetes had almost six times more symptoms than those without diabetes ($p=0.01$). Vaccinated patients infected with the SARS-CoV-2 Alpha variant were at a higher risk of developing moderate cases than mild cases ($p=0.006$). All of these associations were statistically significant ($p<0.05$). Patients who were both vaccinated and infected with the SARS-CoV-2 Alpha variant were more likely to progress to severe cases than mild ones ($p=0.32$), although this association was not statistically significant ($p>0.05$). Patients who received the second dose of the vaccine experienced fewer symptoms than those who received only the first dose ($p=0.06$). While this association was only borderline statistically significant, this result nevertheless showed the importance of the second dose of the vaccine. Vaccination was a protective factor against hospitalization for vaccinated Alpha variant cases ($p=0.94$). While the association was not significant, this result demonstrates the impact of vaccination in reducing the risk of hospitalization in Alpha Variant cases.

This analysis of vaccinated individuals reveals that comorbidities remained the critical determinant of outcomes during an Alpha variant infection. The presence of comorbidities was the most powerful predictor of symptom development, which in turn was a significant marker for disease progression to moderate severity. The study also revealed that those who had completed the two-dose vaccination series experienced fewer symptoms, indicating a protective trend. While not statistically significant, these findings ultimately reinforce the value of vaccination in preventing the most severe consequences of infection by reducing the risk of hospitalization.

Table 1. Description of Epidemiologic and Sociodemographic profile of SARS-CoV-2 Alpha Variant patients in the Rabat-Sale-Kenitra Region of Morocco.

Sociodemographic profile				
Distribution by Location		Effective (%)		
	Kenitra	252 (46.24)		
	Sale	160 (29.36)		
	Sidi Kacem	77 (14.13)		
	Sidi Slimane	37 (6.79)		
	Skhirate-Temara	16 (2.94)		
	Khemisset	3 (0.55)		
Distribution by Person				
Age	Mean	38.72 years	[Min 1 ; Max 95]	
	Median	38 years	[24 ; 53]	
Sex-Ratio	Male / Female	0.73	230/315	
Epidemiological profile				
Effective (%)				
Distribution by Time		Cumulative Incidence		
	January	31(5.68)	7.2 per 1000000 persons	
	February	54 (9.90)	12.54 per 1000000 persons	
	March	126 (23.12)	29.27 per 1000000 persons	
	April	259 (47.52)	60.16 per 1000000 persons	
	7 th day in May	75 (13.76)	17.42 per 1000000 persons	
Distribution by clinical				
Vaccine Status		Vaccine Dose		
	Yes	81 (14.86)	1 st dose	32 (39.51)
			2 nd dose	49 (60.49)
	No	464 (85.14)		
Indicators				
	Cure Indicator	542 (99.45)		
	Lethality Indicator	3 (0.55)		
Symptomatology				
	Symptoms +	300 (55.05)		
	Symptoms -	245 (44.95)		
Comorbidity				
	Yes	79 (14.5)		
	No	466 (85.5)		
Clusters				
	Familial	318 (89.58)		
	Professional	37 (10.42)		
Cases classification				
	Mild cases	451(82.75)		
	Moderated cases	79 (14.50)		
	Severe cases	15 (2.75)		
Clinic evolution				
	Hospitalized	74 (13.58)		
	Domicile	471 (86.42)		
Distribution by test				
Screening tests				
	PCR	510 (93.58)		
	Rapid antigenic tests	32 (5.87)		
Confirmation tests				
	Molecular Screening	510 (93.58)		
	Molecular Sequencing	9 (1.65)		

Table 2. Association of the symptomatology with the clinical features.

