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RESEARCH ARTICLE

The role of pharmacist education as a catalyst: Examining COVID-19 vaccine acceptance and hesitancy in senior Lebanese citizens

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Abstract

Objective: This study aims to underscore the potential of pharmacist education in bridging the gap between COVID-19 vaccine hesitancy and acceptance, focusing on senior Lebanese citizens. **Methods:** The study is an online cross-sectional observational survey using the snowball technique. It was conducted in Lebanon during the lockdown over a period of five months from December 2020 to April 2021. Two hundred Lebanese adults aged 65 years and older with internet access were enrolled. **Results:** In total, 229 seniors completed the questionnaire, among which 18.8% took the COVID-19 vaccine. Results showed a significant association between vaccine-intake individuals with a higher number of comorbidities (ORa=1.15, 95% CI (1.09;1.22)). Acceptance of the vaccine (ORa=1.12, 95% CI (1.04; 1.20)) had a more significant influence than vaccine hesitancy (ORa=0.81, 95% CI (0.73; 0.90)). Key factors affecting higher vaccine acceptance were a recent history of falls (Beta=2.545, CI (0.823;4.268)), and seeking advice from a pharmacist (Beta=3.992, CI (0.877;7.106)) while being a healthcare professional was associated with lower acceptance (Beta=-2.398, CI (-4.492; -0.305)). **Conclusion:** This study accentuates the vital role of pharmacists' educational influence in promoting vaccine acceptance among seniors, emphasising the need to empower the elderly in their health choices for effective disease prevention.

Introduction

COVID-19 has disproportionately affected the aging population since the onset of the pandemic. Overwhelming global evidence shows that advanced age is a primary risk factor for contracting severe COVID-19 symptoms. People aged 65 years and above are at an increased risk of hospitalisation and mortality due to COVID-19 than other age groups. As of February 2022, more than 5.77 million deaths have been reported worldwide out of more than 398 million confirmed cases (Domiati *et al.*, 2020; Zhou *et al.*, 2020). Elderly deaths account for nearly 80% of all COVID-19 deaths (Chen *et al.*, 2021; Freed *et al.*, 2021).

The Centres for Disease Control and Prevention (CDC) and World Health Organisation (WHO) recommend

elderly vaccination with any of the currently licensed COVID-19 vaccines (CDC, 2021; WHOCC, n.d.). The sharp decline in COVID-19 morbidity and mortality post-vaccination among people of advanced age justifies the need to increase vaccination rates at the population level (Christie *et al*., 2021; Moline, 2021). Nevertheless, vaccine acceptance plays a pivotal role in successful pandemic response (Milošević Đorđević *et al*., 2021; Sallam *et al*., 2022).

Many factors influence older adults' decisions about vaccine intake, such as individual risk perception, education level, and confidence in the source of information about the vaccine (Eilers *et al*., 2014). Numerous studies have shown that concerns about safety profile and potential side effects influence vaccine hesitancy, especially for newly developed vaccines (Larson *et al*., 2014; Faezi *et al*., 2021).

Importantly, pharmacists, with their advanced education and frontline position in healthcare, are uniquely positioned to offer credible information about vaccinations (Goff *et al*., 2020). Their trusted role in communities can play a transformative role in addressing vaccine concerns, dispelling myths, and enhancing vaccine acceptance (Erku *et al*., 2021).

In one study that examined the intentions to be vaccinated against COVID-19, in which Lebanon participated, participants reported mistrust and uncertainty as the most common reasons for not getting the vaccine (Larson *et al*., 2014; Faezi *et al*., 2021). However, higher education levels and reliable sources of information, notably from healthcare professionals like pharmacists, were significantly associated with greater vaccine acceptance (Lazarus *et al*., 2020).

The source of information about the COVID-19 vaccine is paramount. Whether from a healthcare professional, the mass media, or social media, it plays a critical role in vaccination rates among older adults (Mian & Khan, 2020; Roozenbeek *et al*., 2020; Lu *et al*., 2021)

Pharmacists, as community-based healthcare professionals, have a significant influence in guiding individuals, especially the elderly, in making informed vaccination choices.

