Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Research in Social and Administrative Pharmacy xxx (xxxx) xxx

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Willingness to pay for COVID-19 vaccines: Applying the health belief model

Rasha M. Arabyat [a,*], Mohammad B. Nusair [a,b], Sayer I. Al-Azzam [c], Haneen A. Amawi [a], Feras Darwish El-Hajji [d]

[a] Department of Clinical Pharmacy and Pharmacy Practice, College of Pharmacy, Yarmouk University, Irbid, 21163, P. O. BOX 566, Jordan
[b] Department of Sociobehavioral and Administrative Pharmacy, College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL, USA
[c] Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, Jordan
[d] Applied Science Private University Amman, Jordan

ARTICLE INFO

Keywords:
Willingness to pay
COVID-19 vaccine
Health Belief Model

ABSTRACT

Background: To date, there is no effective treatment for COVID-19. Vaccines are effective and safe strategies to control the pandemic.
Objective: To measure consumers' maximum willingness to pay (WTP) for COVID-19 vaccines in Jordan and to identify the predictors of WTP.
Method: An online survey was used to collect data related to sociodemographic factors and constructs from the Health Belief Model (HBM). The contingent valuation method using the payment card approach was used, whereby the respondents were asked to choose their maximum WTP value from a range of 5–200 Jordanian Dinar (JOD). The maximum WTP values were then categorized into several groups, and an ordered logistic model was used to generate adjusted odds ratios and estimate the significant predictors of maximum WTP.
Results: A total of 3116 respondents completed the survey. More than half of the sample were not willing to pay out of pocket for the vaccine (57%). Among the respondents who were willing to pay any amount above zero, the mean maximum WTP was 28.1 JOD (39.63 USD), and the median WTP was 20 JOD (28.21 USD). The significant predictors of higher WTP values were being of younger age, higher income, being a healthcare provider, having one or more chronic diseases, previous history of receiving the seasonal influenza vaccine, having a family member/friend who has died from the COVID-19, lower perceived risk of the vaccine, higher perceived benefits of the vaccine, and having been recommended to get the vaccine.
Conclusion: It is recommended to continue providing the vaccine free of charge to increase its uptake. Educational campaigns should focus on refuting myths related to the vaccine and promoting the benefits of receiving the vaccine in slowing the spread of the pandemic, and improving the economy. Healthcare providers' recommendations have the potential to increase WTP for the vaccine.

1. Introduction

The first case of coronavirus disease 2019 (COVID-19) was reported in December 2019, when a group of patients presented with severe pneumonia of unknown cause in Wuhan, China.[1] It was then found that COVID-19 is caused by a novel coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On March 11, 2020 the WHO declared COVID-19 a global pandemic.[2] Up until August 18, 2022, SARS-CoV-2 had affected almost every country of the world, resulting in more than 590 million confirmed cases and causing more than 6,450,00 documented deaths.[3] Data from epidemiological studies suggest that SARS-CoV-2 is transmitted most commonly through droplets spread from infected persons during coughing, sneezing, or talking.[4]

In Jordan, the first confirmed case of COVID-19 was reported on March 2, 2020 and up until August 18, 2022, there had been over 1,730,000 cases of COVID-19 and over 14,095 deaths.[5] To date, there are no known proven effective pharmacological therapies for treating COVID-19.[6] Therefore, safe and effective COVID-19 vaccines provide the most effective strategy for the prevention of future outbreaks by achieving community immunity. There are six available vaccines against COVID-19 that are recognized by the WHO as safe and effective as of June 3, 2021. These vaccines are AstraZeneca/Oxford, Johnson and

Abbreviations: Willingness to Pay, WTP.

* Corresponding author.
E-mail address: rasha.arabyat@yu.edu.jo (R.M. Arabyat).

https://doi.org/10.1016/j.sapharm.2022.09.003
Received 27 April 2022; Received in revised form 19 August 2022; Accepted 7 September 2022
Available online 13 September 2022
1551-7411/© 2022 Elsevier Inc. All rights reserved.

Johnson, Moderna, Pfizer/BioN Tech, Sinopharm, and Sinovac. However, a previous study conducted in Jordan showed that the rate of acceptance of the COVID-19 vaccines is among the lowest rates globally.[7] Additionally, Jordan has been severely affected from the economic consequences of the COVID-19 pandemic, which include a reduction in the employment rate by more than 20%, a reduction in average household income by around one-fifth, and a reduction in the Gross Domestic Product (GDP) growth rates.[8] A recent report by the World Bank in Jordan reported an unprecedented and alarming youth unemployment rates that reached up to 50% in the fourth quarter of 2020.[9] In light of the weak economy and scarce healthcare resources, it is important to conduct pharmacoeconomic studies to determine the value of pharmaceutical products such as COVID-19 vaccines.[10] In addition, it is important to consider consumer preferences and valuation of these vaccines including willingness to pay (WTP).[11] It is possible that the Jordanian government may not be able to provide the COVID-19 vaccine free of charge for everyone in the future. Hence, the results of this study can help decision-makers in pricing these health technologies in face of the significant economic challenges. To further understand the factors that contribute to WTP for COVID-19 vaccines, the health belief model (HBM) was utilized as the theoretical framework in this study.

Objective: This study aimed to measure consumers' maximum willingness to pay (WTP) for COVID-19 vaccines in Jordan and to identify the predictors of WTP based on sociodemographic factors and constructs from the Health Belief Model (HBM).

