

# BMJ Open Acceptance of COVID-19 vaccines in Palestine: a cross-sectional online study

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## ABSTRACT

**Introduction** In Palestine (West Bank and Gaza), there have been more than 320 890 known cases of COVID-19, resulting in 3452 deaths. The detrimental effects of the virus can be seen in the nation's health, economy and government operations, leading to radical uncertainty that is exacerbated by the absence of any definitive treatment or vaccines. The level of knowledge about and trust in treatment and vaccination varies worldwide. This study aims to assess the willingness of Palestinians to receive a COVID-19 vaccine and their knowledge about such vaccines.

**Methods** An online survey of adults over 18 years old (n=1080) was conducted in Palestine in October 2020. Using multivariate logistic regression, we identified correlates of participants' willingness to get a COVID-19 vaccine.

**Results** We found that about 63% of participants were willing to get a COVID-19 vaccine. However, acceptance varied with the specific demographic variables that were investigated. Women, married participants and those aged 18–24 years are more likely to take the vaccine. Further, participants with good knowledge about the vaccine and its side effects are more willing to get the vaccine.

**Conclusion** The availability of a safe and effective COVID-19 vaccine in Palestine is crucial to decrease the burden of COVID-19 morbidity and mortality. In addition, to ensure a high vaccination rate, health awareness campaigns should target those who are not willing to get the vaccine, especially those who are more vulnerable and the elderly.

## INTRODUCTION

The novel coronavirus (COVID-19) was first detected in Wuhan in 2019, signalling the start of a severe global pandemic.<sup>1</sup> Since then, COVID-19 has infected over 107 532 472 people and caused 2 354 212 deaths worldwide. As of April 2021, COVID-19 has infected 317 961 Palestinians and caused 3406 deaths.<sup>2</sup> This has resulted in serious consequences for world health and the global economy and forced governments to operate in a context of radical uncertainty, as there were previously no definitive treatments or vaccines.<sup>3</sup> Consequently, many countries have acknowledged these tremendous problems and are cooperating to improve the situation. Vaccines for

## Strengths and limitations of this study

- This study is the first to estimate the willingness of people to receive a COVID-19 vaccine in Palestine.
- This study has a good and high participation rate.
- This study is a cross-sectional online survey; therefore, it was subjective to participation bias.

COVID-19 are an important health measure to help bring the pandemic under control, and several promising vaccines have already been approved and are considered safe and effective. Several countries have started the process of vaccinating their populations using Pfizer/BioNTech, Moderna, Sputnik V, Sinopharm and Oxford-AstraZeneca vaccines.<sup>4 5</sup> Since the virus poses a significant threat to public health, vaccination is an essential intervention; however, public perception toward the uptake of COVID-19 vaccines has not yet been determined.

Determann and colleagues found that disease and vaccination programmes influence respondents' receptiveness to vaccines during a pandemic, which affects vaccine uptake.<sup>6</sup> Previous studies have shown that the general population's intention to accept or decline a vaccine is influenced by their perception of personal risk, attitude toward vaccination and ethnicity. Kourlaba and colleagues reported that the acceptance rate for vaccination was 57.7% in Greece,<sup>7</sup> while a behavioural model developed by Schwarzingger and colleagues predicted that 29.4% (95% CI: 28.6% to 30.2%) of the French population of working age would refuse the COVID-19 vaccine.<sup>8</sup>

The medical services in Palestine are fragmented and are provided by the Palestinian Ministry of Health (PMOH), non-governmental health institutions, military medical services, United Nations (UN) Relief and Works Agency, and the private sector.<sup>9</sup> The number of medical cadres registered in various medical associations in Palestine has reached 31 873, of which 24 432 (76.6%)

are in the West Bank and 7441 (23.3%) are in the Gaza Strip.<sup>10</sup> Thus, after 1 year of battling with COVID-19, the healthcare system in Palestine is facing a crisis due to the spread and increase in the infection rate of COVID-19. Hospitals, which are already operating beyond their capacity, are being overloaded by new cases of COVID-19. Health providers are being faced with extraordinary levels of demand, as hospital beds are now essentially filled by COVID-19 cases and the number of infections is increasing.<sup>11</sup> To decrease the incidence of COVID-19, lower the demand for intensive care and reverse the course of the COVID-19 epidemic, a large portion of the population must be vaccinated within a short period. In the absence of prophylaxis through a vaccine, the surge in cases will likely continue.

