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Preference-Based Assessments

Willingness to Pay for a Coronavirus Vaccine and Its Associated Determinants in Lebanon

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ABSTRACT

Objectives: This study aimed to investigate the willingness to pay (WTP) for a hypothetical vaccine and its associated determinants among the Lebanese general population during one of the peak episodes during the coronavirus disease 2019 (COVID-19) pandemic in Lebanon.

Methods: An online survey was developed and delivered to the Lebanese general population. The questionnaire included the participants' sociodemographic characteristics, financial situation, attitude toward vaccination, and WTP for the hypothetical vaccine. The study was based on the contingent valuation method.

Results: Among 500 individuals solicited, 352 individuals agreed to participate (participation rate = 70.4%); among them, 66% were between 18 and 45 years old, and 54% were women. Notably, 78.1% of the respondents were ready to pay for this hypothetical vaccine even if the vaccine will not be covered. The maximum WTP of the Lebanese population was approximately \$60 ± \$66 (range \$3-\$500) after excluding extreme values in the sensitivity analysis and ranged between \$3 and \$500. WTP was associated with the severity of COVID-19 ($P<.001$), the education level ($P=.001$), and the place to live during the lockdown ($P=.045$). There was an association between family income and WTP ($P=.004$) with a weak correlation.

Conclusions: The WTP was comparable with other studies and highly associated with the level of education, the household income, living in the city during the lockdown, and the perceived severity of COVID-19. These findings can help in understanding COVID-19 vaccination acceptance and WTP in Lebanon.

Keywords: contingent valuation method, coronavirus, hypothetical vaccine, willingness to pay.

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Introduction

The world is going through drastic changes because of the onset of a new pandemic: coronavirus disease 2019 (COVID-19). It is a new infectious disease caused by severe acute respiratory syndrome coronavirus 2[1] that belongs to Coronaviridae family,[2] the same family that caused severe acute respiratory syndrome and Middle East respiratory syndrome.[3] It is now considered as one of the most serious health, economic, and sociable concern worldwide,[4] because of uncontrolled spread worldwide.[3]

On March 11, 2020, because of the rapid increase in reported cases outside China, the World Health Organization declared COVID-19 a global pandemic,[5] while in Lebanon, the first case was reported on February 21, 2020, according to the Ministry of Public Health (MOPH).[6]

After the widespread of the virus, it was concluded that COVID-19 mainly causes upper respiratory infection,[7] and symptoms may range from mild to severe, depending on age and medical conditions.[8] Therefore, older patients (aged ≥65 years) with comorbidities such as lung diseases (asthma, chronic obstructive pulmonary disease), cardiovascular diseases, type 2 diabetes, and cancer are considered as a risk group, for which symptoms can be more severe.[8]

Preventive measures are recommended to control the pandemic, including social distancing, ensuring good hygiene, and avoiding going out in case of illness.[9] In case of severe cases, hospitalization is required and ventilation with empiric antibiotherapy protocols is recommended.[10] Several treatment measures are being installed in different countries such as antiviral drugs including hydroxychloroquine,[11] chloroquine phosphate,[12] remedesivir,[13] vitamin C,[14] and lopinavir or ritonavir,[15] with variable evidence regarding their effectiveness.

Researchers worldwide are working to find a vaccine against COVID-19. Experts estimate that the vaccine still needs 3 to 6 months to be in the market[16] and >100 vaccines are in development[17] and several vaccines have got through clinical trials and reached stage III in developing the vaccine by pharmaceutical industries such Pfizer and BioNTech,[18] Moderna,[19] and AstraZeneca,[20] for example.

