ANTI-SARS-COV-2 VACCINATION: ABOUT THE ALGERIAN EXPERIENCE

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ABSTRACT

Introduction: The recent pandemic of the novel coronavirus-2 of severe acute respiratory syndrome (SARS-Cov-2 or COVID-19), is one of the deadly diseases of the last twenty years.

Objectives: Many efforts have been devoted to find solutions to fight COVID-19 pandemic as quickly and effectively as possible. After the development of COVID-19 vaccines, several rumors about their effectiveness and safety spread all over the world. The objective of the present study is to report data about the vaccination in Algeria and to document the various side-effects notified by the Algerian population during the 24 hours following the administration of anti-COVID-19 vaccines.

Methods: An online observational retrospective survey targeting Algerian adults residing in the different Wilayas of the country has been conducted.

Results: Nine hundred and ninety-four (994) Algerians participated in this survey. The age of the participants ranged between 18 and 78 years with an average of 34.75 ± 14.31 years. The sex ratio was 2.1 with female predominance. The participants were from different Wilayas (provinces) especially: Bejaia (21.6%), Setif (17.8%), Algiers (8.5%), Batna (4.9%), etc. Almost half of the participants (46.9%) have a university degree. A total of 24% of participants were vaccinated between February 2021 and March 2022. Of these, 81.1% were fully vaccinated and 18.9% were partially vaccinated. Numerous vaccines were administered; Sinovac (50.4%), Janssen (16%), Sputnik (12.2%), AstraZeneca (10.1%), Sinopharm (5.9%), Pfizer (4.6%). More than half (62.3%) did not feel any signs after vaccination. Others (37.7%) claimed the appearance of certain effects including fever (21.6%), pain (16.5%), asthenia (8.1%), headache (7.2%) and others (40.1%).

Conclusion: According to the Algerian experience, in the majority of cases, anti-COVID-19 vaccines are devoid from annoying effects. In some cases, it may be accompanied by some mild effects. However, vaccination is an important way to prevent COVID-19 infection and the vaccine can be used safely.

Keywords: Algeria; Anti-COVID-19 vaccines; Pharmacovigilance; Side-effects; Survey.

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Introduction

Humanity has always experienced more or less significant health crises during the various stages of its history. The recent pandemic of the novel coronavirus-2 of severe acute respiratory syndrome (SARS-Cov-2 or COVID-19), is one of the deadly diseases of the last twenty years.1 This pandemic has been shaking the whole world since February 2020.2 Hence, it was necessary to take devastating measures to fight against this disease.1 The efforts to develop a multitude of vaccines, to respond to the pandemic and to protect the world from the COVID-19 disease, represent an unprecedented advance in the history of public health.1,3,4 As early as December 2020, vaccines began to be deployed according to different allocation plans, different from one country to another.4 In general, these schemes are based on criteria for the risk of serious illness or death, on ethical principles of impartiality and fairness.1 Of course, the ultimate goal remains to achieve herd immunity as soon as possible, and to ensure a return to normal life to limit the considerable damage caused by COVID-19 on the health, economic and social levels.1,3,4 Associated adverse events are still not fully documented due to the quick development of the vaccine for urgent need.1 Therefore, studies for monitoring different side effects are needed. However, in Algeria, the coronavirus being unprecedented, it embodies uncertainty, these anti-COVID-19 vaccines scare Algerian citizens because they have little information and knowledge about these products and for other reasons as well. This same problem arises almost everywhere in the world, and as a result, a large number of people find themselves in a situation of hesitation and uncertainty to get vaccinated.4,5 The corresponding data about the vaccination of the Algerian population is missing in literature. Therefore, the objective of this research work is to document the Algerian experience on vaccination against COVID-19, as well as the adverse effects of different vaccines used in Algeria.