Saied and colleagues observed that acceleration in the rate of vaccine development compared with the past had aroused speculation about whether or not such vaccines are safe to use.<sup>12</sup> Furthermore, they noted that the side effects of the new COVID-19 vaccinations are still unknown. People on social media are providing misleading information about the new vaccines. Consequently, the WHO has administered a serious warning that this epidemic could turn into an 'infodemic'. This refers to a phenomenon that occurs when people start spreading debunked news and false information based on anecdotal evidence.<sup>13</sup> Qattan and colleagues stated that people need to accept the vaccine to implement a vaccination programme successfully; this requires that the government build more public trust in emergency-released vaccines.<sup>14</sup>

Effective control of the COVID-19 pandemic via widespread vaccination will require achieving sufficient herd immunity among the population; for COVID-19, this requires a vaccination rate of about 67%.<sup>15</sup> However, due to growing uncertainty and confusion among the general population regarding vaccines' effectiveness and safety, it is unclear whether the availability of vaccines will be met with a high uptake. Information is currently lacking about people's acceptance of COVID-19 vaccines and the factors that may influence their acceptance.<sup>16</sup> Therefore, this study aims to assess the willingness of the general public to get a COVID-19 vaccine in Palestine (West Bank and Gaza). This information will be crucial for planning future campaigns to improve vaccine uptake among the Palestinian population.

## METHODS

We conducted a cross-sectional web-based study to assess the willingness of the Palestinian population to receive a COVID-19 vaccine. Participation was limited to those who were 18 years or older and residing in Palestine. Data were gathered anonymously online through a self-administered questionnaire designed using Google Forms distributed on different venues on social media such as Facebook and WhatsApp platforms, universities and different unions' websites. We anticipated a minimum sample of

384 responses using the 95% CI for population, and we limited the study by 2 months, and accepted any response in this period. Participants (n=1080) were informed that participation was voluntary and confidential, and they can stop completing the survey at any time.

## Data collection

The survey items were developed based on information about the COVID-19 pandemic provided by the WHO (online supplemental file 1).<sup>17</sup> A pilot testing was conducted on 46 participants who were excluded later from the study. Furthermore, face validity with three Palestinian experts in the field of epidemiology was used to ensure the integrity of the questionnaire. The survey questionnaire consisted of several sections: demographic information, health status, and knowledge about the nature of the COVID-19 virus, treatment and prevention modalities. In addition, the survey collected information about priority groups that should be vaccinated and participants' willingness to be vaccinated.

Demographic data included questions about gender, age, geographical region, locality (city, village or camp), marital status, educational level, employment status, income, smoking status and disease status.

We then assessed items that might affect participants' willingness to be vaccinated, their knowledge regarding treatment modalities and prevention of COVID-19, and if such knowledge affected their willingness to be vaccinated. We asked participants whether certain medications would be of benefit to treat or prevent COVID-19 infection. Furthermore, participants were asked about the role of plasma from recovered patients with COVID-19 in treating the infection. We also asked whether the vaccine would be safe or not once it is available and whether the vaccine would provide immunity against COVID-19 instead of transmitting the infection.

We also assessed the participants' knowledge of which priority groups should be vaccinated, and acceptance of COVID-19 vaccination was assessed by asking them about their willingness to get the vaccine once it becomes available in Palestine. In addition, trust in the vaccination process was evaluated by asking them if they would accept having their children vaccinated and if they trusted the scientists involved in COVID-19 vaccine development.

Knowledge and attitude scores were calculated by adding up the number of correct answers (ie, the first answer option) for each question. Each variable was given equal weight, and each score was recoded into three equal groups.