In Lebanon, the introduction of the COVID-19 vaccine in February 2021 was timely, as the nation grappled with financial, health, and sociopolitical challenges. The vaccination plan in Lebanon prioritised high-risk groups in a phased manner (Ministry of Public Health Lebanon *et al*., 2022), with individuals above 65 years being part of the first phase (Impact, 2023). Within three months of the vaccine campaign's launch, a significant portion of the Lebanese elderly population had received at least one dose of the vaccine. Given the essential role of vaccination in ensuring a better quality of life for Lebanon's elderly, it is vital to ensure its continuation. However, the success of this initiative hinges on factors that influence vaccine acceptance and hesitancy.

Research objective

To investigate the efficacy of pharmacist education in shaping COVID-19 vaccine acceptance and hesitancy in elderly Lebanese and to validate relevant hesitancy and acceptance scales.

Hypothesis

Pharmacist-led educational interventions will enhance vaccine acceptance rates in elderly Lebanese citizens, and recognised scales for vaccine hesitancy and acceptance will be valid in this demographic.

Methods

Study design

The study is an online cross-sectional survey conducted in Lebanon while the country was under lockdown measures. To overcome the challenges of restricted movement during this period, the authors employed a snowball sampling method, allowing participants to refer to others from their social network, facilitating the recruitment process in a constrained environment. The study period was five months, from December 2020 to April 2021.

The inclusion criteria were Lebanese older adults aged 65 years and older with internet access. The authors used social media platforms such as LinkedIn, Facebook, and WhatsApp to distribute and share the questionnaire.

Sample size

The minimum sample size was calculated using the Epi Info 7.2.5.0 tool. Considering the Lebanese population is 6 million citizens (Abdulrahim *et al*., 2015) and 11% elderly (Abou taha *et al*., 2022), the minimum sample size must be 168. The calculation assumed an 80% confidence level and a 5% margin of error.

Questionnaire

The questionnaire was developed by a group of pharmacists with experience in academia in English and translated to Arabic according to the WHO translation guidelines (WHO, 2022).

The final questionnaire consisted of four sections: sociodemographic characteristics, use of COVID-19

vaccine score, acceptance of COVID-19 vaccine use, and hesitancy of COVID-19 use.

The first part covered the sociodemographic characteristics: age, gender, marital status, education level, health insurance, the household crowding index, being a healthcare professional, history of hospital admission in the past six months, history of falls in the past six months, and number of comorbidities. The household crowding index was computed by dividing the number of persons living in the house by the number of rooms, excluding the kitchen and bathrooms.

Acceptance of COVID-19 use scale and hesitancy of COVID-19 use scale

The scale of acceptance and hesitancy of COVID-19 were structured according to similar published articles (Leist, 2013; Larson *et al*., 2014; Vošner *et al*., 2016; Al-Mohaithef & Padhi, 2020; Domiati *et al*., 2020; Alqudeimat *et al*., 2021; Faezi *et al*., 2021; Ministry of Public Health Lebanon, UNICEF, & WHO, 2022; Impact, 2023; Moph, n.d.).

Acceptance of COVID-19 Vaccine Score: It was created to assess reasons for taking the COVID-19 vaccine. It consisted of nine questions graded on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The total score was calculated by summing the nine responses ranging from 9 to 45. A higher score indicated a good acceptance level of the COVID-19 vaccine. Hesitancy of COVID-19 use scale: Five questions assessed the causes of COVID-19 vaccine hesitancy. All are graded on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The total score was calculated by summing the five responses ranging from. The total score was calculated by summing the nine responses ranging from 5 to 25. A higher score indicated a more positive attitude toward COVID-19.

Ethical considerations

The study protocol was approved by the Lebanese International University institutional ethics committee under the number 2020RC-061-LIUSOP. The study was in accordance with the Declaration of Helsinki and the relevant national and institutional guidelines and regulations for publication. Before filling out the online survey, participants were informed about the objective of the study and the freedom to withdraw at any time. Participants did not receive any financial reward for their participation. The online survey was anonymous and voluntary. Informed consent was obtained for all participants.