MATERIALS AND METHODS
Study design

In order to collect information on the sociodemographic data, the vaccination status, the types of vaccines administered and the occurrence of possible side-effects during the 24 hours after the administration of the anti-COVID-19 vaccines, an observational retrospective survey was launched during the period from November 2021 to May 2022 in Algeria.

Sample size estimation

As it is known, estimating the appropriate sample size is an important consideration in survey research, as it can impact the accuracy and reliability of the results. Since the current population of Algeria is around 45 million, a sample size of approximately 1000 respondents would be required to achieve a margin of error of 3% and a 95% level of confidence in the survey results. This estimation is based on statistical assumptions.

Inclusion and exclusion criteria

The study concerns Algerian adult citizens residing in the different Wilayas who showed willingness to participate in the study by completing the form. All generations combined including both sexes were enrolled in the study. No specific exclusion criteria have been identified for the present study.

Data collection

To collect data on vaccination against COVID-19 in Algeria, we prepared an anonymous, self-administered online questionnaire using Google® Forms, a widely used tool for creating and sharing surveys. The questionnaire was designed to be user-friendly and easy to complete, and was made available electronically throughout Algeria in order to reach as many potential participants as possible. We took steps to ensure that the questionnaire was accessible to all participants, regardless of their level of technological

proficiency or internet access. Participants were able to complete the questionnaire at their own pace and convenience, and all responses were collected anonymously to protect the privacy of participants.

Ethics consideration

To ensure that the study was conducted in an ethical manner, we followed established ethical principles, including informed consent, confidentiality, and respect for privacy. Prior to participating in the study, all participants were provided with a written consent message that clearly explained the nature and objectives of the research. The message was placed prominently at the top of the survey form to ensure that participants were fully informed before deciding to take part. The study was conducted for a scientific purpose, and no economic or political benefits were taken into consideration. We took care to minimize any potential harm or discomfort to participants, and we did not collect any personal information that could identify them.

Data analysis, tabulating and graphics

All data were statistically processed using IBM® SPSS statistics software. The graphs were represented using Microsoft® Excel. The categorical variables were represented by the percentage, while the numerical variables were represented by the mean ± standard deviation or the median. To compare differences between vaccinated and non-vaccinated participants, we used the t-test for numerical variables and the Chi-square test for categorical variables. The level of statistical significance was set at P-value < 0.05.

Results

The online survey showed that a total of 994 Algerian persons had participated in the survey conducted from November 2021 to May 2022.

Respondents provided information about the different variables used for the study.

Socio-economic data

The age of the respondents ranged from 18 to 78 years with an average of 34.75 ± 14.31 years. The majority of the respondents (67.3%) are aged between [18-38[years followed by [38-58[years (23.9%) and [58-78] years (8.8%). The mean age of the vaccinated participants was significantly higher 40.63 ± 15.22 years compared to 31.10 ± 12.41 years of the non-vaccinated ones (P=0.000). Figure 1 shows that the persons with an age ranging between [18-38[years are more likely to be vaccinated (70.7%) followed by [38-58[years (22.4%) and [58-78] years (6.9%).
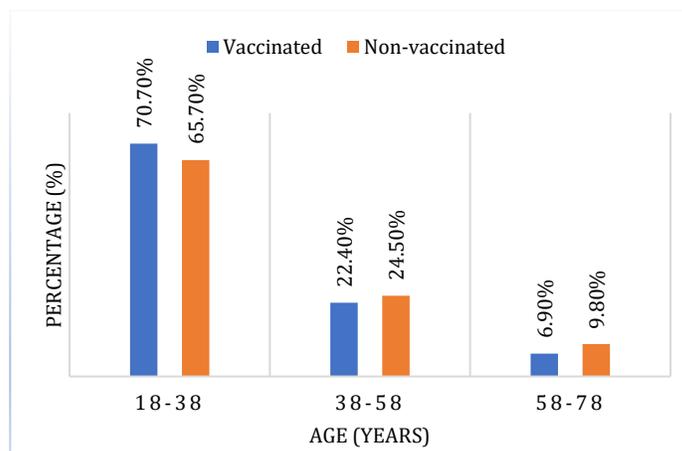

Figure 1. Comparison of age repartition between vaccinated and non-vaccinated participants.