## Statistical analysis

Analysis of the data was completed using IBM SPSS V.26.0. Descriptive measures are presented as frequencies and percentages. Pearson's  $X^2$  was used for the comparison of categorical variables. Bivariate analysis was conducted to measure the correlation between participants' willingness to get a COVID-19 vaccine and other independent variables. Multivariate logistic regressions were also

performed to identify the variables associated with vaccine acceptance among Palestinians. Results were considered significant when the p value was less than 0.050. CIs (95% CI) and ORs were also determined.

### Patient and public involvement

No patients were involved in this study.

## RESULTS

### Participant characteristics

Of the 1080 participants, half were young adults between the ages of 25 and 44 years (49.9%) and more than half were female (58.6%). The majority of participants came from the south of West Bank (46.8%) and lived in the city (59.7%). Just over half of the participants were married (53.2%) and the vast majority had bachelor's degrees (66.0%). About 41.1% of the participants were healthcare workers. Sixty-six and a half per cent of participants never smoked, and only 18.3% of participants had at least one medical disease. Less than half of the participants had been tested for COVID-19 (40.9%). Only 14.1% reported a personal history of COVID-19 infection, while 94.9% reported a history of COVID-19 infection among family members (table 1).

### Willingness to get a COVID-19 vaccine

Around 63% of participants were willing to get a COVID-19 vaccine (table 2). Based on participants' knowledge about the nature of the COVID-19, participants who were willing to be vaccinated were those who considered COVID-19 to be a real virus (69%), compared with those who believed it was fabricated (39%) and those who did not know what COVID-19 was (39%,  $p < 0.001$ ). Participants who thought they were susceptible to COVID-19 infection were willing to take the vaccine (65%), compared to those who did not or those who did not know if they were susceptible respectively (48%, 41%,  $p = 0.012$ ). Also, participants who thought that following the safety measures (wearing a mask correctly and keeping a safe physical distance) were more willing to receive the vaccine, compared to those who did not believe in such measures and those who did not know (face masks: 66%, 39%, 31%,  $p < 0.001$ ; distancing: 65%, 45%, 47%,  $p = 0.007$ ) (online supplemental table 1).

The bivariate analysis measuring participants' willingness to be vaccinated against COVID-19 and their knowledge about the treatment and prevention of COVID-19 infection showed that those who were willing to get the vaccine were those who thought that it would be safe (91%), compared with those who did not think it would be safe (28%) and those who did not know (66%,  $p < 0.001$ ). Participants were also more willing to get the vaccine if they thought that the vaccine would not cause side effects (79%), compared with those who thought that it would (55%) and those who did not know (72%,  $p < 0.001$ ); if they thought that the vaccine should be given every year (74%), compared with those who thought it should not

**Table 1** Participant characteristics (n=1080)

Characteristic	n (%)
<b>Gender</b>	
Female	633 (58.6)
Male	447 (41.4)
<b>Age groups (years)</b>	
18–24	368 (34.1)
25–34	311 (28.8)
35–44	228 (21.1)
>45	173 (16.0)
<b>Geographical region</b>	
Middle of West Bank	295 (27.3)
North of West Bank	147 (13.6)
South of West Bank	535 (46.8)
Gaza Strip	103 (9.5)
<b>Locality</b>	
City	645 (59.7)
Village	357 (33.1)
Camp	78 (7.2)
<b>Marital status</b>	
Married	575 (53.2)
Not married	505 (46.8)
<b>Educational level</b>	
Diploma or less	114 (10.6)
Bachelor	713 (66.0)
Higher education	253 (23.4)
<b>Employment status</b>	
Health professionals	444 (41.1)
Non-health professionals	636 (58.9)
<b>Income</b>	
Excellent	84 (7.8)
Very good	325 (30.1)
Good	496 (45.9)
Less than good	99 (9.2)
Bad	43 (4.0)
Very bad	33 (3.1)
<b>Smoking status</b>	
Cigarette only	158 (14.6)
Shisha only	140 (13.0)
Cigarette and shisha	29 (2.7)
Electronic cigarette	9 (0.8)
Ex-smoker	26 (2.4)
Never smoke	718 (66.5)
<b>Having at least one underlying medical disease</b>	
Yes	198 (18.3)
No	882 (81.7)
<b>Personally reported with COVID-19</b>	