Statistical analysis

The authors conducted the analysis on SPSS software version 25. For the descriptive analysis, the authors used the absolute frequencies and percentages for categorical variables and mean and standard deviations (SD) for quantitative measures.

The authors assessed the validity and internal consistency of the acceptance of COVID-19 vaccine use score and acceptance of COVID-19 vaccine use score using the principal component analysis and Cronbach's alpha.

The bivariate analysis was conducted using the chi-square test to compare categorical variables the student's independent *t*-test to compare continuous variables in two groups, and the ANOVA test to compare three or more means, after checking for assumptions of normality and homoscedasticity, when appropriate. Pearson correlation was used for linear correlation between continuous variables. Multivariable analysis included a logistic regression, where COVID-19 vaccination was the dependent variable, and two linear regression analyses that considered the two scales as dependent variables. All variables that showed a $p < 0.2$ in the bivariate analysis were included in the model to eliminate potentially confounding factors as much as possible. A *p*-value of less than 0.05 was considered significant.

Results

Socio-demographic characteristics

Table I describes the socio-demographic characteristics of participants. The total sample size was 229 participants, 55.5% females, and the mean age was 73.30 ± 7.79 years. 23.6% of the respondents had tertiary education, and 15.3% were healthcare professionals. 28.4% were admitted to the hospital in the past six months, and 77.3% have two or more comorbidities.

Table I: Sociodemographic and other characteristics of the participants (N=229)

Variable	N (%)
Gender	
Male	102 (44.5%)
Female	127 (55.5%)
Marital status	
Single/widowed/divorced	109 (47.6%)
Married	120 (52.4%)
Health Insurance	
Private	79 (34.5%)
Public	83 (36.2%)
No health coverage	67 (29.3%)
Education level	
Tertiary education	54 (23.6%)
Secondary education	88 (38.4%)
Primary education	87 (38.0%)
Healthcare professional	
Yes	35 (15.3%)
No	194 (84.7%)
Number of comorbidities	
No chronic illness	23 (10%)
1	29 (12.7%)
2 or more	177 (77.3%)
History of hospitalization in the past six months	
Yes	65 (28.4%)
No	164 (71.6%)
History of fall in the past six months	
Yes	59 (25.8%)
No	170 (74.2%)
Variable	**Mean ± SD**
Age (in years)	73.30 ± 7.79
Household crowding index	0.79 ± 0.52

Factor analysis

The factor analysis results of the acceptance of COVID-19 vaccine use score showed two factors solution and a Bartlett sphericity test $p < 0.001$, and KMO = 0. 850. The Cronbach's alpha values were good (α=0.872).

The factor analysis results of the hesitancy of COVID-19 vaccine use score showed a one-factor solution, with a Bartlett sphericity test $p < 0.001$ and KMO = 0.796. The Cronbach's alpha values were good (α=0.829). (Appendices 1 and 2). Use of COVID-19 vaccine

Table II shows that 18.8% of the respondents took the COVID-19 vaccine. Participants with previous hospitalisation in the past six months ($p = 0.001$), who have a history of falls within the past six months, and who had a higher number of comorbidities ($p = 0.001$) had a higher vaccination rate. A higher hesitancy score was significantly associated with a lack of vaccination ($p = 0.011$).

Table II: Uses of COVID-19 vaccine

Variables	Use of COVID-19 vaccine		*p*-value
	Yes	No	
	43 (18.8%)	**186 (81.2%)**	
Gender			
Male	23 (22.5%)	79 (77.5%)	0.190
Female	20 (15.7%)	107 (84.3%)	
Marital status			
Single/widowed/divorced	26 (23.9%)	83 (76.1%)	0.044
Married	17 (14.2%)	103 (85.8%)	
Health insurance			
Yes	23(14.2%)	139 (85.8%)	0.006
No	20 (29.9%)	47 (70.1%)	
Education level			
Tertiary education	10 (18.5%)	44(81.5%)	0.986
Secondary education	17 (19.3%)	71 (80.7%)	
Primary education	16 (18.4%)	71 (81.6%)	
Healthcare professional			
Yes	8 (22.9%)	27 (77.1%)	0.322
No	35 (18.0%)	159 (82.0%)	
History of hospitalization in the past six months			
Yes	21 (32.3%)	44 (67.7%)	0.001
No	22 (13.4%)	142 (86.6%)	
History of fall in the past six months			
Yes	20 (33.9%)	39 (66.1%)	0.001
No	23 (13.5%)	147 (86.5%)	
	Mean ± SD		
Age (in years)	74.79 ± 8.29	72.95 ± 7.65	0.163
Comorbidities	9.37 ± 8.02	4.75 ± 5.05	<0.001
Household crowding index	0.72 ± 0.46	0.82 ± 0.50	0.228
Hesitancy of COVID-19 vaccine use scale	15.84 ± 4.85	17.45 ± 3.44	0.011
Acceptance of COVID-19 vaccine use scale	33.09 ± 6.32	31.29 ± 5.79	0.092

