



ORIGINAL ARTICLE

Acceptance of COVID-19 vaccines in patients with chronic diseases: A cross-sectional study

Ning Jiang RN, PhD, Research Assistant^{1,2}  | Pengfei Gu MA, Lecturer³ | Xian Sun RM, MA, Deputy Chief Physician⁴ | Hui Han RN, BA, Nurse in Charge⁵ | Wenwen Liu RN, BA, Senior Nurse⁶ | Na Song RN, BA, Nurse in Charge⁷ | Xiaolian Jiang RN, PhD, Professor¹ 

¹West China School of Nursing/West China Hospital, Sichuan University, Chengdu, China

²School of Nursing, Shandong First Medical University, Taian, China

³School of Foreign Languages, Shandong First Medical University, Taian, China

⁴Neurology Department, Tianjin Third Central Hospital, Tianjin, China

⁵Department of Gynecologic Oncology, Tai'an City Tumor Prevention Hospital, Taian, China

⁶Department of Respiratory Medicine, Joint Logistic Support Force of the People's Liberation Army, Taian, China

⁷Department of Hemodialysis, Joint Logistic Support Force of the People's Liberation Army, Taian, China

Correspondence

Xiaolian Jiang, West China School of Nursing/West China Hospital, Sichuan University, Chengdu 610041, Sichuan, China.
Email: jiangxiaolianhl@163.com

Na Song, Department of Hemodialysis, Joint Logistic Support Force of the People's Liberation Army, Tai'an Medical Area, 960th Hospital, Taian 271000, Shandong, China.
Email: na_song_1985@163.com

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Abstract

Aims and objectives: This study aimed to clarify the attitudes, knowledge and vaccination willingness of patients with chronic diseases toward COVID-19 vaccines and the influencing factors.

Background: Vaccination against COVID-19 is an important way to protect patients with chronic diseases, but the vaccination acceptance varies across diseases and populations. A better understanding of this condition will lead to tailored intervention strategies and high vaccination rates.

Design: Cross-sectional study.

Methods: Data were collected between March 2021 and May 2021 in China. A self-compiled questionnaire was used in the survey. Two independent-samples t-tests/one-way analysis of variance or *U* test/*H* test was used to measure the differences between groups. Multivariate regression analysis was used to identify the influencing factors. The study adhered to the EQUATOR checklist, STROBE.

Results: A total of 998 patients participated in the study. Score rates of attitudes, knowledge and vaccination willingness were 69.9%, 68.4% and 70.6% respectively. Age, vaccination status of family members, education levels, vaccine side effects and economic level were positive factors that could influence patients' vaccination acceptances, while time of illness, type of disease and political affiliations were negative predictors. The top reasons for willingness toward vaccination were supporting national strategies, belief on the vaccines and fearing of contracting COVID-19, while physical reasons, side effects and having a wait-and-see attitude were unwillingness factors.

Conclusions: Patients' attitudes, knowledge and vaccination willingness were medium. Nurses should pay attention to patients who are from lower socioeconomic backgrounds, under 30 or over 70 years old, have no political affiliations, have damage to vital organs, have a long course of illness, family members have not received COVID-19 vaccines and had no side effects after receiving other vaccines.

Relevance to clinical practice: Clinical nurses are recommended to take measures from patients' duration of illness, damaged organs, demographic characteristics and families to improve patients' vaccination acceptances.

KEYWORDS

attitudes, COVID-19 vaccines, knowledge, nursing, patients with chronic diseases, willingness

1 | INTRODUCTION

The COVID-19 pandemic has posed a great threat to global public health security. In this pandemic, people with chronic diseases have a much higher risk and mortality from COVID-19 than other populations (Boulle et al., 2021; Nikpouraghdam et al., 2020). Prophylactic vaccination against COVID-19 can effectively control the spread of the virus; therefore, the population's willingness to be vaccinated is key to achieving a high coverage rate (Williams et al., 2020). However, the influencing factors can also vary because of the particularity of the patients' physical conditions and the differences in different groups' willingness toward vaccination. This study investigated the attitudes, knowledge and willingness toward vaccination of patients with chronic diseases to clarify the current status of patients' acceptance of COVID-19 vaccines and the related influencing factors and to provide a basis for formulating strategies to increase the vaccination rate.