Continued

**Table 1** Continued

Characteristic	n (%)
Yes	152 (14.1)
No	721 (66.9)
Do not know	204 (18.9)
Reported any family member(s) infected with COVID-19	
Yes	1022 (94.9)
No	0 (0.0)
Do not know	55 (5.1)
Had tested for COVID-19	
Yes	440 (40.9)
No	637 (59.1)

(53%) and those who did not know (60%,  $p<0.001$ ); and if they believed that the COVID-19 vaccine would not transmit the infection instead of providing immunity (79%), compared with those who believed that it would (38%) and those who did not know (52%,  $p<0.001$ ). Moreover, those who did not think that vitamins (such as vitamin C) and plasma from recovered patients with COVID-19 would be of benefit for preventing infection were more willing to get the vaccine compared with those who answered 'yes' or 'do not know' (vitamins: 73%, 57%, 66%,  $p<0.001$ ; plasma: 68%, 66%, 58%,  $p=0.024$ ). Participants' knowledge about the utility of antiviral or antimalarial medications to treat the infection, and giving the vaccine separately from other vaccines, did not significantly affect their willingness to receive the vaccine (online supplemental table 2).

Participants were in favour of distributing vaccines to all age groups, as well as pregnant women and the immunocompromised (online supplemental table 3). Participants' attitudes toward getting a COVID-19 vaccine (table 3) were also assessed based on their trust in vaccination. Participants who were willing to receive the vaccine were those who agreed to give their children the vaccine (94%,  $p<0.001$ ), trusted scientists and researchers (88%,  $p<0.001$ ), thought that the period in which the vaccine was developed was sufficient (80%,  $p<0.001$ ), and thought that information regarding vaccine development should be clear and accessible (74%,  $p<0.001$ ), compared with those who disagreed or did not know (online supplemental table 4).

In the multivariate logistic regression (table 4), participants were more likely to be willing to receive a COVID-19 vaccine if they were married (OR=4.48, 95% CI: 1.668 to 12.044), living in a camp (OR=2.36, 95% CI: 0.701 to 7.945) or living in Gaza (OR=7.13, 95% CI: 1.679 to 30.303). Participants who had high positive attitude scores toward vaccination would be more likely to accept the vaccine (OR=110.62, 95% CI: 28.329 to 431.0), along with those who had moderate knowledge scores regarding which priority groups should be vaccinated (OR=1.60, 95% CI: 0.768 to 3.318), and those who had

**Table 2** Bivariate analysis correlates of getting a COVID-19 vaccine for participant characteristics

Willingness to take the vaccine (n=889)			
Characteristic	Yes n (%)	No n (%)	P value
Gender			
Female	296 (58.3)	212 (41.7)	<0.001
Male	268 (70.3)	113 (29.7)	
Age groups (years)			
18–24	219 (73.5)	79 (26.5)	<0.001
25–34	161 (61.0)	103 (39.0)	
35–44	106 (56.1)	83 (43.9)	
>45	78 (56.5)	60 (43.5)	
Geographical region			
Middle of West Bank	139 (57.4)	103 (42.6)	<0.001
North of West Bank	83 (68.6)	38 (31.4)	
South of West Bank	270 (61.2)	171 (38.8)	
Gaza Strip	72 (84.7)	13 (15.3)	
Urban/rural settings			
City	341 (64.8)	185 (35.2)	0.53
Village	184 (62.0)	113 (38.0)	
Camp	39 (59.1)	27 (40.9)	
Marital status			
Married	280 (68.3)	193 (33.6)	0.005
Not married	284 (59.2)	132 (40.8)	
Educational level			
Diploma or less	56 (57.7)	41 (42.3)	0.25
Bachelor	380 (65.3)	202 (34.7)	
Higher education	128 (61.0)	82 (39.0)	
Employment status			
Health professionals	247 (64.8)	134 (35.2)	0.46
Non-health professionals	317 (62.4)	191 (37.6)	
Income			
Excellent	45 (64.3)	25 (35.7)	0.005
Very good	166 (63.6)	95 (36.4)	
Good	272 (66.2)	139 (33.8)	
Less than good	36 (43.9)	46 (56.1)	
Bad	27 (75.0)	9 (25.0)	
Very bad	18 (62.1)	11 (37.9)	
Smoking status			
Cigarette only	88 (65.7)	46 (34.3)	0.069
Shisha only	87 (71.3)	35 (28.7)	
Cigarette and shisha	13 (61.9)	8 (38.1)	
Electronic cigarette	6 (100.0)	0 (0.0)	
Ex-smoker	17 (73.9)	6 (26.1)	
Never smoke	353 (60.5)	230 (39.5)	
Having at least one underlying medical disease			