2. Methods

2.1. Survey development

The survey items were developed based on extensive literature review of previous work that assessed the acceptance of vaccines based on the HBM.[12–15] Additionally, specific studies that determine factors associated with COVID-19 vaccine acceptance[16] and perception regarding coronaviruses outbreak were adapted.[17] The survey was translated and distributed in the Arabic language. An online sample size calculator was used to generate the minimum required sample size with a margin of error of 4% and a confidence interval of 95%. In Jordan, the number of adults aged 18 years and older is estimated to be 3, 500, 000. Given these information, the estimated sample size generated by the software was 601. Face and content validity were used to assess the comprehension of the survey. A panel of experts with various research and professional expertise reviewed the survey several times to assess clarity and comprehension. The first 20 responses were used for pilot testing and were discarded from the final analysis. A statement of consent was presented at the beginning of the survey and respondents may only proceed if they state that they do consent to participate.

2.2. Survey dissemination

An online survey was distributed through several social media networks such as Twitter, Facebook, and WhatsApp from the 2^{ed} to the 29th of December 2020. The survey targeted individuals aged 18 years and older who reside in Jordan without any intention to target a specific group. The survey was shared on Facebook and Twitter accounts where Jordanians followed COVID-19 news and updates (e.g., Ministry of Health and Local TV stations social medial accounts). The survey was also shared on local Facebook pages that were open to the public to share their experiences with COVID-19 illness. WhatsApp was also used to increase sample size and reach participants who do not follow Facebook and Twitter from all over Jordan. The research team also distributed the survey to their friends and family WhatsApp groups and asked the groups' members to share it with their other WhatsApp groups. It is important to note that the survey was distributed before the launch of the vaccination campaign in Jordan, which started in mid-January 2021. Ethical approval to conduct the study was obtained from the Institutional Review Board of King Abdullah University Hospital (IRB reference number: 3/137/2020).

2.3. Survey instrument

The survey consisted of three main parts. The first part covered sociodemographic characteristics such as gender (male, female), age (18–24, 25–34, 35–44, 45–54, $\geq$ 55 years), region (Central: Amman, Balqa, Madaba, and Zarqa; North: Irbid, Jerash, Ajloun, and Mafraq; South: Karak, Ma'an, Tafilah, and Aqaba), income (less than 250 JOD, 250–499 JOD, 500–999 JOD, 1000–1499 JOD, and over 1500 JOD), number of family members (1–3, 4–6, 7–9, and $\geq$ 10), having a family member aged > 65 years (yes, no), being a healthcare provider (yes, no), having a chronic disease (yes, no), being a smoker (yes, no), the highest educational qualification attained (below high school, high school/diploma, bachelor's degree, master's/PhD degree), employment status (currently employed, unemployed, retired), having ever received the seasonal influenza vaccine (yes, no), history of COVID-19 infection/symptoms (negative PCR test, positive PCR test, or did not perform the PCR test), history of COVID-19 infection of family members or friends (negative PCR test, positive PCR test, or did not perform the PCR test), and the death of a family member/friend due to COVID-19 (yes, no).

The second part of the survey was based on the HBM which has been used extensively as a theoretical framework to understand perceptions and beliefs about vaccination.[12–15] The HBM is one of the most widely used theoretical frameworks to understand the health behaviors adopted by individuals. In its original tenet, the HBM consisted of four constructs: perceived severity, perceived susceptibility, perceived barriers, and perceived benefits. As the model evolved, two more constructs were added, namely cues to action and self-efficacy.[18] In this study, perceived severity of the vaccine side effects was measured using four-items scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The other HBM domains that were measured in this study were perceived susceptibility (3 items), perceived access barriers to vaccination (3 items), perceived benefits to vaccination (3 items) and, cues to action (4 items).

The third part of the survey measured potential willingness to pay for COVID-19 vaccination. In this study, we utilized the contingent valuation method using the payment card (PC) approach to elicit the maximum amount of money each respondent was willing to pay for the COVID-19 vaccine.[11] The contingent valuation method is a technique used to obtain information about maximum WTP with respect to a certain good or service directly from respondents using a hypothetical scenario. In the PC approach, respondents are provided with a range of reasonable WTP values to select from.[11] In this study, the respondents were initially asked the following question: *"Suppose that a COVID-19 vaccine is proven to be safe and effective and is made available. However, the vaccine is not free of charge and you must pay for it directly. Would you be willing to pay to receive this vaccine?*" If the respondent answered "*yes*," then the following question would appear: *"Suppose that a COVID-19 vaccine is proven to be safe and effective and is made available. However, the vaccine is not free of charge, and you must pay for it directly. Which of the amounts listed below describe your maximum willingness to pay to receive this vaccine?"*

JOD 5	JOD 20	JOD 40	JOD 100
JOD 10	JOD 25	JOD 50	JOD 150
JOD 15	JOD 30	JOD 75	JOD 200

The respondents could only choose one value from the above range, and this value represented their maximum WTP.[19]

2.4. Data analysis

Stata® statistical software version 14.0 was used to analyze the data.[20] Frequency tables were generated for categorical data such as

gender, income, and education. The HBM items were grouped into their respective domains (perceived severity, perceived susceptibility, perceived barriers, perceived benefits, and cues to action). To assess the reliability of the scales, Cronbach's alphas were generated for domains with at least three items. For this study, a Cronbach's alpha value of at least 0.7 was considered acceptable.[21–23] The mean (±SD) was calculated for each item (ranging from 1 to 5) and for each construct with an alpha coefficient of > 0.7. The mean score for each construct was calculated by dividing the total score by the total number of items in that construct.[23]

The mean and median values were calculated from the maximum amounts chosen by individuals who were willing to pay any amount above zero. The maximum WTP values were then categorized into the following groups: 0 JOD, 5–15 JOD, 20–30 JOD, 40–75 JOD, and ≥ 100 JOD. Since the number of categories of the dependent variable (maximum WTP) was greater than two and there was an ordering in its values, an ordered logistic regression model was used. The model was used to express the categorized maximum WTP values as a function of the respondents' sociodemographic characteristics and the HBM domains. First, the potential significant predictors of maximum WTP were examined using a bivariate ordered logistic regression model. Second, variables with a cutoff p-value of < 0.2 were included in the multivariate ordered logistic model. Items in the HBM domains with an alpha coefficient of < 0.7 were loaded separately in the model.[13] Adjusted odds ratios (AORs) and 95% confidence intervals were generated. The significance level was set as alpha $= 0.05$.

