

## Original Research

# Acceptance of COVID-19 vaccine among general population and students in Benghazi, Libya: a cross sectional study

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**Abstract**

The most successful and cost effective method for control the COVID-19 pandemic is the vaccination. Currently, there are different COVID-19 vaccine introduced into Libyan market. This study aimed to evaluate and compare the acceptance of COVID-19 vaccine among general population and students in Benghazi city. A cross sectional survey was conducted during March 2021 among 440 respondents (240 general populations and 200 students) using a self-administered questionnaire. The results were considerably similar among the two groups of participants. Only 10.9% said that they infected with COVID-19 during the pandemic period. About two thirds of the respondents agreed to be vaccinated against COVID-19 when available whereas the majority said they would wait some time before taking the vaccine (71.4%). Approximately, one third of the participants preferred the Sputnik vaccine, 24% preferred the Pfizer and BioNTech and 19.2% preferred Oxford (AstraZeneca) vaccine. More than a half (55.9%) of the participants are refused to pay for the vaccine. The majority of the respondents do not think the vaccine alone will be enough in protection against the COVID-19 (79.8%). There was no significant association between general population, students and the COVID-19 vaccine acceptance ( $p = 0.776$ ). Additionally, there was no significant correlations between socio-demographic data and attitudes of the respondents with the acceptance of COVID-19 vaccine ( $p > 0.05$ ), except for using hand sanitizers daily was significantly associated among the general population ( $p = 0.008$ ). In conclusion, although, the general population and students have a good acceptability to the COVID-19 vaccine, more education health programs and promotion are wanted to reduce the vaccine hesitancy by declaring the importance of the vaccine, showing sufficient data stabilize the vaccine safety.

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**Keywords:** COVID-19, general population, Libya, students, vaccine acceptance

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**Introduction**

Coronavirus disease (COVID-19) is a pandemic disease that spreads all over the world infects millions and hundreds of thousands dead. It is highly infectious disease that infects the respiratory system, leading to pneumonia like infection. The disease is caused by etiological factor severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2 virus), which is beta virus and its genetic material resembles to the SARS-CoV reported in 2002 [1, 2]. The viral entry to the cell happens when the spike S protein of SARS-CoV-2 conjugate to the angiotensin-converting

enzyme II (ACE II) of the type II pneumocytes in the lung of the infected person, similar to SARS-CoV [3]. Spreading of the disease among the population is mainly by respiratory droplets in closed spaces when close contact is happened. As well as, the symptomatic, pre-symptomatic and asymptomatic carriers can spread the disease. World Health Organization (WHO) and governments were applying many efforts to control the highly infectious nature of COVID-19. The therapeutic strategies that used for treatment of COVID-19 such as anti-virus medicines and immunotherapy (monoclonal antibodies and protease inhibitors) are being developed or

are under clinical trials [4, 5]. The most promising and cost effective method for control the infectious diseases including the COVID-19 is the vaccination. Currently, there are some different COVID-19 vaccine introduced into the market, meanwhile, there some in preclinical and clinical trial stage. Developing and introducing an effective and safe COVID-19 vaccine in a short period is not an easy. Furthermore, its storage, distribution, transportation and administration in developing countries is an extraordinary challenge. For vaccine design, there are critical points have to be taken into account such as, antigen, the adjuvant, the system of manufacture and the route of administration. The vaccine can be developed in many plat-forms like life attenuated vaccine, protein subunit vaccines, genetic vaccines and inactivated virus vaccine [6, 7]. To obtain a successful immunization program necessarily to have high acceptance rate and coverage [8]. To attain this, it is a crucial to understand the Libyan's risk perceptions about COVID-19, confidence and acceptance toward COVID-19 vaccine. Thus, the purpose of the current study is to evaluate and compare the acceptance of COVID-19 vaccine among general population and students at University of Benghazi (Pharmacy and information technology) in Libya.

### Materials and methods

**Study design and sample:** A cross sectional survey was conducted during March, 2021 among general population in Benghazi city and students (Pharmacy and Information Technology) who are studying at University of Benghazi, Libya. A self-administered questionnaire was designed based on review of previous studies and distributed randomly through a face to face interview. A total of 440 valid forms were used as a study sample (240 general populations, 100 pharmacy students and 100 information technology students). The contents of questionnaire included three parts; part I: contains demographic characteristics (age, gender, level of education and working status), part II: involves disease history and protective measures followed by the participants (participants' attitudes) regarding COVID-19 and part III deals with the acceptance of COVID-19 vaccine among the participants.