In addition, researchers are studying the amount that people are willing to pay to get a vaccine. This type of study, willingness

to pay (WTP) studies, can help governments and care providers to consider different factors such as socioeconomic class and healthcare service quality to implement an affordable and effective health system for patients.[21,22]

Different studies were conducted to estimate WTP for a hypothetical dengue vaccine in Malaysia[23] and Southeast Asia Region[24] and cholera vaccine and Ebola vaccine in Bangladesh[25] and Indonesia,[26] respectively. Taking into consideration the enormous amount of money spent to create a vaccine and the commercial background of most of the companies working on the vaccine, many studies were conducted to test peoples' WTP for the COVID-19 hypothetical vaccine such as in Chile,[27] Romania,[28] Indonesia,[29] Malaysia,[30] United Arab Emirates,[31] Ecuador,[32] and the United States.[33]

Finally, knowing the harsh economic situation in Lebanon, the severe financial crisis, and the associated shortage of medications and medical devices, the study aimed to assess the WTP and its associated determinants among the Lebanese general population during one of the peak episodes during the COVID-19 pandemic in Lebanon.

Methods

Study Design and Settings

A cross-sectional study was conducted in Lebanon over a period of 5 weeks in June 2020 to July 2020 during one of the peak episodes of the COVID-19 pandemic to assess WTP for a hypothetical COVID-19 vaccine. At this time, the news about vaccine developments were in very early phase, and there was not yet a Food and Drug Administration–approved vaccine.

Lebanon is a Middle East country that counts almost 6 million of citizens with a minimum wage of 675 000 Lebanese pound (LBP).[34] This is a country with 8 regions or districts.

Study Population and Sampling Procedures

The study participants, aged ≥18 years, were selected from the general population, using a quota sampling method. This method consists of using sample representative of 8 districts of Lebanon obtained from the statistical bulletin 2018 of Lebanese MOPH.[35] The sample size was calculated using single population proportion formula by considering 50% proportion, 95% confidence interval, and 5% margin of error.

$$N = \frac{Z\alpha^2 \times P\,(1-P)}{d^2} = \frac{1.96^2 \times 0.05(1-0.05)}{0.05^2} = 384.16$$

The minimum final sample size required was 384.16.

Survey Instrument

An online survey instrument (questionnaire) was adapted from previous studies[19,25] and developed in English. The questionnaire was translated into the local language (Arabic) and translated again in English to maintain consistency.

A pilot study was administrated to 10 respondents to check the accuracy of the questionnaire and confirm the feasibility. The instrument was divided into 3 sections and answered anonymously. The first section recorded the respondent's willingness to participate in the study.

The second section gathered the sociodemographic information of the participant. In addition to that, this section also highlights the medical profile of the respondents along with the general view of coronavirus such as perceived severity and knowledge about the disease.

The third section recorded the understanding of the vaccine, the vaccination in general, and the potential coronavirus vaccine in particular and the description of the vaccine.

At the end, the valuation question was used to ask participants about the source of coverage for the vaccine, their WTP, and the amount that they are ready to pay for the hypothetical vaccine.

Even though this study does not require any definite ethical approval, a verbal consent was obtained from all participants before filling the questionnaires by asking them if they want to participate in the study. All data were collected in a manner that respects participant's anonymity and confidentiality.

Contingent Valuation Approach

To assess the respondent's WTP, the contingent valuation method (CVM) was used. This method is a standard and accepted technique of stated preferences for capturing maximum WTP and was originally developed as a method for valuing environmental benefits.[25,36–38] It includes 2 steps. First, the outlining of the efficacy of hypothetical vaccine was estimated with an efficacy rate of about 99%.

The revealing of the WTP was used by 2 methods open-questions and payment card (PC) approaches, whereas CVM can use a wide range of methods (PC, open-ended [OE] questions, bidding games) to help respondents state their pricing preferences. In the PC approach, respondents are asked to choose the 1 value, which represents their maximum WTP values.[39] The true WTP of the respondents is then assumed to be located above the indicated value and below the next higher one, if such a value exists.[40] This method is used to avoid the starting point bias creating a scale where the wage of the WTP was proposed taking as a starting point the lowest price of vaccine available on the website of MOPH and a rounded value of the highest price of vaccine available in Lebanon.[41] In a country that is dealing with unstable currency, the scenario of inflation was imperial to be present by asking the participants on their WTP as the maximum value in an international currency (US dollars [US$]) where a clear data of WTP are established as final bidding.