3. Results

3.1. Characteristics of the survey respondents

A total of 3116 individuals from all regions of Jordan responded to the survey. The characteristics of the survey respondents are demonstrated in Table 1. Most of the participants were female (73.8%), and 48.8% fell within the 18–24 years' age category. The majority of the responses were obtained from the central region of Jordan (59.1%). The most frequently selected monthly income range was 250–499 JOD (36.0%). Among the respondents, 59.5% were single, 49.7% were living in a household of 4–6 family members, 69.5% had a family member aged under 18 years, 66.5% had obtained a bachelor's degree as their highest educational qualification, 59.2% were unemployed, 67.5% had never received the seasonal influenza vaccine, and 67.4% had a negative polymerase chain reaction (PCR) test of COVID-19. Approximately, 30% of the respondents identified themselves as healthcare providers, 14% had at least one chronic disease, 28% were smokers, and 24% had a family member/friend who had died from COVID-19 (Table 1).

Table 1
Characteristics of survey respondents (N = 3116).

Items	
Gender	
Female	2300 (73.8%)
Male	816 (26.2%)
Age	
18–24 years	1519 (48.8%)
25–34 years	570 (18.3%)
35–44 years	418 (13.4%)
45–54 years	376 (12.0%)
≥55 years	233 (7.5%)
Region	
Central	1842 (59.1%)
North	1104 (35.4%)
South	170 (5.5%)
Income	
Less than 250 JOD	347 (11.1%)
250 JOD to 499 JOD	1122 (36.1%)
500 JOD to 999 JOD	936 (30.0%)
1000 JOD to 1499 JOD	389 (12.48%)
More than 1500 JOD	322 (10.3%)
Marital status	
Single	1865 (59.9%)
Married	1153 (37%)
Previously married	98 (3.1%)
Number of family members	
1–3	496 (15.9%)
4–6	1548 (49.7%)
7–9	935 (30.0%)
≥10	137 (4.4%)
Have a family member of less than 18 years	2165 (69.5%)
Have a family member of more than 65 years	856 (27.5%)
Being a Healthcare Provider	931 (29.9%)
Have a chronic disease	450 (14.4%)
Being a smoker (cigarette, electronic, or water pipe)	886 (28.4%)
Highest education level	
Less than high school	112 (3.6%)
High school/Diploma	603 (19.4%)
Bachelor's degree	2073 (66.5%)
Master/PhD degree	328 (10.5%)
Employment status	
Currently employed	1080 (34.7%)
Unemployed	1844 (59.2%)
Retired	192 (6.2%)
Ever received the seasonal influenza vaccine	1012 (32.5%)
History of COVID-19 infection/symptoms	
Negative PCR test	2097 (67.4%)
Positive PCR test	456 (14.7%)
Had symptoms but did not perform the PCR test	560 (18.0%)
History of COVID-19 infection of family members or friend	
Negative PCR test	732 (23.5%)
Positive PCR test	2139 (68.7%)
Had symptoms but did not perform the PCR test	245 (7.9%)
Family member/friend died because of COVID-19	740 (23.8%)

3.2. Maximum willingness to pay for the COVID-19 vaccine

Most of the respondents were not willing to pay any amount of money out of their pockets to receive the COVID-19 vaccine (57%) (Fig. 1). Among the respondents who were willing to pay any amount above zero, 20.9%, 12.8%, 6.2%, and 2.9% were willing to pay amounts of 5–10 JOD, 20–30 JOD, 40–75 JOD, and ≥ 100 JOD, respectively. The mean maximum WTP was 28.1 JOD (39.63 USD), and the median WTP was 20 JOD (28.21 USD).

3.3. Health belief model domains summary

Table 2 shows a summary of the HBM domains. The Cronbach's alphas for the perceived severity, perceived access barriers, and perceived benefits domains were all above 0.7. The mean score was 3.31 (±0.69) for the perceived severity of the vaccine side effects domain, 3.34 (±0.72) for the perceived access barriers to vaccination domain, and 3.52 (±0.82) for the perceived benefits to vaccination domain. In the cues to action domain, 63.3% of the respondents indicated that they would get the COVID-19 (mean score: 3.52 (±0.82)) vaccine if recommended to them by a healthcare provider, and 9.34% will get the COVID-19 vaccine if recommended to do so by a family member. The mean score for the item "I think that the COVID-19 vaccine should be made mandatory by the government was 2.84 (±1.3).