Table 1 shows that the majority of the participants were women with a sex-ratio of 2:1. Our results showed that males are more likely to get vaccinated while females are more likely to be non-vaccinated. Almost all respondents were literate and most of them had attended university. Almost half of the participants were employees. The respondents were from different parts of Algeria. We have noticed that the vaccination rate is variable according to the region of the Algerian territory. In our study, the

northern (48%) and eastern (45%) cities have known the highest number of vaccinated persons (Figure 2). Our analysis revealed that there were no significant differences in gender distribution, educational level, or region between vaccinated and non-vaccinated participants (P > 0.05) while a significant difference has been observed in occupation between the groups (P < 0.05).

Table 1. Socio-economic data of the studied population (n= 994)

| Socio-economic data		Percentage	P
Gender	Female	67.7%	0.515
	Male	32.3%	
Occupation	Employees	45.4 %	0.032*
	Students	37.6%	
	Unemployed	2.7%	
	Pensioners	0.6%	
Residence area	Bejaia	21.6%	0.159
	Sétif	17.8%	
	Alger	8.5%	
	Batna	4.9%	
	Biskra	4.6%	
	Consanine	4.3%	
	Msila	4%	
	Annaba	3.6%	
	Tizi Ouzou	3.5%	
	Bouira	3.2%	
	Blida	3%	
	Oum El Bouaghi	2.8%	
	Jijel	2.4%	
	Tipaza	2.3%	
	Bechar	2.2%	
	Tiaret	2.1%	
	Skikda	2.1%	
	Oran	2%	
	Sidi Belabess	1.1%	
	GUELMA	0.2%	
	EL OUED	0.2%	
	SOUK AHRASS	0.2%	
	AÏN DEFLA	0.2%	
Level of education	University level	83.4%	0.213
	Upper secondary level	13%	
	Lower secondary level	3%	
	Primary school level	0.2%	
	Never attended school	0.4%	

*Signifiant value P < 0.05
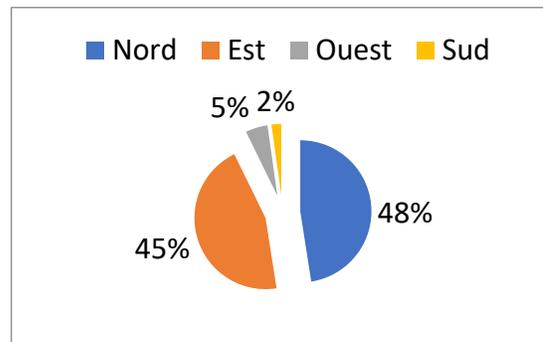
Figure 2. Rate of vaccinated subjects according to the regions.

Comorbidities

More than half (78.68%) of the participants did not have a chronic disease. Nevertheless, some participants (21.32%) had certain comorbidities, including diabetes (6.37%), thyroid dysfunction (3.92%), hypertension (3.43%), asthma (2.20%), osteoarthritis (0.98), anemia (0.98%), nervous colon (0.98%), celiac disease (0.49%), low vitamin D levels (0.49%), hypercholesterolemia (0.49%), migraine (0.25%) and chronic obstructive pulmonary disease (0.25%). No significant differences have been observed between vaccinated and non-vaccinated participants (P = 0.107).

Administrated vaccines and vaccination rate

In our population the vaccination rate was 24%. Of these, 81.1% were fully vaccinated and 18.9% were partially vaccinated. The participants were vaccinated between February 2021 and March 2022. The high percentage of vaccination was observed between July and September 2021. We have observed a hesitation of the Algerian population to participate in the survey a long time with a vaccine uptake hesitancy. Mostly, respondents declared get vaccinated to avoid severe forms, to be able to work

or to travel. Different vaccines have been provided by the Algerian government during the COVID-19 pandemic. Table 2 bellow illustrates the different vaccines that have been used with their percentages.