Characteristics		Symptoms + (Number: 300) %	Symptoms – (Number: 245) %	Odds- Ratio	CI 95%	P-value
Age	[1 ;38[	44	57.14			
	[38;95]	56	42.86	1.69	[1.20 ; 2.38]	0.0022
Sex	Male	41.33	43.27			
	Female	58.67	56.73	1.08	[0.76 ; 1.52]	0.64
Comorbidities	Yes	22	5.31	5.03	[2.70 ; 9.37]	0.0001
	No	78	94.69			
Diabetes	Yes	7.67	2.45	3.30	[1.32 ; 8.25]	0.006
	No	92.33	97.55			
High Blood Pressure	Yes	8	3.27	2.57	[1.13 ; 5.84]	0.019
	No	92	96.73			
Cardiovascular Diseases	Yes	2.67	1.63	1.65	[0.49 ; 5.54]	0.41
	No	97.33	98.37			
Immunodepressions	Yes	1.67	0.41	4.13	[0.47 ; 35.63]	0.16
	No	98.33	99.59			
Chronic Respiratory Diseases	Yes	3.67	0	–*	–*	0.002
	No	96.33	100	–*		
Status Vaccinal	Yes	16	13.47	1.22	[0.75 ; 1.97]	0.4
	No	84	86.53			
Cases Classification	Mild Cases	73	93.88			
	Moderated Cases	22.33	4.90	5.81	[0.96 ; 11.04]	0.0001
	Severe Cases	4	1.22	4.16	[0.92 ; 14.95]	0.029
Hospitalization	Yes	14.33	12.65	1.15	[0.70 ; 1.98]	0.56
	No	85.67	87.35			
Cases Evolution	Death	1	0	–*	–*	0.11
	Cure	99	100	–*		
History of COVID	Yes	1.67	0.41	4.13	[0.47 ; 35.63]	0.16
	No	98.33	99.59			
Confirmed Cases Contact	Yes	73	69.39	1.21	[0.83 ; 1.76]	0.30
	No	26.67	30.61			

*–: The Odds-Ratio is undefined due to the reduced number of people in one of the categories of the independent variable.

Table 3. Predictive model of symptomatology using logistic regression.

Symptoms	Odds-Ratio	Confidence interval 95%	P-value
Age > 38 years	1.29	[0.90 ;1.84]	0.165
Comorbidities (Yes/No)	4.49	[2.36 ; 8.54]	0.0001

Table 4. Association of the symptomatology with the clinical features in the vaccinated patients infected with the SARS-CoV-2 Alpha Variant.

Characteristics		Symptoms + (Number: 48) %	Symptoms – (Number: 33) %	Odds- Ratio	CI95%	P-value
Status Vaccinal	1 st dose	47.92	27.27	2.45	[0.94 ; 6.36]	0.06
	2 nd dose	52.08	72.73			
Comorbidities	Yes	43.75	21.21	2.88	[1.05 ; 7.93]	0.03
	No	56.25	78.79			
Diabetes	Yes	27.08	6.06	5.75	[1.20 ; 27.54]	0.01
	No	72.92	93.94			
Hospitalization	Yes	18.75	18.18	0.97	[0.30 ; 3.03]	0.94
	No	81.25	81.82			
Cases classification	Mild cases	56.25	87.88			
	Moderate cases	37.50	9.09	6.44	[1.70 ; 24.35]	0.006
	Severe cases	6.25	3.03	3.22	[0.31 ; 32.88]	0.32