Hesitancy and acceptance of COVID-19 use scales

Table III indicates that being a healthcare provider was significantly associated with a higher vaccine hesitancy score (p = 0.015). The acceptance of the vaccines was correlated with increased age (p = 0.024).

Table III: Bivariate analysis taking the hesitancy and acceptance of COVID-19 vaccine scales as the dependent variables

		Hesitancy of COVID-19 vaccine use scale	*p*-value	Acceptance of COVID-19 vaccine use scale	*p*-value
		Mean ± SD		Mean ± SD	
Gender					
Male		16.9 ± 4.09	0.386	31.90 ± 6.00	0.533
Female		17.35 ± 3.53		31.41 ± 5.88	
Marital status					
Single/widowed/divorced		17.45 ± 3.84	0.253	31.28 ± 6.32	0.403
Married		16.87 ± 3.73		31.94 ± 5.54	
Health insurance					
Yes		16.86 ± 3.45	0.105	31.55 ± 4.95	0.809
No		17.85 ± 4.44		31.81 ± 7.84	
Tertiary education level					
Yes		16.59 ± 3.77	0.218	32.89 ± 5.16	0.074
No		17.32 ± 3.79		31.24 ± 6.10	
Healthcare professional					
Yes		18.57 ± 3.04	**0.015**	33.31 ± 4.46	0.067
No		16.89 ± 3.86		31.32 ± 6.11	
Hospital admission in the past six months					
Yes		17.11 ± 4.07	0.919	30.38 ± 6.83	**0.045**
No		17.16 ± 3.68		32.12 ± 5.47	
History of fall in the past six months					
Yes		17.66 ± 4.19	0.229	29.91 ± 7.71	**0.010**
No		16.397 ± 3.63		32.22 ± 5.05	
Source of information					
Physician	Yes	16.64 ± 4.22	0.194	32.21 ± 6.07	0.342
	No	17.36 ± 3.59		31.39 ± 5.86	
Pharmacist	Yes	15.57 ± 4.07	0.108	27.78 ± 7.17	**0.012**
	No	17.25 ± 3.76		31.87 ± 5.76	
Family/friends	Yes	18.38 ± 2.40	0.086	31.46 ± 6.90	0.917
	No	17.07 ± 3.84		31.63 ± 5.88	
Internet search	Yes	17.80 ± 2.68	0.698	31.20 ± 7.22	0.870
	No	17.13 ± 3.81		31.64 ± 5.91	
Mass media	Yes	16.89 ± 2.37	0.834	30.11 ± 5.62	0.434
	No	17.16 ± 3.84		31.69 ± 5.94	
Social media	Yes	17.16 ± 3.74	0.991	29.58 ± 6.68	0.115
	No	17.15 ± 3.80		31.81 ± 5.83	
		Correlation coefficient		**Correlation coefficient**	
Age		-0.017	0.802	-0.149	**0.024**
Comorbidities		0.065	0.330	-0.004	0.949
Household crowding index		-0.081	0.222	-0.008	0.909

Multivariable analysis

Table IV shows the results of the linear regression taking the hesitancy of the COVID-19 vaccine use scale as the dependent variable. Being a healthcare professional was the only variable significantly associated with vaccine hesitancy (Beta=1.68, CI

(0.323; 3.036)). Table V represents the second linear regression taking the acceptance of the COVID-19 vaccine use scale as the dependent variable.