Statistical Analysis

All data analyses were performed using statistical software IBM SPSS Statistics 26. First, descriptive statistics were used to analyze and summarize the data using various variables. Results are presented as a mean and median WTP with SD and confidence interval, in Lebanese currency (LBP) applying the exchange rate (1 US$ = 1515 LBP as an official rate) during the data collection year for all continuous variables. For all nominal variables, the results were presented by frequencies and percentages. Stratification was chosen as a statistical method for sociodemographic variables to check that an equal allocation of subgroups of respondents to each condition, where the results were presented by mean and SD in addition to percentages. A bivariate analysis was done. Student's *t* test and analysis of variance (ANOVA) were used to compare continuous variables with adequate normal distribution, between 2 and 3 or more groups, respectively. For non-normally distributed continuous variables, the Mann–Whitney *U* test or Kruskal–Wallis test was used. For categorical variables, the chi-square was used to compare percentages. Correlations (Pearson's) were used to identify factors associated with WTP and the amount that people were willing to pay and the maximum value that they are willing to pay in normal case scenario and in case of inflation. A $P<.05$ was considered significant in all tests. Finally, a sensitivity analysis was done to exclude all extreme values. It was done to determine how different values of the household income (independent values) can affect the WTP under different sets of assumptions depending on education level, working status, etc.

Table 1. Sociodemographic characteristics.

Variables	Frequencies (N = 352)	Percentages (%)
Sex		
Male	162	46
Female	190	54
Age		
18-44	237	67.3
45-64	80	22.7
>64	35	10
Marital status		
Single	153	43.5
Married or divorced or widowed	199	56.5
Number of members in household	(Mean ± SD = 3.78 ± 1.16)	
<4	144	40.9
4	117	33.2
>4	91	25.9
Number of children	n = 193	
≤2	178	87.0
>2	25	13.0
Residential area		
Akkar	24	6.8
North	52	14.8
Beirut	43	12.2
Mount-Lebanon	118	33.5
Bekaa	25	7.1
Baalbeck or Hermel	26	7.4
South	39	11.1
Nabatieh	25	7.1
Living during lockdown		
City	136	39.2
Village	211	60.8
Education levels		
School degrees	80	22.7
University	202	57.4
Advanced studies	70	11.9
Working status		
Unemployed	37	10.5
Active	181	51.4
Student	81	23.0
Others (retired)	53	15.1
Working status during lockdown		
I don't work	126	36.0
I work from home	108	30.9
I go to work	116	33.1
Work in the medical field		
No	293	83.2
Yes	59	16.8
Do you have any kind of disease?		
No	197	44
Yes	155	56
Pulmonary diseases	57	16.3
Cardiac diseases	83	23.6
Metabolic diseases	89	25.4
Cancers	2	0.6
Other diseases	9	2.6
Estimated salary (in LBP* with $1 = 1500 LBP)		
<675 000	70	19.9
657 000-999 000	99	28.1
1 000 000-1 999 000	111	31.5
2 000 000-2 999 000	46	13.1
3 000 000-3 999 000	15	4.3
4 000 000-5 000 000	5	1.4
>5 000 000	6	1.7

continued on next page

LBP indicates Lebanese pound.
*Household income in LBP N = 352; 2 863 352.32 ± 2 381 315.09 range: 300 000-32 000 000.

Results

Participant's Characteristics

Among 500 surveyed individuals, only 352 accepted to participate in the study; the participation rate was 70.4%. Most of the respondents were female (54%) and married (56.5%). Approximately 67.3% of the participants were aged between 18 and 44 years, and 54.7% had completed the primary and secondary education and had their university degree and 22.7% had elementary or high-school degree. Only 25.9% of the household included >4 members. Approximately 87% of the married or previously couples had 2 children or below. The average monthly household income was 2 863 352.32 LBP ($1908.90 knowing that $1 = 1515 LBP), and 51.4% of the population were active. Regarding working status, 23% of the population were students or follow internship. The population at 56% had diseases and do not present a healthy medical history. They had several diseases such as pulmonary, cardiac, metabolic, and cancer diseases. During the lockdown, 60.8% of the population who answered to this question had chosen the village as the place to be during the lockdown; 33.1% of the participants went to work during the lockdown and 30.9% of the respondents worked from home (Table 1).