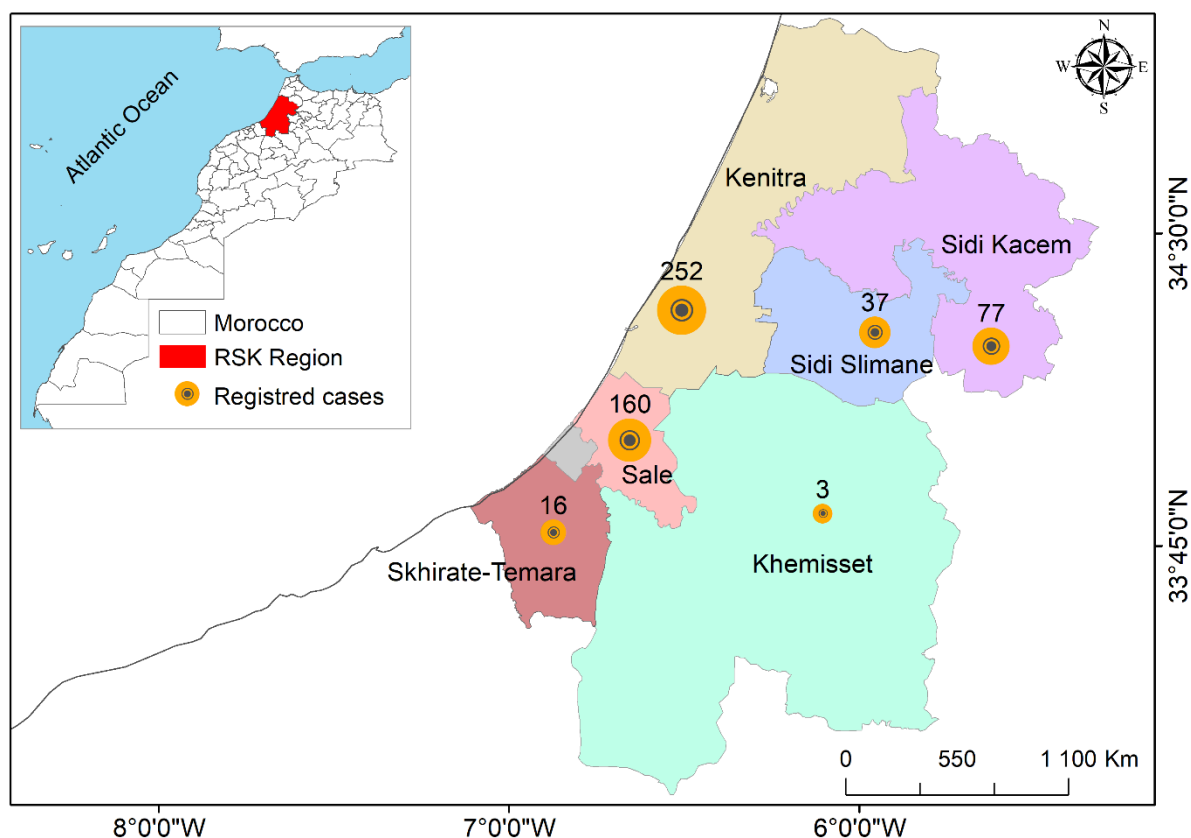
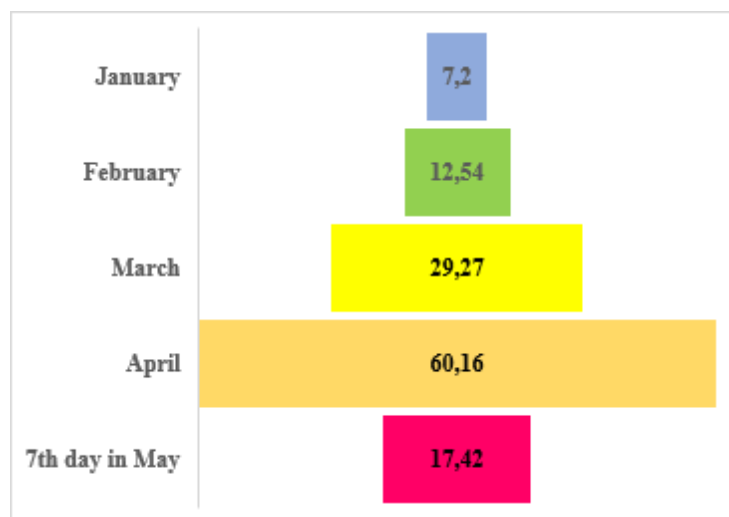
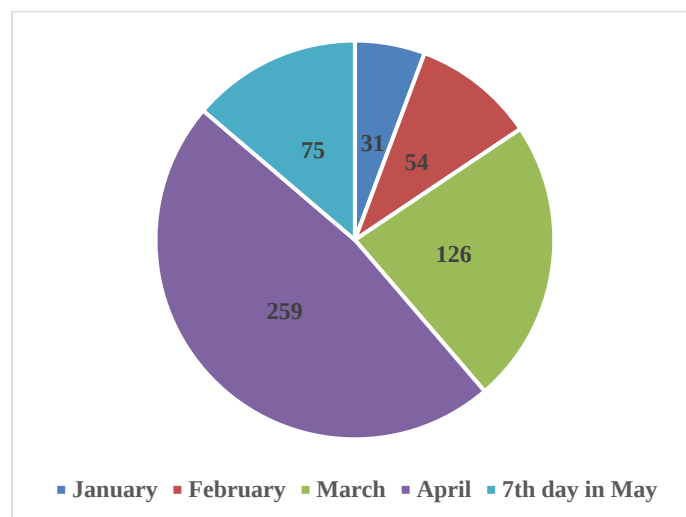
Figure 1. Geographical Distribution of Alpha Variant cases in RSK Region in Morocco.**Figure legends:** Of the 545 patients with SARS-CoV-2 Alpha Variant from six provinces and prefectures, the distribution was as follows: Kenitra 252 (46.24%); Sale 160 (29.36%); Sidi Kacem 77 (14.13%); Sidi Slimane 37 (6.79%); Skhirate-Temara 16 (2.94%) and Khemisset 3 (0.55%).**Figure 2A.** The Distribution by cumulative incidence per 1,000,000 persons of SARS-CoV-2 Alpha Variant patients in the Rabat-Sale-Kenitra Region in Morocco (N=545).**Figure legends:** The evolution of the monthly cumulative incidence rate in the diagram displays the incidence per 1,000,000 inhabitants, revealing a pronounced peak in April.**Figure 2B.** The Distribution by number cases of SARS-CoV-2 Alpha Variant patients in the Rabat-Sale-Kenitra Region in Morocco (N=545).**Figure legends:** The Distribution of the absolute number of cases in the pie chart shows the breakdown of the 545 study cases, corroborating the high volume of infections diagnosed in April compared to the other months.