3.4. Predictors of willingness to pay for the COVID-19 vaccine

Table 3 shows the results of the bivariate and multivariate ordinal logistic regression models. The results of the bivariate analysis showed that being male, being of younger age, being resident in the North region, having higher income, being married or previously married, being a healthcare provider, holding higher educational degrees, being currently employed, and having ever received the seasonal influenza vaccine increased the maximum WTP among the respondents. The health belief model constructs that increases the max WTP in the bivariate analysis were lower perceived severity of the vaccine side effects, higher perceived benefits of vaccination, and cues to action

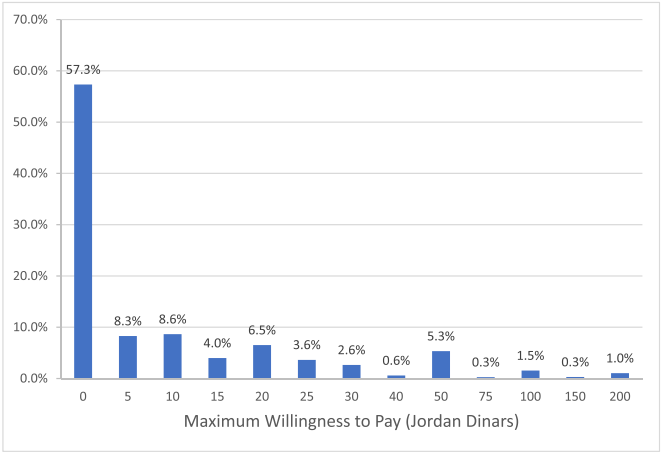

Fig. 1. Maximum Willingness to Pay for the COVID-19 vaccine.

(having the vaccine recommended by a health care provider or family member, and the belief that the COVID-19 vaccine should be made mandatory by the government).

The results of the multivariate regression model showed that younger respondents, those residing in the North of Jordan (Adjusted Odds Ratio [AOR]: 1.74, 95% CI: 1.21–2.50), those indicating higher income (Fig. 2), those living in smaller families, those with a family member aged over 65 years (AOR: 1.27, 95% CI: 1.07–1.52), healthcare providers (AOR: 1.49, 95% CI: 1.25–1.76), those with a chronic disease (AOR: 1.40, 95% CI: 1.1–1.78), those currently employed (AOR: 1.25, 95% CI: 1.02–1.53), those having ever received the seasonal influenza vaccine (AOR: 1.18, 95% CI: 1.02–1.40), and those with a family member/friend who had died because of COVID-19 (AOR: 1.22, 95% CI: 1.02–1.46) had significantly higher WTP for the COVID-19 vaccine. Respondents who had lower perceived severity of the vaccine side effects (AOR: 0.81, 95% CI: 0.70–0.94) and higher perceived benefits of vaccination (AOR: 1.74, 95% CI: 1.53–1.97) had significantly higher WTP for the COVID-19 vaccine. In the cues to action construct, respondents who indicated intention to get the COVID-19 vaccine if recommended to do so by a healthcare provider (AOR: 11.32, 95% CI: 8.20–15.62) or a family member (AOR: 9.76, 95% CI: 6.62–14.37) and those who believed that the COVID-19 vaccine should be made mandatory by the government (AOR: 1.21, 95% CI: 1.12–1.30) had significantly higher WTP for the vaccine (Table 3).

4. Discussion

This is the first study in Jordan to examine the maximum WTP for COVID-19 vaccines and to identify the predictors of WTP based on sociodemographic factors and the HBM constructs. More than half of the sample (57%) indicated that they were not willing to pay any amount out of their pockets to receive the COVID-19 vaccine. It is important to note that this survey was administered before the launch of the National Vaccination Campaign in Jordan. By that time, it was known by the participants that the COVID-19 vaccine would be provided free of charge by the Ministry of Health[24] which could explain their unwillingness to pay for the vaccine. It is also possible that strategic bias could have influenced the results of the study, whereby participants may have intentionally indicated unwillingness to pay to avoid possible payments in the future and to influence the pricing decisions regarding the vaccine by decision-makers.[25] Moreover, the unwillingness to pay for the vaccine may be explained by the low rate of acceptance of COVID-19 vaccine in Jordan, which is among the lowest rates in the world.[7] The acceptance rate for other vaccines in Jordan such as the influenza vaccine is also low. Hesitancy to get vaccinated and the widespread belief in conspiracy theories in Jordan hinders the uptake of preventive measures

Table 2
Summary of Health Belief Model responses as it applies to intentions to receive COVID-19 vaccine.

Items	n (%)	alpha	Range	Mean (SD)[a]
Perceived severity of the vaccine side effects		0.78	1–5	3.31 (±0.69)
I will have side effects from the novel COVID-19 vaccine			1–5	3.66 (±0.84)
I will get sick from the novel COVID-19 vaccine			1–5	3.4 (±0.88)
I will die from the novel COVID-19 vaccine			1–5	3.1 (±0.93)
The novel COVID-19 vaccine will be painful			1–5	3.1 (±0.86)
Perceived susceptibility to the virus		0.34		
Even if I fall ill with another disease, I will not go to hospital because of risk of getting novel coronavirus/ COVID-19 in the hospital			1–5	3.6 (±1.1)
I am more likely to get the novel coronavirus/COVID-19 than other people			1–5	2.35 (±1.1)
My family members are at risk of getting the novel COVID-19			1–5	3.0 (±0.99)
Perceived access barriers to vaccination		0.70	1–5	3.34 (±0.72)
The novel COVID-19 vaccine will be expensive			1–5	3.45 (±0.91)
I will not get the vaccine because it will run out			1–5	3.25 (±0.90)
It will be difficult to get the novel COVID-19 vaccine			1–5	3.33 (±0.92)
Perceived benefits to vaccination		0.87		3.52 (±0.82)
The novel COVID-19 vaccine will slow down the spread of the pandemic				3.39 (±0.92)
The novel COVID-19 vaccine will help in improving the economy				3.5 (±0.93)
The novel COVID-19 vaccine will reduce the burden on the healthcare system				3.67 (±0.89)
Cues to action				
I will get the COVID-19 vaccine if recommended to me by a healthcare provider	1973 (63.3%)			
I will get the COVID-19 vaccine if recommended to me by a family member	291 (9.34%)			
I will not take the COVID-19 vaccine no matter the recommendation	853 (27.4%)			
I think that the COVID-19 vaccine should be mandatory by the government			1–5	2.84 (±1.3)