Table 2. Administrated vaccines during COVID-19 pandemic in Algeria

Vaccines	First use in Algeria	Percentage
Sinovac	June, 2021	50.4%
Janssen	November, 2021	16%
Sputnik	January, 2021	12.2%
AstraZeneca	August, 2021	10.1%
Sinopharm	August,2021	5.9%
Pfizer	March, 2021	4.6%

Side-effects

More than the half (63.2%) of the vaccinated subjects did not feel any signs during the first 24 hours after vaccination. Otherwise, others (36.8%) claimed the appearance of certain effects. The different reported annoying adverse-reactions are shown in Table 3. In our survey, for all vaccinated people, none of them were hospitalized after vaccination, whether partial or complete.

Table 3. Documented side-effects within the first 24 hours following the use of anti-COVID-19 vaccination (all vaccines confused)

Side-effect	Frequency of citation
Fever	50
Myalgia	42
Chills	21
Fatigue	18
Headache	16
Joint pain	12
Nausea	12
Cough	6
Pain and swelling at the injection site	4
Shortness of breath	4
Diarrhea	4
Vomiting	4
Ageusia	3
Runny nose	3
Anosmia	2
Loss of appetite	2
Dizziness	1
Heaviness at the injection site	1

A moderate association (Phi =1.775) between the type of the vaccine and the occurrence of side effects has been observed (P = 0.000).

Discussion

According to World Health Organization as of August 2th, 2022, the pandemic accounts over 500 million confirmed cases with more than 6 million deaths worldwide. In Algeria, the number of accumulated cases was 267,902 with 6877 deaths).[6] Despite the effectiveness of vaccination in reducing serious complications and deaths due to COVID-19, [3,4,7] a high rate of distrust and hesitation towards vaccines has been recorded worldwide [5,8,9]. Razai et al [5] have reported that vaccine hesitancy is higher among women, young people and people with a lower level of education. We also observed a low rate of uptake of vaccines and even a strong hesitation to participate in the survey among the Algerian population. These hesitation and refusal have also been recorded for many other previous vaccines [10,11]. This could be due to the concern of the nature of the human race about the trial or acceptance of a new vaccine or drug, the lack of rigorous knowledge and misinformation about these vaccines approved in case of emergency and the fear of possible

unknown adverse reactions that lead to low confidence in taking these vaccines.

According to our world in data website, in May 1st, 2022, only 16.2% of people are vaccinated in low-income countries and 17.58% in Algeria. This website has reported that 14.53% of Algerian population is completely vaccinated while only 3.05% are partially vaccinated [12]. These recorded rates in our study are close to the reported percentages of our world in data website (24 % vaccinated persons with 19.46 % fully vaccinated and 4.54% partially vaccinated). According to this same website, different vaccination rates have been reported in other countries around the world with some having a higher rate like United Arab Emirates (98%), China (87.07%), Canada (83.12%), United States (66.81%), Morocco (63.4%) and Tunisia (53.9%), etc. Others showed lower percentages including Niger (6.4%), Senegal (6.28%) and Mali (5.57%). These differences in vaccination figures cannot be compared, since each country had its own vaccination protocol.

According to the national center of pharmacovigilance and materiovigilance, AstraZeneca, Sinovac, Sinopharm and Janssen are so far the vaccines authorized and used in Algeria.[13] In Algeria, the anti-COVID-19 vaccination program was launched with the Sputnik vaccine on January 27th, 2021. The first phase of vaccination targeted front-line health and medical professionals which has limited others' access to vaccination at this phase.[14] The implementation of phased distribution plans has been carried out by most countries.[1,3] The phase two focused on elderly subjects while phases three and four comprises eligible adult persons of the Algerian population. Within time, the availability of anti-COVID-19 vaccines in Algeria explains the recorded rates.