Figure 3. The Vaccine Profile of SARS-CoV-2 Alpha Variant patients in the Rabat-Sale-Kenitra Region in Morocco (N=545).

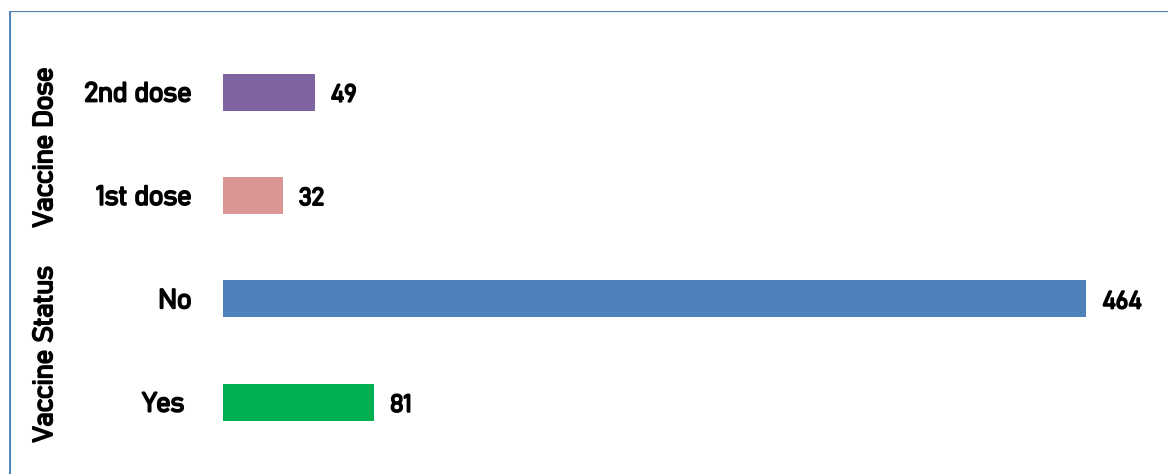


Figure legends: The graph provides a detailed breakdown of the vaccination status across the patient cohort. It stratifies the population into unvaccinated (n=464) and vaccinated (n=81) individuals. Furthermore, within the vaccinated group, the chart distinguishes between patients who had received a single dose (n=32) and those who were fully vaccinated with a second dose (n=49).

Discussion

The SARS-CoV-2 Alpha Variant was attributed to an increase in infection and was estimated to be more transmissible and also became the dominant strain in England in November/December 2020 [14,15], and in several countries since their discovery [16]. The Alpha Variant is estimated to be more transmissible than preexisting SARS-CoV-2 variants, and increased transmissibility is likely to result in a large increase in incidence [17]. Furthermore, the Alpha variant was more transmissible than the wild-type virus, and had a higher basic reproduction number (R_0) [18]. In the Egyptian study, the Alpha variant was one of the most prevalent. Compared to other variants, it is associated with higher white blood cell and lymphocyte counts. This explains why this variant is more virulent, causes more severe clinical features and is associated with a higher transmission rate [19]. Another study revealed that there was a significant increase in pediatric infections, as well as more severe clinical outcomes, during the Alpha variant pandemic wave compared to the Omicron variant [20].

In our study, and under slightly reduced containment and the continuous surveillance of the measures implemented in Morocco, community transmission of the Alpha Variant in the region has a high cumulative incidence on April (60.16 per 1000000 persons) and from the 1st to the 7th day on May (17.42 per 1000000 persons) in 2021. From 8 May 2021, the traceability of the regional database

was affected by the gradual increase in incident cases from 1 January 2021 to 7 May 2021. This last observation can be explained by the fact that the cumulative incidences increased during the study period, and especially the last cumulative incidence, which was only recorded during the first week of May, which had an impact on the continuity of data entry.