2 | BACKGROUND

At present, nine COVID-19 vaccines have been approved for use worldwide. As of 5 May 2021, more than 1.17 billion doses of COVID-19 vaccines have been administered (World Health Organization [WHO], 2021a, 2021b). Considering the limited supply of existing vaccines, WHO & United Nations Children's Fund (UNICEF) (2020) and European Centre for Disease Prevention and Control (ECDC) (2021) recommended the use of risk- and age-based methods to determine the priority populations for COVID-19 vaccination. They identified medical personnel as the top-priority population, followed by individuals with high medical risks, such as the elderly and patients with chronic diseases. Vaccination against COVID-19 is an important way to protect patients with chronic diseases (Kelkar et al., 2021). However, in recent years, the vaccination rate and the public's confidence in vaccines have continued to decline (Larson et al., 2016). In patients with chronic diseases, who are regarded as a high-risk group, the influenza vaccination rate is lower than 50%, which is much lower than the 75% target set by the WHO (Finney Rutten et al., 2021; Jorgensen et al., 2018). Williams et al. (2020) surveyed the elderly and patients with respiratory diseases in the United Kingdom and found that 86% of the respondents wanted to receive COVID-19 vaccines. This positively correlated with the severity of COVID-19 and negatively correlated with patients' perception that the media had excessively exaggerated the risk of the pandemic. The main influencing factors were personal health conditions, health consequences for others, concerns about vaccine safety and perceived severity of COVID-19 (Williams et al., 2020). The acceptance rate of COVID-19 vaccines for HIV patients

was 71.3%. Concerns about individual health, mandatory vaccination requirements and chronic diseases were positive influencing factors on the willingness toward vaccination; those who refused vaccination stated that they were worried about the side effects of the vaccine and assumed they already had immunity to COVID-19 (Vallée et al., 2021). The willingness to be vaccinated was 37%–60% in patients with rheumatic disorders, and 50% of patients with tumours was unsure whether they were willing to be vaccinated (Campochiaro et al., 2021; Ehrenstein et al., 2021). Kelkar et al. (2021) conducted a survey involving cancer patients and their caregivers and found that 71% was willing to receive a COVID-19 vaccine, 24% was unsure and 5% was unwilling (Kelkar et al., 2021). The vaccine acceptance rate among epilepsy patients was 46.6% (Puteikis & Mameniškienė, 2021). Olanipekun et al. (2021) conducted a survey on vaccine acceptance for patients of African descent with chronic diseases (hypertension, diabetes and heart failure) who had recovered from COVID-19. In the study, 30% of people expressed their willingness to receive a COVID-19 vaccine, 54% said they would not receive a COVID-19 vaccine and 16% was undecided. Other studies have shown that one-fifth of hemodialysis patients were unwilling to receive a COVID-19 vaccine (Garcia et al., 2021), whereas 80.9% of patients with multiple sclerosis was clearly willing or may be willing to receive a COVID-19 vaccine (Salavisa & Correia, 2021).

The main reasons for patients' unwillingness to get vaccinated were fear of adverse reactions (Campochiaro et al., 2021; Garcia et al., 2021; Kelkar et al., 2021; Puteikis & Mameniškienė, 2021), fear of disease deterioration (Campochiaro et al., 2021), interference with treatment (Kelkar et al., 2021), vaccine safety issues (Campochiaro et al., 2021; Garcia et al., 2021; Olanipekun et al., 2021), lack of effective information (Kelkar et al., 2021) and rapid vaccination development (Campochiaro et al., 2021). Higher education level (Campochiaro et al., 2021; Garcia et al., 2021), past history of flu vaccination (Campochiaro et al., 2021; Garcia et al., 2021; Puteikis & Mameniškienė, 2021), age over 45 years old (Garcia et al., 2021; Salavisa & Correia, 2021) and doctor's advice (Campochiaro et al., 2021; Kourlaba et al., 2021; Papa et al., 2021; Salavisa & Correia, 2021) were factors that promoted vaccination. On the basis of the above summary, we found that the willingness of patients with chronic diseases to be vaccinated varied and that the proportion of those patients who were unsure about being vaccinated (16%–50%) (Ehrenstein et al., 2021; Olanipekun et al., 2021) was significantly higher than that of the general population (Lin et al., 2020; Reiter et al., 2020). The factors that affected willingness toward vaccination were also different among patients with different diseases. Therefore, it is necessary to investigate the acceptance of vaccines in more chronic disease patients to clarify the correlation between different diseases and the willingness toward vaccination and its influencing factors.

3 | METHODS

The study methods were compliant with the STrengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist for cross-sectional studies (File S1).

3.1 | Design and setting

This study used a cross-sectional survey. Data were collected in general hospitals in mainland China between March 2021 and May 2021.