**Statistical analysis:** Data was collected and summarized in Excel sheet where descriptive statistics (frequency and percentages) were performed to describe the demographic characteristics, attitudes of the participants regarding COVID-19 and acceptance of COVID-19 vaccine. The correlation between demographic characteristics, participants' attitudes of the study sample with acceptance of COVID-19 were assessed. Chi-square test was used to test the significance of association between variables using the Statistical Package for Social Sciences (SPSS-

21) software version considering  $p < 0.05$  is statistically significant.

### Results

The demographic data of the participants (general population and students) are summarized and shown in **Tables 1** and **2**, respectively. In this study, female participants represented a higher percentage with 57.9% and 63.5% for the general population and students, respectively.

**Table 1:** Demographic data of the general population of Libyan participants

Variable	Frequency	%
<b>Gender:</b>		
Female	139	57.9
Males	101	42.1
<b>Education level:</b>		
Primary school	45	18.8
High school	53	22.1
Bachelor degree or Diploma	97	40.4
Post graduate	45	18.8
<b>Age:</b>		
20 – 30	69	28.8
31 – 40	71	29.6
41 – 50	58	24.2
51 – 60	24	10.0
61 – 70	11	04.6
> 70	7	02.9
<b>Working status:</b>		
Employed	159	66.3
Unemployed	62	25.8
Retired	19	07.9

**Table 2:** Demographic data of the students of University of Benghazi

Variable	Frequency	%
<b>Gender:</b>		
Females	127	63.5
Males	073	36.5
<b>Specialization:</b>		
Pharmacy students	100	50.0
IT students	100	50.0
<b>Age:</b>		
20 – 25	165	82.5
26 – 30	029	14.5
31 – 35	004	02.0
36 – 40	002	01.0

The age group was between 20 and 25 years old were the vast majority of the students (82.5%) whereas more than a half (58.4%) of the public sample was their age range from 20 to 40 year and 41.7% were in the age higher than

40 years old. Regarding level of education, 40.4% of the general population having a bachelor degree or higher diploma, 22% with high school degree, 18% with primary school degree and about two thirds of the general population are employed.

In **Table 3**, in general, data about disease history and protective measures followed by the respondents regarding COVID-19 were considerably similar among the two groups of study sample are shown.

For example, 10.9% of the respondents (8.3% general population and 13.5% students) said that they infected

with COVID-19 during the pandemic period and 18.2% had at least one family member infected with COVID-19 (13.5% general population and 23% students). It is also show that the majority of general population 80.4% and students 71.5% use hands sanitizers daily as well as they avoid the crowded places with 77.9% and 86%, respectively. More than two thirds of the participants (66.7% general population and 76.0% students) had never administered the Flu vaccine in their lives. Additionally, about two thirds of the participants (61.7% general population and 60.5% students) wear masks whenever they go outside.

**Table 3:** Disease history and protective measures followed by Libyan respondents regarding COVID-19

Variable	General population		Students		Total (%)
	%	n	%	n	
Did you get COVID-19 infection?					
Yes	8.3	20	13.5	27	10.9
No	81.7	196	74.0	148	77.9
Do not know	10	24	12.5	25	11.3
Did one of your family members get COVID-19 infection?					
Yes	13.3	32	23	46	18.2
No	80.8	194	69	138	74.9
Do not know	5.8	14	008	16	6.9
Do you wear masks daily when you go outside?					
Yes					
No	61.7	148	60.5	121	61.1
	38.3	92	39.5	79	38.9
Do you use hands sanitizers daily?					
Yes	80.4	193	71.5	143	75.9
No	19.6	47	28.5	57	24.1
Did you take the flu vaccine before?					
Yes	33.3	80	24	48	28.6
No	66.7	160	76	152	71.4
Do you avoid presence in crowded places?					
Yes	77.9	187	86	172	81.9
No	22.1	53	14	28	18.1

Regarding the acceptance of COVID-19 vaccine among the participants, the results are summarized in **Table 4**. Approximately two thirds of the respondents 65.0%, (69% general populations and 61% students) agreed to be vaccinated against COVID-19 when available. Whereas a majority 71.4%, (64.2% general population and 78.7% students) said that they would wait some time before taking the vaccine until it's safety is established. Approximately one third of participants 31.4% preferred the Vac Sputnik V vaccine, 24.0% preferred the Pfizer and BioNTech vaccine and 19.2% preferred the Oxford (AstraZeneca) vaccine. On the other hand, about 35% of the respondents refused to take the vaccine when available. Among them, 40.9% think that it is not safe and

33.1% do not believe in its protective effect against COVID-19. The results also reported that approximately an equal percentage of general population and students 44% agreed to pay fees for the vaccine. More than one third of the respondents (42.5% of general population and 34.5% of students) think that the vaccine will be effective in all ages. The majority of respondents 79.8% (77.1% general population and 82.5% students) do not think the vaccine alone will be enough in protection against the COVID-19.