A French study in February 2021, reported that the Alpha Variant affected the patients aged 64.4 ± 18.3 years and was associated with a more severe clinical presentation, while the proportion of infected healthy patients without comorbidities increased in parallel with the spread of the Alpha Variant, and the case fatality rate during the study period was 0.5% [21]. In addition, the median age of patients infected with the Alpha Variant was 31 [17;43] years in a cohort study in England [22], and another study reported a median age of 55.5 [13;83] years in a retrospective analytical study in Germany [23].

The mean age of the affected cases recorded in our study was 38.72 ± 18.91 years and the median age was 38 [24;53] years. This age registered in our Moroccan context remains younger than that reported in France and Germany [21,23] and almost similar to that reported in England [22].

However, the clinical features of the SARS-CoV-2 Alpha Variant in this study were the most common symptoms of wild SARS-CoV-2. And the study conducted from February 15 to March 15, 2021 included 379 patients and compared the

symptoms between the infected patients with Wild-Type SARS-CoV-2 (Number of patients: 190) versus SARS-CoV-2 Alpha Variant (Number of patients: 189), showed the absence of the difference existence of symptoms between the two groups [24]. The B.1.1.7 (Alpha) variant was associated with an increase in respiratory excretion and mortality. The estimated time between symptom onset and the first PCR test for the wild-type virus did not differ significantly from that for the B.1.1.7 (Alpha) and B.1.351 (Beta) variants [25]. And the SARS-CoV-2 alpha variant is associated with an increased risk of both hospitalization and mortality compared to the wild-type virus [26].

The role of some comorbidities in the progression of the COVID19 has been associated with an increased rate of severity and mortality in patients infected by the virus with chronic diseases such as cardiovascular disease, diabetes, high blood pressure [27,28], chronic kidney disease, chronic obstructive pulmonary disease, and malignancies were the significant risk factors for progression to severe and critical cases [27]. In addition, the SARS-CoV-2 Alpha Variant was associated with a higher risk of death, which was higher in those with one or more comorbidities compared to those without [29].

In this study, comorbidities were present in 14.50% of the SARS-CoV-2 Alpha Variant patients, and the most common comorbidities were high blood pressure, diabetes, cardiovascular disease, chronic respiratory disease, and autoimmune disease, chronic kidney disease. Again, the three deaths recorded in our study were in ICU patients with one or two comorbidities.

These results of the present study were consistent with those reported in the studies cited above and with scientific observations that strongly suggest the presence of a high mortality risk in the vulnerable population living with comorbidities and presented the highest risk of infection with the Alpha Variant [27-30].

Furthermore, the SARS-CoV-2 Alpha Variant has a more severe consequences than the wild-type of SARS-CoV-2 virus, particularly in patients hospitalized in ICU and in patients with predominant risk factors such as advanced age and the presence of comorbidities [31]. Also, the hospitalization was specific to an unvaccinated population and the case fatality rate registered in the study was 0.5% [31]. Another Chinese study showed that the case fatality rate among hospitalized patients infected with the wild-type SARS-CoV-2

virus infection was 28% [28]. Epidemiological data show that the Alpha variant has led to an increase in disease severity, as have the Beta and Gamma variants. The UK's study on the impact of the SARS-CoV-2 virus also confirms increased inflammation in people infected with the alpha and delta variants compared to the wild-type variant, as well as a higher mortality rate associated with the alpha variant [32].

Despite the number of hospitalized cases and severe cases recorded in our study, the case fatality rate, estimated at 0.55%, remained optimal compared to the study cited [31] and less severe than unvaccinated patients infected with wild-type SARS-CoV-2 virus [28].

Prior to the update reported at the end of 2022 concerning vaccines, one of the concerns regarding the evolution of SARS-CoV-2 was the emergence of antigenically distinct variants capable of evading immunity acquired through vaccination or infection. Although all the available vaccines against SARS-CoV-2 were based on the antigen of the wild-type strain, using the Wuhan-Hu-1 reference sequence — whose spike protein is stable and without mutations — limited antigenic changes were reported for the Alpha variant compared to other variants, such as Beta, Gamma, and Delta [33]. However, epidemiological surveillance demonstrated the effectiveness of vaccines against the B.1.1.7 (Alpha), B.1.351 (Beta) and B.1.617.2 (Delta) variants [25].