3.2 | Questionnaire and participants

3.2.1 | Questionnaire

This study used a self-compiled questionnaire titled "Attitudes, Knowledge and vaccination Willingness for the COVID-19 vaccine" (AKW). This questionnaire was developed using the COVID-19 Vaccine Technology Guide (first edition) issued by the National Health Commission of the People's Republic of China (China NHC) (2021), the Vaccine Explained series of the WHO featuring illustrated articles on vaccine development and distribution (2021), and the guiding principles for immunization activities during the COVID-19 pandemic from the Chinese Center for Disease Control and Prevention (China CDC) (2021), the New York State Department of Health (2021), and related literature (Lin et al., 2020; Qiao et al., 2020). This questionnaire consisted of four parts. The first part includes the questionnaire introduction and questions on the demographic data of the patient, including gender, age, nationality, educational level, political affiliations, occupation, high-risk profession, marital status, major diseased systems, duration of illness, place of residence, family economic conditions, history of travel to high-risk areas, basic information about family members, relationship and vaccine status of family members and side effects after receiving other vaccines (18 items). The remaining three parts are as follows: (1) The attitude part included the influences of COVID-19, risk perception, vaccine acceptance and concerns about the vaccine (11 items); the attitude dimension was scored on a 5-point Likert scale, and the total score was between 11–55 points. A higher total score indicated a more positive attitude. (2) The knowledge part included priority groups for vaccination, recommended age group for vaccination, correct methods, contraindications, adverse reactions, matters needing attention, herd immunity and objective item sources of acquired knowledge (nine items). ① The knowledge dimension included single- and multiple-choice questions and was scored according to the correct rate. Each correct answer to the single-choice questions is given a score of five, and each correct answer to the multiple-choice questions is given a score of 1; the total score was between 1–46 points. ② The objective item sources of acquired knowledge included mobile phone, TV, radio, network,

newspaper, school/enterprise, community, professionals, relatives/friends and others. (3) The vaccination willingness part included vaccine selection, vaccination form, duration of protection, willingness, reasons and vaccine prices (eight items). Vaccination willingness was scored on a six-point Likert scale. Two of these items were scored to determine the level of vaccination willingness. A higher score means higher willingness. The remaining items were objective indicators and were expressed as percentages.

Four experts were invited to review the questionnaire, including two professors in public health, a community-based nursing specialist in charge of vaccination, and a nursing education specialist. All of the experts have more than 15 years of professional experience and have senior professional titles. The content validity of the questionnaire was 0.98. Prior to the survey, 15 patients with chronic diseases were selected to test the acceptability of the scale. The patients indicated that the items of the AKW scale were clear and easy to understand. The Cronbach's alpha coefficient was 0.71 in patients.

3.2.2 | Participants

According to the purposive sampling method, patients with chronic diseases in three general hospitals in mainland China were selected as the research subjects. This questionnaire comprises three dimensions and 28 variables for statistical analysis; therefore, the required samples should be 10–20 times the number of variables (Wang, 1990). The minimum sample size for the current study was 280–560 patients. The inclusion criteria for patients were as follows: ① diagnosis of chronic disease, ② age ≥ 18 years old, ③ stable disease and ④ provision of informed consent and willingness to participate. The exclusion criteria were as follows: ① language and written communication disorders, ② cognitive or intellectual disorders and ③ prior vaccination against COVID-19. A total of 1132 patients were invited in this survey.

3.3 | Data collection

The survey team comprised six people, all of whom were registered nurses/doctors with more than 10 years of work experience. By using the convenience sampling method, the research team members first contacted the doctors/nurses working in the chronic disease departments that they were familiar with. After getting to know the basic information of the patients, the patients who met the sampling criteria were investigated. By using the method of snowball sampling, the doctors/nurses recommended other chronic disease departments that they were familiar with for further investigation. A total of 28 medical wards, including the respiratory department, neurology department, nephrology department, cardiology department, gastroenterology department, endocrinology department, and oncology department participated in the survey. A paper AKW questionnaire was used to conduct onsite surveys of hospitalised patients who met the inclusion criteria. After entering the

department, investigators first explained the purpose, significance and methods of the study to the patient and conducted the survey after obtaining the consent of the patient. The patients completed the questionnaire independently. For patients with reading difficulties, visual impairment or difficulty in writing, the investigators read the questions one by one in neutral, nonsuggestive language and assisted the patient in filling out the questionnaire. After the patient completed the questionnaire, the investigator checked whether the questionnaire was filled completely. If items were missing, the patient would fill them on the spot, and the questionnaire was returned after reverification. Similarly, questionable items were verified with the patient on the spot and then returned after verification.

3.4 | Ethical considerations

This study followed the biomedical ethics code and was approved by the ethics committee of a medical university. Before the survey, all participants signed a written informed consent form. During the survey, the privacy of the patients was protected, and their data were kept strictly confidential.