**Table 5** shows the influencing several factors on the acceptance of COVID-19 vaccine in Libya including; demographic characteristics and attitudes of respondents. Overall, the results show that there is no significant

correlation of the COVID-19 vaccine acceptance among the public people and student's samples ( $p = 0.776$ ). As well as, there is no significant correlation between the two types of students (Pharmacy and IT) with the COVID-19 vaccine acceptance ( $p = 0.523$ ). In the public sample, there is no significant correlation between gender, level of

education, had COVID-19 infection or having family members infected, wearing masks whenever they go outside, taking the flu vaccine before and avoid the crowded places with acceptance of COVID-19 vaccine with  $p$  value of 0.544, 0.053, 0.082, 0.162, 0.639, 0.093 and 0.576, respectively.

**Table 4:** Acceptance of COVID-19 vaccine among the Libyan respondents

Variable	General population	Students	Total
Do you will agree to take COVID-19 vaccine when it will be available?			
Yes	69.2	61	65.1
No	30.8	39	34.9
If yes when you will take it?			
Immediately	35.8	21.3	28.6
Will wait some time	64.2	78.7	71.4
If no, what are your reasons?			
Not safe	43.4	38.5	40.9
I do not think it will protect me	27.6	38.5	33.1
I do not know what is the vaccine	29	23.0	26
Which vaccine do you prefer?			
1. Pfizer & BioNTech	23.8	24.2	24
2. Moderna	11	10.5	10.8
3. Vac Sputnik V	40.2	22.6	31.4
4. Novavax	7.3	12.1	9.7
5. Oxford (AstraZeneca)	16.5	21.8	19.2
6. Sinovac	1.2	8.9	5.1
Do you agree to pay fees for the vaccine?			
Yes	44.2	44	44.1
No	55.8	56	55.9
Do you think the vaccine will be effective in all ages?			
Yes	42.5	34.5	38.5
No	52.9	65.0	58.95
Do not know	4.6	0.5	2.55
Do you think the vaccine alone will be enough in protection against the COVID19?			
Yes	20.8	17.5	19.15
No	77.1	82.5	79.8
Do not know	2.1	0.00	1.05

**Table 5:** Correlation between socio-demographic characteristics and attitudes of respondents with COVID-19 vaccine acceptance

Variable	Acceptance of COVID-19 vaccine	
	General population (P-value)	Students (P-value)
Gender	0.544	0.080
Age	0.288	-----
Level of education	0.053	0.472
Working status	0.314	-----
Did you get COVID-19 infection?	0.082	0.054
Did one of your family members get COVID-19 infection?	0.162	0.445
Do you wear masks daily when you go outside?	0.639	0.264
Do you use hands sanitizers daily?	0.008	0.080
Did you take the flu vaccine before?	0.093	0.306
Do you avoid presence in crowded places?	0.576	0.697

Similarly, in the university student sample, there was no significant correlation between gender, level of education, had COVID-19 infection or having family members infected, wearing masks whenever they go outside, taking the flu vaccine before and avoid the crowded places with acceptance of COVID-19 vaccine with p value equal to 0.080, 0.472, 0.054, 0.445, 0.264, 0.306 and 0.697, respectively. However, using hand sanitizers daily was the only factor significantly associated with the COVID-19 acceptance among the general population,  $p = 0.008$ .

## Discussion

In Libya, since August 26<sup>th</sup>, 2020, the number of COVID-19 patients has been doubled and the real number of the infected people is much higher. In addition, the healthcare system had faced numerous challenges due to the years of conflict where around 50% of primary health facilities closed. Alarming of COVID-19 pandemic not only on general population, it spreads to healthcare staff because long working hours during caring COVID-19 patients [9]. However, the social occasions, limitation and lockdown has been lifted by the Libyan government. Moreover, the study in schools and universities started by the traditional way (physically presence of the students). Therefore, the vaccine is the best way to control the COVID-19 pandemic in this situation. Meanwhile, this study is performed to detect the acceptance of general population and students to the COVID-19 vaccine and the related determinants in the two samples. In the current study, about 70% of the public sample accept to be vaccinated against COVID-19, while about 60% of the students intended to be vaccinated for COVID-19; according to some assessments, this percentage would be sufficient to attain herd population immunity [10]. In comparison, the agreement to COVID-19 vaccine in this study is less than other published studies such as Chinese study, where the general population acceptance was about 90% [11]. As well as, the acceptance percentage among the Indonesian citizens was higher than the current study (93% and 67%) with COVID-19 vaccine effectiveness 95% and 50%, respectively [12]. On the other hand, Saudi Arabia [13] and USA [14] studies showed relatively lower agreement rate to the COVID-19 vaccine with 65% and 57%, respectively.