Results showed that being a healthcare professional (Beta=-2.398, CI (0.305; 4.492)) was associated with lower attitude, while a history of falls in the past six months (Beta=2.545, CI (0.823;4.268)), and asking the pharmacist (Beta=3.992, CI; (0.877;7.106)) were significantly associated with higher vaccine acceptance.

Table IV: Linear regression taking the Covid-19 vaccine hesitancy scale as the dependent variable

	Covid-19 vaccine hesitancy scale		
	Beta	**95% CI**	***p*-value**
Being a healthcare professional (Yes or No*)	1.68	0.323; 3.036	0.015
Variables entered in the model: Age, marital status, Healthcare professional, Insurance coverage, University degree, source of information (Physician, Pharmacist, Family and friends), and History of fall.			
*Reference group			

Table V: Linear regression taking the Acceptance of COVID-19 vaccine use scale as the dependent variable

	Acceptance of COVID-19 vaccine use scale		
	Beta	**95% CI**	***p*-value**
History of fall in the past 6 months (Yes or No*)	2.545	0.823; 4.268	0.004
Pharmacist as a source of information (Yes or No*)	3.992	0.877; 7.106	0.012
Healthcare professional (Yes or No*)	-2.398	-4.492; -0.305	0.025
Variables entered in the model: Age, university degree, Healthcare professional, admission to the hospital, history of fall, Source of information (Pharmacist, Mass media),			
*Reference group			

Table VI shows the results of the logistic regression taking COVID-19 intake as the dependent variable. Results showed a significant association with respondents having a higher number of comorbidities (ORa=1.15, 95% CI (1.09;1.22)).

Acceptance of COVID-19 vaccine use scale highly influenced COVID-19 vaccine intake (ORa=1.12, 95% CI (1.04; 1.20)) than hesitancy of COVID-19 vaccine use scale (ORa=0.81, 95% CI (0.73; 0.90)).

Table VI: Logistic regression taking COVID-19 vaccination as the dependent variable

	ORa	**95% CI**	***p*-value**
Acceptance of COVID-19 vaccine use scale	1.12	1.04; 1.20	<0.001
Hesitancy of COVID-19 vaccine use scale	0.81	0.73; 0.90	<0.001
Comorbidities	1.15	1.09; 1.22	0.02
Variables entered in the model: Gender, Marital status, Insurance coverage, History of hospital admission, History of fall, Comorbidities, Household crowding index, Covid-19 vaccine hesitancy, Covid-19 vaccine acceptance.			
*Reference group			

Discussion

This study was the first in Lebanon to examine the determinants of COVID-19 vaccine intake and validate the acceptance and hesitancy of vaccine use in senior Lebanese citizens. These results showed a limited rate of vaccine intake in the elderly (18.8%) significantly correlated with a higher hesitancy score. Despite the Ministry of Public Health in Lebanon (MoPH) efforts (Moph, n.d.), which prioritised elderly immunisation and conducted awareness campaigns about the vaccine's effectiveness in preventing infection severity, the rate of vaccination in the elderly remained suboptimal. Global statistics showed varying vaccine acceptance rates (Wake, 2021), with notable differences even among Arab countries (Alqudeimat *et al*., 2021; Sallam *et al*., 2022).

Understanding the drivers behind these discrepancies is essential, and previous studies indicate that the rationale behind accepting or refusing the COVID-19 vaccine is multifaceted, and impacted by diverse socioeconomic (gender, level of education, marital status, profession, household crowding index), clinical (number of comorbidities, history of fall, history of hospital admission), source of information (Social media, pharmacist, physician..), and political dynamics (Barello *et al*., 2020; Kreps *et al*., 2020, Malik *et al*., 2020; Coustasse *et al*., 2021; Geana *et al*., 2021; Lockyer *et al*., 2021; Momplaisir *et al*., 2021; Siu, 2022).