Continued

Table 2 Continued

Willingness to take the vaccine (n=889)			
Characteristic	Yes n (%)	No n (%)	P value
Yes	92 (62.2)	56 (37.8)	0.72
No	472 (63.7)	269 (36.3)	
Personally reported with COVID-19			
Yes	82 (65.1)	44 (34.9)	
No	381 (63.6)	218 (36.4)	0.82
Do not know	101 (61.6)	63 (38.8)	
Reported any family member(s) infected with COVID-19			
Yes	540 (64.1)	303 (35.9)	
No	0 (0.0)	0 (0.0)	0.10
Do not know	24 (47.8)	22 (52.2)	
Had tested for COVID-19			
Yes	242 (64.0)	136 (36.0)	0.76
No	322 (63.0)	189 (37.0)	

high trust scores for vaccination were also more willing to get the COVID-19 vaccine (OR=11.80, 95% CI: 4.092 to 34.006).

Participants were less likely to be willing to get a COVID-19 vaccine if they were male (OR=0.86, 95% CI: 0.425 to 1.754), aged 45 years and older (OR=0.11, 95% CI: 0.024 to 0.472), had a bachelor's degree (OR=0.65, 95% CI: 0.124 to 1.629) or were non-healthcare professionals (OR=0.85, 95% CI: 0.412 to 1.767), and participants who had a high knowledge score regarding the nature of the COVID-19 (OR=0.18, 95% CI: 0.065 to 0.492) and who had a moderate score toward the treatment and prevention of COVID-19 infection (OR=0.74, 95% CI: 0.332 to 1.629).

## DISCUSSION

This study aimed to evaluate the acceptance of COVID-19 vaccines among Palestinians. Around 63% of the study population showed a positive attitude toward vaccination against COVID-19. Our results were consistent with similar studies exploring the willingness of the population to be inoculated with the COVID-19 vaccine in Saudi Arabia (64.7%), China (72.5%) and the USA (80%).<sup>18</sup> As vaccines become available, it will be necessary to monitor changes in people's willingness and how that will affect vaccine uptake, since people's intentions do not always reflect their actual behaviour.<sup>16</sup> Having a better understanding of the factors influencing people's decisions to accept an emergency-released vaccine can help authorities to manage the pandemic better.<sup>18</sup>

Many studies have shown that willingness to receive a vaccine is linked to several factors, including the risk of being infected with the virus; the severity of the virus; the safety, efficacy and adverse outcomes of the vaccine; a lack of knowledge about the nature of vaccine-preventable

diseases; and misconceptions and misinformation related to the vaccine.<sup>18 19</sup>

This study has highlighted several factors that may increase or decrease people's willingness to receive the vaccine. Perceived risk of becoming infected was a positive predictor of the intention to be vaccinated.<sup>18 19</sup> Our results were consistent with those of previous studies and showed that 65% of participants believed that they could be susceptible to COVID-19 infection.