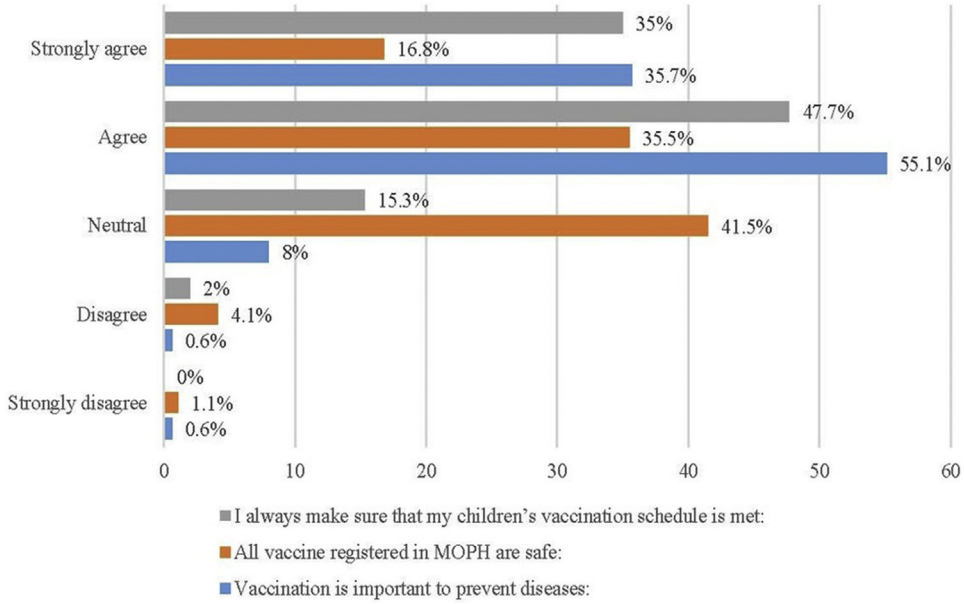
Attitude Toward Vaccination in General

The respondents were asked attitude toward vaccination procedure in general, where 90.8% of the population agreed or strongly agreed that vaccination is important to prevent diseases, but in matters of safety of the vaccine being registered in the MOPH, 41.5% of the population were neutral. Only 35% of participants strongly agree that they make sure that their children's vaccination schedule is met. All these data were illustrated in Figure 1.

Perception and Attitude Toward COVID-19 and Vaccination

Approximately 59% of the respondents mentioned that they heard about COVID-19, and approximately 15% of the responds knew someone in their family or their entourage who had contracted the virus. Regarding severity of the disease, 55.7% of the participants believed that COVID-19 is severe, and 30.7% of the respondents considered that is a disease with moderate severity.

Figure 1. Attitude of respondents toward vaccination (N = 352).



MOPH indicates Ministry of Public Health.

Nevertheless, 35% of the population were not sure of the severity of the COVID-19 infection.

Regarding COVID-19 vaccination, approximately 71.8% of the population predicted that the injection will be the route of administration of vaccine; and only 23.9% considered that the route of administration of this vaccine could be oral administration.