Importantly, one of the core drivers of vaccine acceptance is the source of information. While social media platforms and mass media had a neutral effect in this study, advice from healthcare professionals, and notably pharmacists, emerged as a significant influencer. This underscores the pivotal role of pharmacist education in shaping health decisions and influencing vaccine acceptance rates (Tran *et al*., 2021). Pharmacists, trusted figures within communities, can provide accurate, understandable, and personalised information that dispels myths and alleviates concerns related to vaccination (Nawas *et al*., 2023). Compared to other healthcare providers, pharmacists are highly accessible, and they are considered to be trusted medication experts who can provide regular follow-up for patients. Their personalised consultations can foster trust and dispel conspiracy theories (Mallhi *et al*., 2020; Valliant *et al*., 2022).

Multiple models were proposed to explain the hesitancy of vaccine use, such as the 5A, 3C, and 5C models. The 5As model consists of access, affordability, awareness, acceptance, and activation, while the 3Cs taxonomy defines complacency, convenience, and confidence (MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015), and the C5 model includes in addition to complacency and confidence, constraints, collective responsibility, and calculation (Betsch *et al*., 2018). Using various models, the authors sought to delve deeper into vaccine hesitancy. Complacency, a key determinant, known as unawareness of the health risks of not taking the vaccine, was less applicable to these Lebanese elderly cohort given their heightened risk perception. In fact, these results showed that acceptance of the vaccine increased with the number of comorbidities. This finding aligns with the literature demonstrating a higher willingness to take the vaccines when the risk of getting the disease is high (Al-Mohaithef & Padhi, 2020; Reiter *et al*., 2020; Alqudeimat *et al*., 2021; Karlsson *et al*., 2021). The Health Belief Model (HBM) predicts that those who feel susceptible to health threats, such as advanced age and a high number of comorbidities, have benefits that outweigh the risks, have the self-efficacy to overcome barriers, and are most likely to be willing to get vaccinated (Alqudeimat *et al*., 2021; Wake, 2021; Mekonnen *et al*., 2022). In this study, people who took the vaccine were aware of the risks associated with ageing and their health status. Seventy-seven percent considered that they should take the vaccine because of their age-related risks. Ageing, changes in the immune system, the presence of multiple comorbidities, recent hospitalisation, polypharmacy, and frailty are among the risk factors that increase the likelihood of the elderly contracting the severe form of COVID-19 infection (Weinberger, 2018; Rahman *et al*., 2020; Pizano-Escalante *et al*., 2021;). These are the exact causes of immunisation prioritisation that despite the best intentions may have contributed in some settings to the deprivation of the elderly from their right of willingly refusing the vaccine (Allen, 2021). Researchers are now stressing the importance of fighting ageism and supporting older people's right to voice their health decisions (Ayalon & Tesch-Römer, 2018; Reynolds, 2020).

Economic factors, including financial resources and health insurance, significantly influence individuals' willingness and hesitancy toward COVID-19 vaccination (Hou *et al*., 2014; Akarsu *et al*., 2021; Oyekale, 2023). In contrast, convenience, constraints, and affordability played less of a role in Lebanon, where vaccines were freely available at varied locations.

Furthermore, a sense of collective responsibility emerged as a primary driver, with a significant majority (70%) viewing vaccination as a national duty.

Another critical element in the vaccine decision-making process is the act of 'calculation', which encompasses the active seeking of information. Studies of individuals' behavioural changes related to infectious diseases suggest that perceptions or beliefs about an outbreak are important in determining the adoption of certain preventive behaviours (Gesser-Edelsburg *et al*., 2020; Yıldırım *et al*., 2021; Anas *et al*., 2023).

The crucial role of healthcare professionals, especially pharmacists, cannot be overemphasised in this regard (Goff *et al*., 2020). Their expertise and trustworthiness make them invaluable sources of credible information. In this study, heightened awareness significantly boosted vaccine acceptance rates.

Yet, confidence was still a challenge that could explain immunisation hesitancy. These results showed that healthcare professionals exhibited a significantly higher hesitancy score, potentially due to being exposed to an overwhelming influx of data that can lead to confusion or misinterpretation, especially if studies have conflicting results (Beta=1.68, CI (0.323; 3.036)). Their firsthand experiences with rare adverse reactions, high standards for evidence, and potential mistrust in

pharmaceutical companies can contribute to hesitancy (Gorman *et al*., 2022; Peterson *et al*., 2022). Scepticism surrounding the rapid development and approval of the vaccine amplified concerns about potential side effects (Anas *et al*., 2023).