Although wearing a mask correctly and keeping a safe social distance are crucial for reducing the spread of COVID-19, the Centers for Disease Control and Prevention (CDC) has stated that these measures alone will not be sufficient to stop the spread of the virus. Thus, using COVID-19 vaccines combined with these measures will be vital for stopping the pandemic.<sup>20</sup> As reported in our study, participants who understood the importance of the measures mentioned above were more willing to get the vaccine. Therefore, governments and health agencies should do more to try and increase public awareness of the effectiveness of these measures.

According to the CDC, none of the existing COVID-19 vaccines will cause people to become infected with COVID-19. Furthermore, they confirmed that all the vaccines had been carefully assessed through clinical trials. COVID-19 vaccines have also been shown to decrease the seriousness of infection even if a person does become infected.<sup>20</sup> This supports our finding where most participants shared the same belief regarding the safety and effectiveness of the vaccine. Some participants who were reluctant to get the vaccine were worried about the side effects of the novel vaccine and its impact on their overall health. However, most of our study participants believed that the vaccine would not cause any serious side effects.

The WHO has stated that every human being anywhere in the world who could benefit from a safe and effective COVID-19 vaccine should quickly have access to one.<sup>21</sup> Some of Palestine's neighbouring countries such as Jordan and Egypt have started their vaccination campaigns,<sup>22</sup> and Palestinians also have the right to have fair and equal access to necessary healthcare, including COVID-19 vaccines, to face the burden of the pandemic, especially that physical implications such as path of the wall that has taken through West Bank and long-lived siege in Gaza that resulted in isolation from healthcare and making the vulnerable people in the society inaccessible to health services.<sup>9</sup> However, according to a correspondence published in *The Lancet*, the UN has stated that the majority of Palestinians are unlikely to have access to the available vaccines in the near future.<sup>23</sup>

As of March 2021, the limited vaccines that were available to Palestinians were used to cover the first phase of vaccination according to the priorities suggested by a study conducted in China; this includes maintaining necessary services such as healthcare and national security. The second stage will then aim to reduce the number of severe cases, thereby decreasing the number of hospitalisations, admissions to intensive care units and deaths. As a third

**Table 3** Attitude of study participants toward getting a COVID-19 vaccine

Question	Willing to take the vaccine (n=889)		P value
	Yes n (%)	No n (%)	
Would you agree to participate in clinical trials for testing efficacy of COVID-19 vaccine?			
Agree	211 (91.7)	19 (8.3)	
Disagree	291 (50.4)	286 (49.6)	<0.001
Do not know	62 (75.6)	20 (24.4)	
Would you agree to pay to get the vaccine, if not provided freely?			
Agree	381 (94.1)	24 (5.9)	
Disagree	123 (30.4)	282 (69.6)	<0.001
Do not know	60 (75.9)	19 (24.1)	
Would you get the vaccine from another country which either produces it, or has it, if not available in Palestine?			
Agree	234 (92.5)	19 (7.5)	
Disagree	181 (39.8)	274 (60.2)	<0.001
Do not know	149 (82.3)	32 (17.7)	
Would you advise people to get the COVID-19 vaccine?			
Agree	468 (91.9)	41 (8.1)	
Disagree	16 (7.8)	189 (92.2)	<0.001
Do not know	80 (54.3)	95 (45.7)	
Would you take the COVID-19 vaccine, if it has mild side effects?			
Agree	437 (90.9)	44 (9.1)	
Disagree	76 (22.8)	257 (77.2)	<0.001
Do not know	51 (68.0)	24 (32.0)	
Score of attitude toward COVID-19 vaccine*			
(0)	21 (8.3)	232 (91.7)	
(1)	61 (44.5)	49 (55.5)	
(2)	104 (85.2)	18 (14.8)	<0.001
(3)	157 (96.3)	6 (3.7)	
(4)	162 (95.3)	8 (4.7)	
(5)	71 (100.0)	0 (0.0)	
Low score	21 (8.3)	232 (91.7)	
Moderate score	153 (65.9)	79 (34.1)	<0.001
High score	157 (96.3)	6 (3.7)	