3.5 | Data analysis

SPSS software was used for statistical analysis. Attribute data were expressed by frequency distribution, and variable data were expressed as mean \pm SD. This study used the P-P graph and histogram to analyse the normality of the data. When the data were normally distributed, two independent-samples *t*-tests or one-way analysis of variance was used. If the data showed a skewed distribution, the Mann-Whitney *U* test or Kruskal-Wallis *H* test was used to measure the differences between different sociodemographic characteristic groups. Demographic data were used as independent variables to perform multivariate regression analysis to further clarify the factors that affected AKW. A $p < .05$ indicated statistical significance (two tailed).

4 | RESULTS

A total of 1,132 questionnaires were distributed, and 998 valid questionnaires were returned with a validity rate of 88.2%.

4.1 | Demographic characteristics

The ratio of men to women in this study was approximately 1:0.92. Among the subjects, 97.5% was Han Chinese, 71.3% was aged 40–69.9 years old and 44.9% had a high school degree or above. Most of the subjects were farmers (30.8%), followed by retired personnel (18.3%) and enterprise employees (15.6%). Furthermore, 90.2% was married/cohabiting. When divided by disease, 27.1% had diseases

in the urinary system (including nephrology), 21.3% in the digestive system (including liver disease and gastrointestinal tract disease), 13.2% in the respiratory system, 10.7% in the circulatory system, 9.4% in the reproductive system, 7.6% in the endocrine system, 5.3% in the nervous system, 1.9% in the head and face, 1.4% in the bone joints and skin and 1.3% in the blood. Furthermore, 0.7% had rheumatic and immune disorders. Most patients had suffered from the disease for 1–9.9 years (74.5%), had a moderate economic level (66.6%), had never been to medium- and high-risk areas (98.2%) and had good family relations (75.3%). The majority of them had fewer than three family members over the age of 60 and under 18 years old (87%), and the ratio of urban/rural residents among them was 1:0.92. Among the subjects, 9.6% of them had family members who were engaged in medical professions, and 28.7% of them had family members who had been vaccinated against COVID-19. Table 1 shows the results.

4.2 | Scoring

According to the normality analysis of the P-P graph and the histogram of the AKW score, the dimensions of knowledge and vaccination willingness showed a skewed distribution, and the attitudes and total scores were normally distributed. Therefore, the data on knowledge and willingness were described by the medians and other dimensions by mean \pm SD.

4.2.1 | Scoring of attitudes and knowledge

The average score of the attitude was 38.47 ± 5.8 , and the score rate was 69.9%. Most patients believed that their potential infection with COVID-19 could have a significant effect not only on their own bodies (81%) but also on the people around them or the environment (85.2%). They believed that the epidemic in China will not be repeated and that the risk of contracting COVID-19 is low. The knowledge dimension score rate was 68.4%, and the top three items with the highest score rates were “priority populations for vaccination” (84.4%), “contraindications for vaccination” (82.5%) and “matters needing attention” (78.8%). The top three items with the lowest score rates were “correct vaccination methods” (49.7%), “herd immunity” (57%) and “familiarity with COVID-19 vaccine-related knowledge” (59.7%).

4.2.2 | Scoring of willingness and vaccination choices

The score rate of vaccination willingness was 70.6%, and 88.6% of patients clearly expressed their willingness to receive a COVID-19 vaccine. The top three reasons for being willing to receive vaccination were supporting national strategies (86.9%), believing that vaccination can produce effective antibodies (52%) and worrying about

TABLE 1 Demographics, univariate and multivariate analyses of factors associated with patients' attitudes, knowledge and willingness toward COVID-19 vaccines (N = 998)