Results showed that the fact of asking the pharmacist for advice did increase the chances of vaccine acceptance (Beta=3.992, CI (0.877;7.106)). Pharmacist-led education can bridge this confidence gap by providing evidence-based information on vaccine efficacy, safety, and addressing other vaccine-related concerns. Their personalised consultations can foster trust and dispel conspiracy theories (Nabia *et al*., 2023).

This study had multiple strength points. This study is the first to validate the reliability of the COVID-19 vaccine use hesitancy and acceptance scales in Lebanese senior citizens. The authors highlight that the authors examined the factors that affected the actual vaccine intake and not the willingness to take the vaccine that was the focus of previous literature.

The current study had certain limitations. During the study period, the COVID-19 vaccine was recently available in Lebanon, with no feedback on its efficacy and safety profile. The cross-sectional design of this investigation did not allow for drawing causal relationships. The online survey represented a specific point in time and did not capture the dynamics of the COVID-19 pandemic progress, which limits the generalisability of the results. Online surveys can introduce selection bias, potentially excluding older adults or those with limited internet access or lower computer literacy. Additionally, self-reported data can introduce response bias, and the lack of face-to-face interaction might lead to misunderstandings of survey questions.

In future research, transitioning from a cross-sectional to a longitudinal design would allow the exploration of causal relationships and better capture the pandemic's evolving dynamics. Combining online and offline data collection can mitigate selection bias and better represent groups like older adults or those with limited internet access. Incorporating objective measures alongside self-reported data can address potential biases and participant misunderstandings.

Clinical implications

The battle against COVID-19 heavily depends on protective behaviours and vaccinations. These findings illuminate the vital role of fostering vaccine acceptance and confronting hesitancy sources. Public health campaigns need to prioritise not only spreading awareness about vaccine safety and efficacy but also leveraging the pivotal role of healthcare professionals, especially pharmacists, in these educational endeavours.

Future directions

Studies with more comprehensive samples are needed for a holistic understanding of vaccine hesitancy and acceptance. The role of healthcare professionals, primarily pharmacists, in shaping vaccine perceptions and behaviours should be at the forefront of this research.

Conclusion

Understanding the determinants of COVID-19 vaccine acceptance or refusal among the elderly is crucial to shaping impactful awareness campaigns and ensuring maximal vaccine uptake. These findings shed light on the pivotal factors affecting vaccination decisions among senior Lebanese citizens, underscoring the need to combat ageism and empower this demographic in making informed health choices. Central to this endeavour is the role of pharmacists, with their specialised education and community trust, in disseminating evidence-based information. By integrating pharmacists more prominently into awareness efforts and emphasising their unique position to offer personalised consultations, the authors can significantly enhance vaccine acceptance and, in turn, bolster these defences against infectious diseases.

Conflict of interest

The authors declare no conflict of interest.

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Appendix A: Factor analysis of the acceptance of COVID-19 vaccine use score

Promax rotated matrix	Factor	
	1	2
Vaccination decreases the risk of complications if I get the infection	0.785	
The vaccine will not prevent me from getting infected again but with less serious complications	0.676	
Vaccination decrease the risk of death from Corona virus infection	0.797	
I must take the vaccine because of my age	0.814	
I will get the vaccine because I miss having my children and grand-children home	0.780	
I do not have the choice to refuse getting the vaccine		0.618
I don't care if the rNA vaccine cause genetic damage , I am old anyway		0.597
I will get the vaccine because it is a national duty	0.740	
Vaccination is a good idea because it makes me feel less worried about catching the infection	0.782	

Appendix B: Hesitancy of COVID-19 vaccine use score

Promax rotated matrix	Factor
	1
I am not sure about the efficacy of the vaccine	0.830
I am afraid the vaccine will cause irreversible damage that will appear with time	0.813
I do not trust the vaccine; this is a conspiracy	0.709
I prefer the conventional vaccine, even if it is less effective	0.654
I am worried about the possible side-effects of the vaccine	0.846