Scales with an alpha coefficient of less than 0.5 were loaded separately in the regression model.
[a] The scale mean was calculated for domains with an alpha coefficient >0.6.

to slow down the progression of epidemics and poses a threat to public health.[7]

Among individuals who were willing to pay any amount above zero, most participants were willing to pay 5–10 JOD to receive the vaccine. The calculated mean and the median WTP values were 28.1 JOD (USD 39.63) and 20 JOD (USD 28.2), respectively. Similar WTP values have been reported in Indonesia (USD 30.94)[26] and Malaysia (USD 30.66).[14] However, our results indicated lower WTP for COVID-19 vaccines compared to Shanghai (USD 46),[27] Chile (USD 184.72),[28] China (USD 66.09),[29] and the United States (USD 236.85).[30] On the contrary, the estimated WTP in Brazil (USD 22.18)[10] was lower than the calculated median WTP in this present study. These variations in previously reported maximum WTP values may be attributed to methodological variations among different studies, differences in *per capita* income, and variations in the COVID-19 epidemiological status in different countries.

Table 3
Predictors of maximum WTP based on socio-demographic factors and constructs from the health belief model using ordinal logistic regression.

Variables	Unadjusted Analysis				Adjusted Analysis			
	UOR	SE	P-value	95%CI	AOR	SE	P-value	95%CI
Gender								
Female	Ref							
Male	1.36	0.11	<0.001	1.16–1.58	1.02	0.10	0.818	0.84–1.25
Age*								
18–24 years	Ref							
25–34 years	0.87	0.08	0.13	0.72–1.04	0.94	0.13	0.635	0.72–1.23
35–44 years	0.67	0.07	<0.001	0.54–0.83	0.82	0.15	0.280	0.58–1.17
45–54 years	0.56	0.07	<0.001	0.44–0.7	0.58	0.11	0.005	0.40–0.85
≥55 years	0.93	0.12	0.585	0.72–1.21	0.58	0.14	0.024	0.36–0.93
Region*								
South	Ref							
North	1.6	0.26	0.004	1.16–2.21	1.74	0.32	0.003	1.21–2.50
Central	1.23	0.20	0.193	0.9–1.69	1.30	0.24	0.147	0.91–1.86
Income*								
Less than 250 JOD	Ref							
250 JOD to 499 JOD	1.67	0.23	<0.001	1.27–2.20	1.74	0.27	<0.001	1.28–2.36
500 JOD to 999 JOD	3.03	0.43	<0.001	2.20–4.00	3.36	0.54	<0.001	2.45–4.60
1000 JOD to 1499 JOD	5.23	0.82	<0.001	3.8–7.12	5.89	1.06	<0.001	4.14–8.37
More than 1500 JOD	9.62	1.58	<0.001	6.87–13.17	10.72	2.05	<0.001	7.37–15.59
Marital status								
Single	Ref							
Married	0.77	0.06	<0.001	0.66–0.88	0.85	0.11	0.205	0.66–1.09
Previously married	0.47	0.11	0.001	0.30–0.74	0.75	0.22	0.325	0.43–1.33
Number of family members*								
1–3	Ref							
4–6	0.88	0.09	0.208	0.73–1.07	0.69	0.08	0.002	0.55–0.87
7–9	0.76	0.08	0.011	0.62–0.94	0.59	0.08	0.000	0.45–0.76
≥10	0.75	0.14	0.136	0.52–1.10	0.58	0.13	0.013	0.38–0.89
Have a family member of more than 65 years*								
No	Ref							
Yes	1.13	0.09	0.108	0.97–1.32	1.27	0.12	0.008	1.07–1.52
Being a Healthcare Provider*								
No	Ref							
Yes	2.02	0.15	<0.001	1.75–2.34	1.49	0.13	<0.001	1.25–1.76
Have a chronic disease *								
No	Ref							
Yes	1.15	0.11	0.151	0.95–1.40	1.40	0.17	0.007	1.1–1.78
Being a smoker (cigarette, electronic, or water pipe)								
No	Ref							
Yes	1.16	0.09	0.046	1.00–1.35	0.96	0.09	0.639	0.80–1.15
Highest education level								
Less than high school	Ref							
High school/Diploma	1.18	0.24	0.42	0.79–1.76	0.85	0.19	0.474	0.54–1.33
Bachelor's degree	1.29	0.25	0.191	0.88–1.881	0.77	0.17	0.236	0.50–1.18
Master/PhD degree	2.36	0.51	<0.001	1.55–3.59	1.08	0.27	0.784	0.66–1.76
Employment status*								
Unemployed	Ref							
Currently employed	1.36	0.10	<0.001	1.18–1.57	1.25	0.13	0.033	1.02–1.53
Retired	1.14	0.17	0.378	0.85–1.51	1.46	0.31	0.078	0.96–2.23
Ever received the seasonal influenza vaccine*								
No	Ref							
Yes	1.75	0.13	<0.001	1.52–2.02	1.18	0.10	0.035	1.02–1.40
History of COVID-19 infection/symptoms								
Negative PCR test	Ref							
Positive PCR test	0.88	0.09	0.213	0.72–1.07	0.81	0.09	0.071	0.65–1.02
Had symptoms but not performed the PCR test	0.75	0.07	0.002	0.62–0.90	0.81	0.09	0.05	0.66–1.01
Family member/friend died because of COVID-19*								
No	Ref							
Yes	1.15	0.09	0.084	0.98–1.35	1.22	0.11	0.029	1.02–1.46
Health Belief Model Constructs								
Perceived severity of the vaccine side effects*	0.45	0.03	<0.001	0.40–0.50	0.81	0.06	0.004	0.70–0.94
Perceived susceptibility of the virus								
Even if I fall ill with another disease, I will not go to hospital because of risk of getting novel coronavirus/COVID-19 in the hospital.	1.0	0.03	0.745	0.95–1.07				
I am more likely to get the novel coronavirus/COVID-19 than other people.	1.1	0.04	0.005	1.03–1.12	1.03	0.04	0.397	0.96–1.11
My family members are at risk of getting the novel COVID-19	1.14	0.04	<0.001	1.06–1.22	0.97	0.04	0.490	0.89–1.06
Perceived access barriers to vaccination	1.18	0.06	0.001	1.07–1.30	0.95	0.06	0.420	0.85–1.07
Perceived benefits to vaccination*	2.98	0.17	<0.001	2.68–3.30	1.74	0.11	<0.001	1.53–1.97
Cues to action*								
I will not take the COVID-19 vaccine no matter the recommendation	Ref							
I will get the COVID-19 vaccine if recommended to me by a healthcare provider	19.0	2.8	<0.001	14.28–25.34	11.32	1.86	<0.001	8.20–15.62
I will get the COVID-19 vaccine if recommended to me by a family member	14.63	2.6	<0.001	10.32–20.77	9.76	1.92	<0.001	6.62–14.37
I think that the COVID-19 should be mandatory by the government								