However, the analysis realized in a study showed that two doses of the COVID19 vaccine were highly effective in preventing hospitalization and protecting against mortality due to the Alpha and Delta variants [34].

In fact, our study demonstrated that the patients infected with the SARS-CoV-2 Alpha Variant who received two doses of SARS-CoV-2 vaccine were showed better protected against symptoms than those who received only one dose of vaccine. We also noted that one of the three deaths recorded in the current study was received a single-dose vaccine, and the other two deaths were unvaccinated patients. Also, the unvaccinated symptomatic patients infected with the Alpha Variant in our study had a higher risk of hospitalization, and reinfection with the SARS-CoV-2 Variant, and the risks also increased with the presence of comorbidities and other risks, such as age>38 years and the contact with a confirmed case. Another Iraqi study found that the Alpha variant was

primarily associated with severe disease, followed by the wild-type strain and then the Delta variant. The majority of severe and critical cases were men over the age of 40 who were infected with the Alpha variant and the wild-type strain rather than the Delta variant [35].

However, A previous study found that full vaccination was less effective at preventing symptomatic infections caused by the Delta and Alpha variants. However, it remains highly effective against both [36]. Also, the risk for vaccinated patients infected with the Delta Variant versus the Alpha Variant for hospital admission and hospitalization were similar to those of unvaccinated patients but the accuracy for the vaccinated subgroup was low [22]. The reduced number of severe cases and case fatality rate in our context may be explained by the finding of the study that compared data on disease severity in infected patients, which concluded that the Alpha variant did not necessarily lead to more severe disease or an increased risk of death [37].

Although this study provides valuable, concrete information on the Alpha variant epidemic, its conclusions must be interpreted in the context in which the study was conducted. Firstly, the timing of the study is important to consider. It was conducted during the Alpha variant wave of the pandemic, a period marked by the initial and challenging phase of the vaccination campaign. This resulted in a smaller cohort of vaccinated individuals. Consequently, the analyses and comparisons of subgroups have limited statistical power and should be considered preliminary, indicating epidemiological trends that warrant further investigation. Additionally, the data were collected under challenging operational conditions, reflecting the intense pressure on health systems at the time. This resulted in local variations to standard protocols, introducing the kind of heterogeneity and incompleteness that is common in crisis-related data collection. Nevertheless, these results are significant in their own right, emphasizing the necessity for standardized and digitalized responses. They must therefore be contextualized, considering the specific statistical results. This is a common challenge in public health crisis research. While these factors are essential for contextualization, they do not affect the findings of the study, which should be viewed as a crucial assessment of the dynamics of an evolving public health emergency.

Conclusion

This study identified an elevated risk of symptomatic SARS-CoV-2 Alpha Variant infection among older individuals (>38 years) with comorbidities within the Rabat-Sale-Kenitra Region. Conversely, and critically, receiving a second dose of the COVID-19 vaccine demonstrated a protective effect against symptoms, hospitalization, and disease severity, even during the early phase of vaccine deployment. These findings underscore the crucial public health implication of prioritizing and accelerating complete COVID-19 vaccination schedules, particularly for at-risk populations, to mitigate the impact of emerging variants. Furthermore, continuous surveillance of SARS-CoV-2 variants remains essential to inform and adapt public health strategies, including vaccination policies and adherence to preventive measures, ensuring timely and effective responses to the evolving pandemic landscape. Future research should focus on the long-term effectiveness of vaccination, including booster doses, against evolving SARS-CoV-2 variants and their differing clinical impacts. Comparative studies assessing the epidemiological profiles and vaccine responses to subsequent variants of concern would also provide valuable insights for ongoing pandemic preparedness and response strategies.

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Ethical statement

The study was based on routine surveillance of the new variants of COVID19, respecting the anonymized information extracted from the regional database, and was approved by the Regional Department of Health and Social Protection, Rabat-Sale-Kenitra, Ministry of Health and Social Protection, Rabat in Morocco.

Declaration of interest statement

The authors declare that the research was conducted in the absence of any commercial or

financial relationships that could be construed as a potential conflict of interest.

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Author contributions statement

YI: Collected and analyzed data, elaborated research protocol, wrote the article and production of the manuscript. SE: Helped in collecting data and she is the Head of the COVID19 Teams in the region. MO, BA, SB, and MR: Provided general technical assistance. AM: Directed, validated and coordinated the study.

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