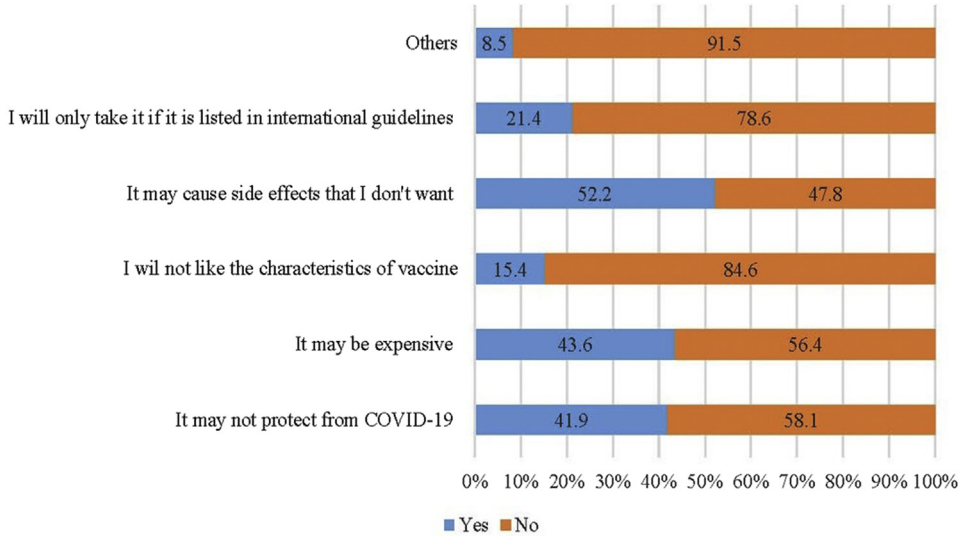
Among respondents, 53.7% tried to be pushed on the descriptions that they wanted to have in the potential vaccine 2 years such as duration of protection, and 51.4% did not want to tolerate even moderate side effects.

Regarding the individual circumstances and perceptions of the COVID-19 pandemic, most individuals (84.1%) did not consider taking a second dose of the vaccine in case of no protection for them.

Most of the respondents were ready to pay for this hypothetical vaccine (78.1%) even if the vaccine will not be covered by any kind of financial support such as social, public or private insurance. Only 38.1% of the participants predicted social or public insurance as the source of coverage of the vaccine.

Considering the effectiveness of the hypothetical vaccine for COVID-19 is approximately 99%, 68.2% of the respondent believed that the disease could be prevented by the COVID-19 vaccine whereas 31.8% reported that they will not do the vaccine for several reasons represented in Figure 2. Notably, approximately 52.2% of the respondents have mentioned that they may not want to get vaccinated because of the side effects of the vaccine (Table 2). As a reason for not getting the vaccination, 43.6% considered that the vaccine will be expensive, 41.9% supposed that the hypothetical vaccine will not protect them from getting COVID-19, and 21.4% will take the vaccine under 1 condition that the vaccine will be listed on international guidelines.

Figure 2. Reasons for not getting the vaccination of COVID-19 (N = 117).



COVID-19 indicates coronavirus disease 2019

Table 2. Attitude concerning COVID-19 and potential vaccination.

Variables	Frequencies (N = 352)	Percentages (%)
Searching information concerning COVID-19		
No	143	40.6
Yes	209	59.4
Knowing people having COVID-19		
No	300	85.2
Yes	52	14.8
Severity of COVID-19		
Mild	12	3.4
Moderate	108	30.7
Severe	196	55.7
Very severe	36	10.2
If available, will you do the vaccine of COVID-19		
No	112	31.8
Yes	240	68.2
Route of administration		
Injection	252	71.8
Oral	84	23.9
Others	15	4.3
Duration of protection		
± 6 months	49	13.9
± 1 year	114	32.4
± 2 years	189	53.7
Tolerate side effects		
Yes	27	7.7
No, in case of mild side effects	29	8.2
No, in case of moderate side effects	181	51.4
No, in case of severe side effects	72	20.5
No, in case of very severe side effects	43	12.2
Second dosage (in case of no protection)		
No	296	84.1
Yes	56	15.9
Source of coverage		
Self-payment	72	20.5
Social or public insurance	134	38.1
Private insurance	130	36.9
Nongovernmental organizations	16	4.5
If not covered, are you willing to pay for a COVID-19 vaccine		
No	77	21.9
Yes	275	78.1
Willing to pay for the vaccine (as maximum value or efficacy estimated 99%)		
<20 000 LBP	20	5.7
20 000-50 000 LBP	106	30.1
51 000-100 000	146	41.5
101 000-150 000 LBP	48	13.6
151 000-200 000 LBP	14	4.0
201 000-250 000 LBP	6	1.7
251 000-300 000 LBP	5	1.4
>300 000 LBP	7	2.0