(*continued on next page*)

Table 3 (*continued*)

Variables	Unadjusted Analysis				Adjusted Analysis			
	UOR	SE	P-value	95%CI	AOR	SE	P-value	95%CI
No	Ref							
Yes	1.73	0.05	<0.001	1.64–1.83	1.21	0.04	<0.001	1.12–1.30
R^2	0.1923							

UOR: Unadjusted Odds Ratio.
SE: Standard Error.
CI: Confidence Interval.
AOR: Adjusted Odds Ratio.
*: Statistically significant variable.

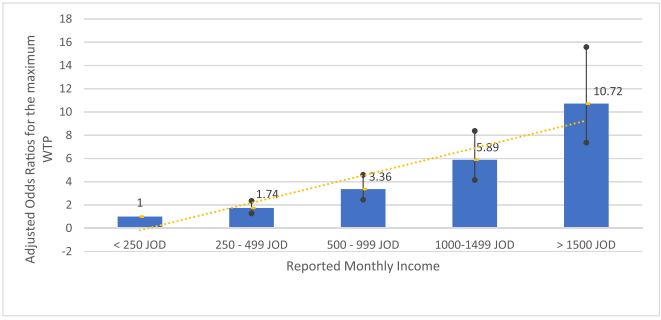

Fig. 2. Association between the reported monthly income and maximum willingness to pay (WTP).

Studies on WTP for healthcare services or products in Jordan are very limited. Therefore, it is difficult to compare the results of this study with previously conducted studies in Jordan. One previous study which was conducted in a teaching hospital in Jordan to assess WTP for pharmaceutical services showed that whilst most participants were willing to pay for these services, the amount they were willing to pay was very low (USD 3.95).[31]

In the present study, a greater WTP was indicated by younger individuals as compared to older respondents. This result is similar to the finding of previous studies conducted in China whereby elderly individuals were less willing than younger individuals to pay for the COVID-19 vaccine.[27,32] Given that elderly individuals are at higher risk of becoming infected with COVID-19 and suffering from severe complications, this finding is surprising. One possible explanation is that the lowest health insurance coverage found in Jordan was in the age group of 15–34 years but the elderly have free health insurance.[33] This may create a perception among elderly that they are not expected to pay any amount out of their pocket to get healthcare services including vaccination.[34] Another possible explanation is the lower acceptance level of COVID-19 vaccine among older age groups compared to younger age groups as found by a previous study conducted in Jordan.[34] Other studies conducted in Brazil,[10] Malaysia,[14] and Indonesia[26] did not report any significant association between age and maximum WTP for the COVID-19 vaccine.

Individuals residing in the North of Jordan indicated greater WTP as compared to respondents residing in the Central and South regions of Jordan. This could be explained by distinguishing characteristics of these regions such as urban/rural areas or affluence. Future surveys should consider including these items to better explain differences between these three regions. Geographical variations in WTP should be taken in consideration when translating the results of this study into specific interventions by policymakers.