\*The first option in each question above is considered the true answer; (0) represents no true answers answered by the participants, (1) represents one true answer answered by the participant and so on. Low score (represents the first 1/3 of the answers), moderate score (represents the second 1/3 of the answers) and high score (represents the third 1/3 of the answers).

stage, vaccination could be extended to the general population to decrease and ultimately stop the burden of viral transmission and symptomatic infections.<sup>24</sup>

According to Yang and colleagues,<sup>24</sup> the groups that should be prioritised to receive the COVID-19 vaccine are essential workers, which include healthcare providers as a top priority (according to the Palestinian Central Bureau of Statistics, the number of healthcare providers in Palestine in 2019 was 45 379 workers, including nurses, Medical Doctors, dentists and pharmacists); high-risk individuals who may experience severe or fatal outcomes; and those who contribute to viral transmission, especially those who

work to maintain daily activities such as transportation, food services, law enforcement and civil services.

Furthermore, the healthcare system in Palestine remains submissive to Israel, with the Israeli state holding ultimate authority over healthcare budgets, border crossings, building permits, and pharmaceutical imports and exports. Consequently, MOH hospitals are basic compared with hospitals within Israel and lack many resources, especially specialist personnel, while the doctors practising in the West Bank have limited opportunities for training and continued professional development due to imposed permit sanctions. Vaccine

**Table 4** Multivariate logistic regression of willingness to get a COVID-19 vaccine

Variable	OR	95% CI	P value
<b>Gender</b>			
Female	1.00		
Male	0.86	0.425 to 1.754	0.68
<b>Age group (years)</b>			
18–24	1.00		
25–34	0.22	0.079 to 0.594	0.003
35–44	0.12	0.031 to 0.468	0.002
>45	0.11	0.024 to 0.472	0.003
<b>Geographical region</b>			
Centre of West Bank	1.00		
North of West Bank	1.47	0.439 to 4.909	0.53
South of West Bank	1.51	0.671 to 3.777	0.32
Gaza Strip	7.13	1.679 to 30.303	0.008
<b>Locality</b>			
City	1.00		
Village	1.02	0.484 to 2.161	0.95
Camp	2.36	0.701 to 7.945	0.17
<b>Marital status</b>			
Not married	1.00		
Married	4.48	1.668 to 12.044	0.003
<b>Educational level</b>			
Diploma or less	1.00		
Bachelor	0.65	0.124 to 1.629	0.22
Higher education	0.85	0.162 to 2.636	0.55
<b>Employment status</b>			
Health professionals	1.00		
Non-health professionals	0.85	0.412 to 1.767	0.67
<b>Knowledge score towards nature of the virus</b>			
Low	1.00		
Moderate	0.51	0.224 to 1.173	0.11
High	0.18	0.065 to 0.492	0.001
<b>Knowledge score towards treatment and prevention</b>			
Low	1.00		
Moderate	0.74	0.332 to 1.629	0.47
High	0.77	0.282 to 2.077	0.60
<b>Knowledge score towards priority groups</b>			
Low	1.00		
Moderate	1.60	0.768 to 3.318	0.21
High	1.23	0.386 to 4.924	0.73
<b>Attitude score towards vaccination</b>			
Low	1.00		
Moderate	13.91	6.042 to 32.041	<0.001
High	110.62	28.329 to 431.0	<0.001
<b>Trust in vaccination score towards vaccination</b>			
Low	1.00		

Continued

Table 4 Continued

Variable	OR	95% CI	P value
Moderate	2.90	1.109 to 7.073	0.029
High	11.80	4.092 to 34.006	<0.001

availability is therefore much lower in Palestine than in Israel.<sup>9</sup> Building a plan to improve acceptance among those who are less willing to receive the vaccine will be crucial, as identified by the study results. Therefore, frontline healthcare providers should be aware of data regarding the safety of the vaccines and advise people to get the vaccine based on solid scientific evidence, as their recommendation and willingness to receive the vaccine are known to be driving factors that could positively affect the people's vaccination intentions.<sup>25 26</sup> Lessons learnt from previous pandemics such as SARS and Middle East Respiratory Syndrome (MERS) suggest that trusted information and guidance from professionals are crucial to controlling the spread of disease.