Note. In case of an inflation, how much are willing to pay as a maximum value in USD: N= 347 (5 missing) 63.729 ± 102.8933 range: 3-1531.
COVID-19 indicates coronavirus disease 2019; LBP, Lebanese pound; USD, US dollar.

Approximately 41.5% of the participants reported that they are willing to pay an amount that goes from 51 000 to 100 000 LBP, and 30.1% are willing to pay for the vaccine from 20 000 to 50 000 LBP. Moreover, 71.5% overall prefer to pay an amount that is below 100 000 LBP. In contrast, only 2% are willing to pay >300 000 LBP for the vaccine. The question was asked in a context where the currency used is the LBP and where the estimated efficacy of the vaccination is approximately 99%. Another question was asked where another scenario had been set: the WTP in an international currency US$ in case of an inflation of the local currency happened. The mean was $63.7 with an SD of $102.89 where the lowest value was $3 and the highest value was $1531 (Table 2). The mean of the WTP (in case of inflation) in United States and their original WTP in LBP were significantly associated (P=.000) (Appendix Table 1 in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2021.10.004).

Subgroup Analysis of WTP

The WTP was studied according to the sociodemographic characteristics. The maximum WTP was the one used in the case of inflation in the international currency (US$). Age and sex were not significantly associated with WTP. The working status was not significantly associated with the WTP (P = .197) (data not shown). Nevertheless, the education level was significantly associated with the WTP (P = .001). The number of members of household has shown that there is no significant association with the WTP (P = .086), and the WTP was not significantly different between districts. Estimated salary and WTP were significantly associated (P = .04). The correlation between household income and WTP in United States was also studied. The P value was .009, the Pearson's correlation being 0.141 (data not shown). The comparison was made between the mean value of the WTP (the value of the WTP used is the value of the inflation scenario) and the answers given toward the respondent's attitude toward a COVID-19 vaccine. The severity of COVID-19 was significantly associated with the WTP of the participants (P < .001). The WTP of the participants who know people having COVID-19 was slightly higher than the other participants (P = .0691). The source of coverage of the vaccine of the participants was not significantly associated with their WTP (P = .761). The willingness to do a second dose of the vaccine in case of no protection was not significantly associated with the WTP for the vaccine (P = .258). All these results are available in the Table 3.

Sensitivity Analysis

While proceeding all the tests, the detection of extreme values was made. To get a more specific data analysis, the extreme values were omitted from the datasheet of the variables, household income and WTP in case of inflation ($1531). The sensitivity analysis was made to reduce the large SD of 102.8933 presented in Table 3.

The WTP (in US$) after excluding extreme values was $59.488 ± $66.026.

Then, the association between the WTP and household income was tested. The association was not substantially changed (P = .005). The correlation between household income in $ and WTP in $ was reassessed and the outcome was 0.152 (P = .000) (data not shown).

Discussion

Coronavirus is considered a major health and economic issue. It has forced governments to take precautions and measures to

Table 3. WTP according to respondents' characteristics and their attitude toward COVID-19 vaccine.