However, in this study about two thirds (65% and 80%) of the general population and students, respectively who accepted to be vaccinated prefer to postpone taking the vaccine. This reassembles to the Chinese study [11] and Iraqi study [15], where these studies reported that about a half 50%, and two thirds 65% of the respondents, respectively, prefer to delay getting the COVID-19 vaccine until safety assurance. This delaying to attain the vaccine may have related to vaccine hesitancy which

causes that the individuals and their families to postpone or reject the vaccine when it is available. Specific-vaccine issues for example safety and confidence, individual, contextual and group influences are the main causes for vaccine hesitancy [16]. About a half of the public and student participants (43.4% and 38.5%, respectively) who refused to take the vaccine was due to the safety issue which ensure that the safety was the effective factor that affect the vaccine hesitancy in the current study. In addition, more than a half of the participants in two samples are refused to pay for vaccine. Cost considered one of the effective factors that affect the vaccine hesitancy [17]. Therefore, COVID-19 vaccine preferred to be available cost free to increase the vaccine acceptance. The high hesitancy that appeared in the current results could be due to some side effects that occurred when the vaccine distributed in the market [18]. However, this level would be reduced when the research studies prove that the side effects are rare and show sufficient data stabilize the effectiveness and the safety of the vaccine.

The current findings demonstrated that different factors were not related to the acceptance of COVID-19 vaccine, including employment status, level of education, family history of previous infection with COVID-19, previous intake of influenza vaccine and the different specialization of the student's sample. Confirming to these results, Wang and others [11], Padhi and others [13] reported that the previous mentioned factors were not significantly effective on the hesitancy to COVID-19 vaccine. In contrast, other researchers established that higher education level predicts higher acceptance rate while unemployment state of the participants presented lower acceptance to COVID-19 vaccine. Similarly, Fisher and others [14] revealed that lower education status and not had flu vaccine were affected on vaccine attainment. The factor related to the attitude toward COVID-19 using the hand sanitizing was significantly associated with the vaccine acceptance where about three quarters of the public who accept to attain the vaccine applying the hand sanitizing. This finding could be due to that they want to protect themselves against the COVID-19 infection by the sanitizer and the vaccine.

Regarding to the age of respondents and its association with the COVID-19 vaccine acceptance, some studies [11, 12] had similarity with the current finding that the age had not a significant influence on the vaccine acceptability (for both samples). Even though, most the older aged participants of the general population accepted to be vaccinated, the percentage of the elderly in the sample is relatively small thus the age was not affected the vaccine attainment in the sample. In contrast, other study reported that the younger people are more likely to



accept the COVID-19 vaccine than the older counterparts and this factor was significantly effective on the vaccine intention [15]. This study also showed that the gender has not substantial effect on vaccine acceptance. This finding could be related to that about two thirds of the study sample were females, therefore, the relation clearance has not determined. On the other hand, the earlier studies established that the gender as a predictor of vaccine attainment [11, 18]. In comparison, there was no a significant difference among the two used samples (general population and students) with the COVID-19 acceptance. As well as, the two samples of students were similar in their vaccine acceptance. These results established that the level of education has not a significant effect on the ability to be vaccinated with COVID-19 vaccine. The acceptability of the sample was assessed before introducing the vaccine in the market where the efficacy and the side effects of the vaccine start to appear in the media. While the side effects as thrombosis following AstraZeneca COVID-19 vaccination relation [18] could had a slight effect in the results. So some people might change their response after cleared this issue by the researchers and the produced company. Although, this study covered a specific region in Libya compared to other studies, a self-administered questionnaire distributed among different counterparts of the society, educated and low educated people, employed and unemployed, different occupations and ages, thus the generalizability of the findings was good.

## Conclusion

The Libyan public and students have good acceptability to the COVID-19 vaccine and to reduce vaccine hesitancy the immunization program, the vaccine cost should be free. An education schedule to declare the importance of the vaccine to eradicate the pandemic disease and its efficacy and safety should be implanted.

## Author's contribution

Asma M. Buzgeia contributed to data analysis tools. Fatma A. Abdrabba performed the analysis and interpretation. Both authors equally contributed to the development of ideas and design of the study, collection of data, drafted/revised manuscript for important intellectual context, and approved the final version of the manuscript.

## Conflict of Interest

The authors have no competing interests.

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