As should be expected, anti-COVID-19 vaccine could be associated with some adverse-reactions ranging from mild to serious and common to rare.[1,3,9] The safety of anti-COVID-19 was based on the country's permanent pharmacovigilance system.[9]

Common events included but not limited to pain and swelling at the injection site,[4,9,15] fever,[1,3,9,15] chills,[9] fatigue, [4,9] joint pain,[9] nausea,[9] headache,[3,4,9,15] urticaria and rash, [1,9,15] diarrhea, [9,15] abdominal pain,[9,15] malaise,[1,9] dizziness,[3,9,15] flu-like symptoms, [9,15] myalgia, [9,15] and sudden increase in blood pressure,[9,15] epigastric pain,[3] shortness of breath,[3,9] loss of appetite,[1] seizures,[9] vomiting,[9,15] etc. Respondents from our study had also reported some of these side-effects. Similarly Anthonia et al.[3] reported some mild events in Nigeria. Cases of menstrual troubles have been reported by the national center of pharmacovigilance and materiovigilance whilst none of the other adverse events have been declared.[13]

Otherwise, some less common cases of reactions such as facial paralysis, paresis, spasms, facial nerve disorders, neutropenia, thrombotic events, heart palpitations, vomiting, myocarditis and pericarditis have been reported to be specific to some vaccines. [3,4,9,15–21] Hypersensitivity reactions and anaphylaxis are also possible but it is extremely rare.[3,4,9] These types of reactions are considered rare and have been more reported in countries using large-scale vaccination based on these types of vaccines.[20] These adverse reactions should be reported, in order to ensure prompt management. However, authorities considered that the effect is rare, that the benefit-risk ratio remains positive and recommended continuing to use it.[4] There are no sufficient proofs that the events are really caused by vaccines. [3] In our study none of these events was reported. This could be justified by the low number of subjects who had received mRNA vaccines. This heterogeneity in the incidence and type of adverse reactions could be due to the different types of vaccines, the way they are produced and the adjuvants used. Genetic diversity can also affect the response to the vaccine.[4]

When death occurs in the period after vaccination, people blame entirely the vaccine by ignoring the history of the patient who died before and during vaccination. The surveillance systems of the

European Community and the United Kingdom reported 18 deaths caused by thrombosis among 25 million people who received at least one dose of vaccine. In our study, we are not able to document death after vaccination because of the retrospective nature. In case of death, the persons would not be able to participate in our survey.

Study limitations

Observational retrospective surveys are cost-effective and efficient, as they rely on existing data and do not require extensive data collection efforts. However, there are also limitations to this study design. Retrospective data collection is subject to recall bias, as participants may not remember certain details accurately. The vaccination rate is low. A number of participants corresponding to 994 people, which may not represent the whole of Algeria, moreover, the majority of people are vaccinated with the Sinovac vaccine, the latter has rare adverse manifestations for human health, other assumptions such as delayed adverse effects that have not yet appeared. All these statements therefore call for more research work in Algeria.

Conclusion

According to the Algerian experience, in the majority of cases, anti-COVID-19 vaccines are devoid of annoying effects. In some cases, it may be accompanied by some mild effects. However, vaccination is an important way to prevent COVID-19 infection and the vaccine can be used safely in Algeria. The benefits of the COVID-19 vaccine in preventing complications and death outweigh the danger of its adverse effects. To conclude, as long as there are unvaccinated people, the virus will always find a host to infect and will continue to mutate. One more reason to strengthen the vaccination campaign and encourage people in Algeria or in another corner of the world to get vaccinated. More knowledge about COVID-19 vaccination makes people feel comfortable and encourages people to get vaccinated even more all over the world. To strengthen the anti-COVID-19 vaccinovigilence in Algeria, the involvement of a pharmacist in the vaccination program is necessary to facilitate the identification, detection and real-time reporting of possible side-effects and to monitor the safety of vaccines.

Acknowledgements

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