Variables	N = 352	Mean value in $	Minimum value in $	Maximum value in $	*P* value
Age					.129*
18-44	237	64.539 ± 75.994	3	500	
45-64	80	49.312 ± 34.984	10	225	
>64	35	91.314 ± 253.733	10	1532	
Sex					.231†
Male	162	65.149 ± 127.215	3	1531	
Female	190	62.500 ± 76.1617	10	500	
Household size					.086*
<4	144	63.021 ± 128.796	3	1531	
4	117	50.427 ± 45.198	10	300	
>4	91	82.557 ± 109.081	10	500	
Education level					.001*
School Degrees	78	66.744 ± 170.671	20	1531	
University	202	55.10 ± 52.922	10	500	
Advanced	70	86.493 ± 109.305	3	500	
Residence during lockdown					.045†
Village	211	55.19 ± 50.95880	10	500	
City	136	78.250 ± 150.343	3	1531	
Estimated salary					.04‡
<675 000 LBP	69	50.725 ± 40.00	10.0	250.0	
675 000-999 000 LBP	99	42.828 ± 19.5767	10.0	150.0	
1 000 000-1 999 000 LBP	109	59.771 ± 71.4965	10.0	500.0	
2 000 000-2 999 000 LBP	45	93.511 ± 112.4155	3.0	500.0	
3 000 000-3 999 000 LBP	15	74.667 ± 84.8416	5.0	300.0	
4 000 000-5 000 000 LBP	5	135 ± 65.192	50.0	225.0	
>5 000 000 LBP	5	371.2 ± 650.8531	20.0	1531.0	
Knowing people having COVID-19					.0691†
No	300	59.606 ± 68.963	3	500	
Yes	52	88.220 ± 212.867	10	1531	
Severity of COVID-19					.000*
Mild	12	173 ± 433.482	10	1531	
Moderate	108	73.019 ± 76.200	10	500	
Severe	196	49.021 ± 42.728	5	500	
Very severe	36	79.514 ± 112.442	3	500	
Tolerate SE					.560‡
Yes	27	74.074 ± 68.304	10	200	
No, due to mild SE	43	81.026 ± 112.444	10	500	
No, due to moderate SE	72	62.324 ± 52.819	5	300	
No, due to severe SE	181	49.751 ± 45.811	10	500	
No, due to very severe SE	29	121.517 ± 289.173	3	1531	
Second dosage (in case of no protection)					.258†
No	77	68.865 ± 184.723	10	1531	
Yes	275	62.337 ± 65.5767	3	500	
Source of coverage					.761‡
Self-payment	72	98.443 ± 202.376	5	1531	
Social or public insurance	134	56.045 ± 58.724	3	500	
Private insurance	130	53.527 ± 43.519	10	300	
Nongovernmental organizations	16	57.500 ± 49.497	10	200	
If not covered, WTP for COVID-19 vaccine					.766†
No	77	68.865 ± 184.723	10	1531	
Yes	275	62.337 ± 65.576	3	500	

ANOVA indicates analysis of variance; COVID-19, coronavirus disease 2019; LBP, Lebanese pound; SE, side effects; WTP, willingness to pay.
*ANOVA.
†Student's *t* test.
‡Kruskal–Wallis nonparametric test.

decrease the spread of this virus such as lockdown, social distancing, and wearing masks.

Moreover, government and health organizations are working hard to protect the global economy and their socioeconomic status. In contrast, the urge into finding a new vaccine is imperial and many medical laboratories and pharmaceutical firms are working to get one of the potential vaccines on the market while checking its efficacy and safety to confront this pandemic episode. To people get vaccinated, it is important to determine their WTP and study the factors that may affects this value.

In our study, this WTP was found by using a CVM approach.

The mean value of WTP was $63.7 with a standard variation of $102.89. This value was $59 when the sensitivity analysis was done. Approximately 41% of the participants were willing to pay from 51 000 to 100 000 LBP. The variables that were positively associated with the WTP were the severity of the disease, the household income, and the education level of the population.

It is important to know that approximately 71% of the population are willing to pay to get the vaccine even though it is not covered. That is an indicator that the Lebanese participants considered the vaccination as a way of protection against COVID-19. This is comparable with the study conducted in the United States where 69% of their population is WTP and willing to do the vaccine.[33] The Lebanese population tends to consider in the first-case scenario the private insurance (36.9%) or the social insurance (38.1%) as a source of coverage.