Our study has shown that higher trust scores were linked to a greater interest in being vaccinated. According to the PMOH's annual health report from 2018, 99.8% of children were given the diphtheria–tetanus (DT) vaccine and oral polio vaccine in the first grade, and 99.5% of children got the DT vaccine in the ninth grade.<sup>10</sup> This shows that Palestinians appreciate and believe in the ability of vaccines to control diseases. In comparison, a cohort study conducted in the USA found that more than 10% of parents reported delaying or refusing vaccinations for their children, also a study was conducted among parents in Turkey showed that they had a low willingness rate to give their children the COVID-19 vaccine.<sup>27 28</sup> Although UK and European populations showed positive attitudes toward vaccination, about 10% still showed distrust in or were unwilling to get vaccines.<sup>29</sup>

Trust in vaccines is strongly associated with compliance with vaccine uptake. Until the sufficient supply of COVID-19 vaccine is available, addressing vaccine hesitancy and building confidence among the population will be vital. This will require direct and clear communication from government officials to provide information about how the vaccine works and its development. Vaccination programmes must address public concerns about the level of vaccine effectiveness and the time needed for protection. The promotion of vaccination programmes should be adopted and encouraged by the leaders of municipalities, religious societies and non-governmental organisations, as well as those in the private sector.<sup>30</sup> Trust in the type of vaccine offered is very important. The scientific debate on which is the most effective vaccine with the least side effects might influence people's willingness to get the vaccine. The influence of the type of vaccine on people's acceptance was not studied in our study, but we are documenting a current observation of people avoiding a certain type of vaccine because of its

side effects. Further research is needed to have a better understanding of people's choices and decisions.

We could not find any recent studies that investigated the 'predictors of vaccine attitudes of Palestinians' and how such attitudes are associated with individuals who are not willing to receive the COVID-19 vaccine, except for one study by Salameh and colleagues that investigated university students' knowledge of and attitude toward COVID-19 and only assessed if they would get the vaccine when it is available.<sup>31</sup>

The results of our study will help the government, policymakers and healthcare professionals to effectively provide informative data during vaccination programmes. However, further research is needed to investigate those who are uncertain or less willing to get the vaccine, since they are considered as a target group for interventions to increase confidence in vaccination.

Our study is the first to estimate the willingness of people to receive a COVID-19 vaccine in Palestine and reflects the positive attitude of Palestinians toward receiving the vaccine, so that it can be used as a guide for future vaccine uptake. Immunisation with a safe and effective COVID-19 vaccine is an important strategy to reduce COVID-19-related morbidity and mortality and to help restore societal functioning. Although vaccines are currently in short supply, the ministry conveys to the population that the vaccine is on its way. Thus, it is important that the population get the vaccine.

Furthermore, to manage those who do not wish to be inoculated, public health authorities need to consider people's concerns about novel vaccines, such as 'personal risk perception and vaccination attitude', and address these concerns through awareness campaigns that aim to educate the public about the vaccine's safety and how it will help mitigate public health risks.<sup>19</sup>

The higher the vaccine acceptance rate, the easier it will be for governments to quickly contain the spread of COVID-19 and better implement health management plans. It will be the responsibility of health agencies to build trust in the COVID-19 vaccine within communities.<sup>32</sup>

This study was the first one in Palestine to estimate the population's acceptance, and so predicting the people's attitudes toward vaccination in order to help the policymakers to put the appropriate measures to face the pandemic. The study was also strengthened by having high participation rate at 1080 participants, especially when the people started to have study fatigue and boredom due to many studies conducted about COVID-19. However, our study might be subjective to certain limitation such as participation bias, since the people



who are interested in the vaccine are the ones to be responding to the survey.

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