As expected, participants who were healthcare providers, had chronic diseases, were currently employed, or had a family member/friend who had died of COVID-19 were more likely than their counterparts to indicate greater WTP. This could be explained by the fact that these sub-groups have a greater risk perception of becoming infected with COVID-19 and may therefore be more likely to indicate greater WTP. For example, a previous study showed that individuals with perceived risk of more than 60% had a higher WTP by USD 1.84 than did individuals who believed that they were not susceptible to infection. Additionally, the same study showed that healthcare workers had higher WTP by USD 1.62 than did non-healthcare workers.[26] Likewise, participants who indicated fear of becoming infected with COVID-19 had a greater WTP for a value of Malaysian Ringgit (MYR) $250/300 over MYR$50/100.[14] A study by Cerda and Garcia in Chile indicated that having a family member infected with COVID-19 increased individuals' WTP for the vaccine.[28] However, no association between WTP and the presence of comorbidities or the death of a family or friend because of COVID-19 was found in a study conducted in Brazil by Dias-Godoi.[10]

The most significant sociodemographic predictor of maximum WTP in this study was income. This finding was expected and has been commonly reported in previous WTP studies. Individuals with higher income were found to be more likely to report greater WTP for the vaccine than were individuals with lower income. The same results were reported by previous studies which assessed WTP for the COVID-19 vaccine in Chile,[28] Shanghai,[27] Malaysia,[14] Brazil,[10] China,[32] the United States,[30] and Indonesia.[26] If decision-makers in Jordan decide not to provide the vaccine free of charge in the future, they may want to consider the implementation of a combination of public and private payment, whereby the vaccine would be provided free of charge for low-income groups whilst high-income groups would be required to purchase the vaccine privately.[28]

The results of the multivariate ordinal logistic regression showed that the HBM constructs, namely lower perceived risks of the vaccine side effects, higher perceived benefits of getting the vaccine, and cues to action were associated with higher WTP. Participants who did not expect the vaccine to be painful or to cause side effects, diseases or death were more likely to indicate higher maximum WTP values. National immunization campaigns should use these findings to increase uptake of the vaccine by focusing on changing people's negative beliefs regarding the risks of the COVID-19 vaccine. We also found that individuals who indicated prior vaccination for influenza reported higher WTP values. This may be explained by the fact that these individuals may have lower concerns regarding the safety and side effects of the vaccines.[35]

Similar to the findings of our study, Harapan and colleagues' study also found that perceived benefits were associated with higher WTP.[26] Educational campaigns should focus on promoting the benefits of receiving the vaccine in slowing the spread of the pandemic, improving the economy, and reducing the burden on the healthcare system. Healthcare providers' recommendations to receive the vaccine significantly increase people's WTP for the vaccine. Previous studies have indicated that healthcare professionals' recommendations were influential in participants' decision to get vaccinated.[13,36,37] This implies that in order to increase people's WTP for the vaccine, educational campaigns should also target healthcare professionals.

The following are the limitations of the study. First, the results are prone to range bias which occurs when the range of amounts presented in a payment card influences the respondents' selected WTP values.[38] Further, although the sample is relatively large, it may not be fully

representative since the respondents were mainly female, unemployed, and of low income. Since most of respondents were unemployed and of lower income, the WTP values may be underestimated. Another limitation is that the survey was administered before the launch of the national vaccination program in Jordan, and the questions were asked with regards to a hypothetical vaccine. Different WTP values may be obtained if the same survey is to be administered now after the launch of the program due to differences in the country's epidemiological status and the increased availability of information about the safety and efficacy of the vaccine. Another source of bias maybe introduced into this study because of the dissemination channels and platforms used to distribute the study. The survey was an online survey that disseminated through Facebook accounts and WhatsApp groups. Previous research indicated that younger age groups are usually more likely to respond to online surveys compared to older people. This could be due a greater use and access to the internet, meanwhile it is more challenging for older people.[39]

5. Conclusion

More than half of the sample indicated that they were not willing to pay any amount out of their pockets to receive the COVID-19 vaccine. Therefore, we recommend that the vaccine should continue to be provided free of charge to increase its uptake in Jordan. Further, healthcare providers' recommendations have the potential to increase WTP for the vaccine. Educational campaigns should focus on promoting the benefits of receiving the vaccine in slowing the spread of the pandemic, improving the economy, and reducing the burden on the healthcare system. In addition, it is important to refute myths related to the risks of COVID-19 vaccines.

Author statement

The Manuscript has been read and approved by all the authors. The requirements for authorship as stated in the ICMJE Uniform Requirements for Manuscripts have been met; and each author believes that the manuscript represents honest work. All authors are involved with the project in all areas: initiation of the project, design, and methodology, and wrote, edited, and reviewed the final draft. This manuscript is not being submitted elsewhere.