In addition, the higher WTP was among people getting advanced studies, which can lead us to say that higher education level may push the target population to know more about COVID-19 and the importance of vaccine to be protected. This was also observed in our study because people who consider COVID-19 as a severe disease were willing to pay more than others.

It was proved that there is an association between the household income and the WTP in all the studied scenarios. The interpretation of this test shows that when the household income is higher, the population is willing to pay more for the vaccine.

Lebanese participants are willing to pay approximately $63 for COVID-19 less than the WTP to get the vaccine reported in Chile ($184.72)[27] and Ecuador (approximately $90)[32] but this value is higher than that reported in the Romanian study (approximately $51).[28] The amount that was willing to pay by the Indonesian population was comparable with the study conducted (approximately $57)[29] but the price that the Malaysian population is ready to pay was lower (approximately $30)[30] than the amount found in the Lebanese study. This suggests that the general population of Lebanon does not consider for this vaccine paying a higher amount than a regular vaccination.

The Lebanese population preferred to stay in the village during lockdown because they will be doing social distancing and avoiding the agglomeration of the population that is present in the cities. That is a positive indicator of the self-awareness of the participants (60.8%). Nevertheless, the respondents who lived in the city are willing to pay more for the vaccine than the participants that lived in the village. There was an association established between the WTP and the place to live during lockdown.

This is the first study of its kind conducted in Lebanon to evaluate the WTP of Lebanese individuals toward vaccination during one of the peak episodes during the COVID-19 pandemic. In the questionnaire, the CVM was used. Two methods (PC and OE) were used to determine the WTP of the respondents: this could reduce the range bias. The starting point bias was reduced by using the PC technique where the respondent chose the minimum value of the WTP present in the ranges available in the first question and then we proceeded by asking an OE question where the maximum of the WTP was asked.

In addition to the CVM, the study conducted was comparative with all the Lebanese districts. The comparison between the percentage of participants from the 8 districts found in our study and the percentages of adults per district available from the data of the MOPH (Statistical Bulletin 2018) is available in Appendix Table 2 in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2021.10.004.[35] For example, for the Mount-Lebanon district, 33.5% of the respondents were from this district; in the standard data, Mount-Lebanon represented 34.85% of the participation rate of this district. Moreover, 14.8% of our participants were from the North compared with the 14.18% that should be represented. All these percentages were collected from individuals that are aged 20 years and older.

Nevertheless, there were several limitations in the study conducted. First of all, the sample size was less than the minimum sample size required (because among 500 participants only 352 respondents accepted to fill the questionnaire). Second, the recruitment technique was an online survey. That might create some confusion for the participant while filling the questionnaire and lead to classification bias. The communication bias is present because there is no face-to-face interaction. Third, respondents can overstate their perceived value of a hypothetical vaccine during the peak of COVID-19 outbreak, in addition, that none of the COVID-19 vaccines has completed the approval process.

Finally, the online survey might also be prone to non-probability sampling. Furthermore, it could represent only groups of the general population: the elderly population, the low-income family, and the low education level could have been excluded from this study, leading to a selection bias. Nevertheless, we tried to overcome these limitations by targeting people from different districts and of different ages and soliciting equally female and male to participate in the study.

Conclusions

The WTP found in this study was comparable with other studies that aimed to investigate WTP for a hypothetical vaccine. It was highly associated with sociodemographic determinants among the Lebanese general population, such as the level of education, the household income, the type of residence during one of the peak episodes during the COVID-19 pandemic in Lebanon, and the perceived severity of the disease. These findings can help in understanding COVID-19 vaccination acceptance and WTP in Lebanon. The WTP was positively related to socioeconomic factors, which should guide policy recommendations for the future national COVID-19 improvisation program in mainland Lebanon. Once the vaccine will be available, further studies should be conducted to understand the evolution of WTP and acceptance of the Lebanese population toward the COVID-19 vaccine.

Supplemental Material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.vhri.2021.10.004.

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