References

1. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382:727–733.
2. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed*. 2020;91:157–160.
3. COVID live update: 233,127,914 cases and 4,770,204 deaths from the coronavirus - worldometer [Internet], [cited 2021 Sep 28]. Available from: https://www.worldometers.info/coronavirus/.
4. Wiersinga WJ, Rhodes A, Cheng AC, et al. Pathophysiology, transmission, diagnosis, and treatment of coronavirus disease 2019 (COVID-19): a review. *JAMA*. 2020;324:782–793.
5. [Internet] Mortality Analyses. Johns Hopkins coronavirus resource center [cited 2021 Oct 5]. Available from: https://coronavirus.jhu.edu/data/mortality.
6. Sanders JM, Monogue ML, Jodlowski TZ, et al. Pharmacologic treatments for coronavirus disease 2019 (COVID-19): a review. *JAMA*. 2020;323:1824–1836.
7. Sallam M, Dababseh D, Eid H, et al. High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: a study in Jordan and Kuwait among other Arab Countries. *Vaccines*. 2021;9:42.
8. Raouf M, Elsabbagh D, Wiebelt M. *Impact of COVID-19 on the Jordanian Economy: Economic Sectors, Food Systems, and Households* [Internet]. 0 ed. Washington, DC: International Food Policy Research Institute; 2020 [cited 2021 Oct 5]. Available from: https://ebrary.ifpri.org/digital/collection/p15738coll2/id/134132.
9. Overview [Internet]. World Bank. [cited 2021 Oct 5]. Available from: https://www.worldbank.org/en/country/jordan/overview.
10. Dias-Godói IP, Tadeu Rocha Sarmento T, Afonso Reis E, et al. Acceptability and willingness to pay for a hypothetical vaccine against SARS CoV-2 by the Brazilian consumer: a cross-sectional study and the implications. *Expert Rev Pharmacoecon Outcomes Res*. 2021:1–11, 0.
11. Rascati K. *Essentials of Pharmacoeconomics*. Lippincott Williams & Wilkins; 2013.
12. Chen H, Li X, Gao J, et al. Health belief model perspective on the control of COVID-19 vaccine hesitancy and the promotion of vaccination in China: web-based cross-sectional study. *J Med Internet Res*. 2021;23, e29329.
13. Coe AB, Gatewood SBS, Moczygemba LR, et al. The use of the health belief model to assess predictors of intent to receive the novel (2009) H1N1 influenza vaccine. *Innov Pharm*. 2012;3:1–11.
14. Wong LP, Alias H, Wong P-F, et al. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. *Hum Vaccines Immunother*. 2020;16:1–11.
15. Shmueli L. Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behavior model. *BMC Publ Health*. 2021;21:804.
16. Malik AA, McFadden SM, Elharake J, et al. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*. 2020;26, 100495.
17. McFadden SM, Malik AA, Aguolu OG, et al. Perceptions of the adult US population regarding the novel coronavirus outbreak. *PLoS One*. 2020;15, e0231808.
18. Champion VL, Skinner CS. The health belief model. *Health Behav Health Educ : Theory Res Pract*. 2008;4:45–65.
19. Klose T. The contingent valuation method in health care. *Health Pol*. 1999;47:97–123.
20. *StataCorp*.Stata Statistical Software: Release; vol. 14. College Station, TX: StataCorp LP; 2015.
21. Santos JRA. Cronbach's alpha: a tool for assessing the reliability of scales. *J Ext*. 1999;37:1–5.
22. Bland JM, Altman DG. Cronbach's alpha. *BMJ*. 1997;314:572.
23. Arabyat RM, Borrego M, Hamidovic A, et al. The impact of a theory-based web-intervention on the intention to use prescription drugs for non-medical purposes among college students: a randomized controlled trial. *Health Educ Res*. 2019;34:173–187.
24. [Internet] COVID-19 Vaccine. UNHCR Jordan [cited 2021 Oct 13]. Available from: https://help.unhcr.org/jordan/en/frequently-asked-questions-unhcr/covid-19-vaccine/.
25. Saadatfar N, Jadidfard MP. An overview of the methodological aspects and policy implications of willingness-to-pay studies in oral health: a scoping review of existing literature. *BMC Oral Health*. 2020;20:1–12.
26. Harapan H, Wagner AL, Yufika A, et al. Willingness-to-pay for a COVID-19 vaccine and its associated determinants in Indonesia. *Hum Vaccines Immunother*. 2020;16:3074–3080.
27. Han K, Francis MR, Zhang R, et al. Confidence, acceptance and willingness to pay for the COVID-19 vaccine among migrants in Shanghai, China: a cross-sectional study. *Vaccines*. 2021;9:443.
28. Cerda AA, García LY. Willingness to pay for a COVID-19 vaccine. *Appl Health Econ Health Pol*. 2021;19:343–351.
29. Dong D, Xu RH, Wong EL, et al. Public preference for COVID-19 vaccines in China: a discrete choice experiment. *Health Expect*. 2020;23:1543–1578.
30. Catma S, Varol S. Willingness to pay for a hypothetical COVID-19 vaccine in the United States: a contingent valuation approach. *Vaccines*. 2021;9:318.
31. Jaber D, Aburuz S, Hammad EA, et al. Patients' attitude and willingness to pay for pharmaceutical care: an international message from a developing country. *Res Soc Adm Pharm*. 2019;15:1177–1182.
32. Qin W, Wang E, Ni Z. Chinese consumers' willingness to get a COVID-19 vaccine and willingness to pay for it. *PLoS One*. 2021;16, e0250112.
33. Main results of the general census of population and housing 2015 – department of Statistics [Internet], [cited 2022 Aug 13]. Available from: http://dosweb.dos.gov.jo/products/census_mainresults2015/.
34. El-Elimat T, AbuAlSamen MM, Almomani BA, et al. Acceptance and attitudes toward COVID-19 vaccines: a cross-sectional study from Jordan. *PLoS One*. 2021;16, e0250555.
35. Cascini F, Pantovic A, Al-Ajlouni Y, et al. Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: a systematic review. *EClinicalMedicine*. 2021;40, 101113.
36. Arabyat RM, Raisch DW, Bakhireva L. Influenza vaccination for patients with chronic obstructive pulmonary disease: implications for pharmacists. *Res Soc Adm Pharm*. 2018;14:162–169.
37. Nusair MB, Arabyat R, Mukattash TL, et al. Pharmacists' perspectives on providing the influenza vaccine in community pharmacies: a qualitative study. *Risk Manag Healthc Pol*. 2020;13:2179–2187.
38. Shackley P, Dixon S. The random card sort method and respondent certainty in contingent valuation: an exploratory investigation of range bias. *Health Econ*. 2014;23:1213–1223.
39. Kelfve S, Kivi M, Johansson B, et al. Going web or staying paper? The use of web-surveys among older people. *BMC Med Res Methodol*. 2020;20:252.