Variable	Attitudes				Knowledge				Willingness				Total scale						
	N (%)	M (SD)	t/F	p	β	Scoring rate	Z/H	p	β	Scoring rate	Z/H	p	β	M (SD)	t/F	p	β		
Gender																			
Male	519 (52)	38.00 (5.95)	-2.68	0.008		67.9%	-1.34	0.18		70.9%	-0.78	0.44		77.75 (11.13)	-2.05	0.04			
Female	479 (48)	38.98 (5.59)			69%					70.2%				79.15 (10.51)					
Age (years old)																			
18-29.9	38 (3.8)	38.21 (5.65)	3.71	0.002	0.12**	65.6%	39.77	<0.001		74.6%	9.77	0.08		77.32 (12.20)	10.41	<0.001	0.08*		
30-39.9	118 (11.8)	38.17 (5.37)			73.1%					69%				80.06 (9.33)					
40-49.9	213 (21.3)	39.49 (5.73)			71.9%					70.1%				80.95 (10.29)					
50-59.9	287 (28.8)	38.69 (5.72)			69.8%					72%				79.45 (10.12)					
60-69.9	212 (21.2)	38.38 (6.07)			65.5%					69.5%				76.86 (11.03)					
≥70	130 (13)	36.79 (5.74)			61.2%					70.3%				73.38 (11.97)					
Nationality																			
Han	973 (97.5)	38.46 (5.82)	-0.15	0.88		68.4%	-0.11	0.91		70.6%	-0.17	0.87		78.42 (10.89)	0.01	0.99	0.07*		
Others	25 (2.5)	38.64 (4.79)			68.6%					68.3%				78.40 (9.40)					
Education level																			
Primary school and below	227 (22.7)	38.51 (6.23)	0.20	0.89		63.5%	43.27	<0.001	0.18**	71.6%	6.49	0.09		76.31 (12.25)	10.51	<0.001	0.16**		
Junior high school	323 (32.4)	38.30 (6.17)			68.4%					69.7%				78.14 (10.74)					
High school	168 (16.8)	38.42 (5.74)			66.4%					67.7%				77.08 (10.14)					
College degree and above	280 (28.1)	38.66 (4.99)			73.7%					72.5%				81.27 (9.58)					
Political affiliations																			
Party member	139 (13.9)	37.49 (5.45)	3.85	0.02		71.4%	11.17	0.004		72.5%	5.00	0.08		79.04 (10.36)	3.92	0.02			
League member	24 (2.4)	40.67 (5.86)			75.1%					75%				84.21 (9.99)					
Other	835 (83.7)	38.57 (5.83)			67.8%					70.1%				78.15 (10.92)					
Occupation																			
Student	14 (1.4)	36.64 (8.08)	1.70	0.08		67.2%	62.63	<0.001		71.4%	11.98	0.29		76.14 (17.20)	4.52	<0.001			
Farmer	307 (30.8)	38.93 (6.40)			65.5%					72.1%				77.72 (11.68)					
Migrant worker	52 (5.2)	40.35 (6.40)			71.7%					73.6%				82.17 (9.89)					
Enterprise employee	156 (15.6)	39.02 (5.67)			73.4%					70.1%				81.19 (9.90)					
Medical staff	34 (3.4)	37.71 (4.98)			79.9%					70.1%				82.88 (8.33)					

(Continues)

TABLE 1 (Continued)

Variable	Attitudes				Knowledge				Willingness				Total scale				
	N (%)	M (SD)	t/F	p	β	Scoring rate	Z/H	p	β	Scoring rate	Z/H	p	β	M (SD)	t/F	p	β
Civil servant	17 (1.7)	38.00 (6.30)				75.8%				77.9%				82.24 (8.99)			
Public institution personnel	51 (5.1)	37.31 (4.63)				72.6%				69.9%				79.10 (9.76)			
The self-employed	72 (7.2)	38.29 (6.34)				65.1%				71.2%				76.78 (9.67)			
Military personnel	28 (2.8)	37.93 (4.28)				75.6%				72.3%				81.39 (8.23)			
Retiree	183 (18.3)	37.77 (4.67)				67.2%				68.4%				76.87 (10.12)			
The unemployed	84 (8.4)	37.83 (5.64)				62.8%				66.7%				74.70 (11.55)			
High-risk profession																	
Yes	42 (4.2)	39.48 (5.69)	1.15	0.25		78.7%	-4.08	<0.001		74.2%	-1.62	0.11		84.57 (10.29)	3.78	<0.001	
No	956 (95.8)	38.42 (5.80)				68%				70.4%				78.15 (10.80)			
Marital status																	
Unmarried	46 (4.6)	38.37 (5.77)	1.51	0.22		69.6%	11.30	0.004		70.8%	2.30	0.32		78.89 (11.64)	8.02	<0.001	
Married/cohabiting	900 (90.2)	38.55 (5.80)				68.9%				70.7%				78.73 (10.65)			
Divorced/widowed	52 (5.2)	37.12 (5.83)				59.5%				67.6%				72.60 (12.09)			
The major diseased systems																	
Rheumatic immune system	7 (0.7)	38.71 (7.41)	8.45	<0.001		78%	20.04	0.03		64.3%	40.35	<0.001		82.29 (8.56)	4.16	<0.001	
Head and face	19 (1.9)	41.11 (5.13)				64%				76.8%				79.74 (9.39)			
Digestive system	213 (21.3)	38.64 (5.27)				70.3%				72.7%				79.69 (10.20)			
Circulatory system	107 (10.7)	37.51 (5.36)				68.4%				68.5%				77.20 (11.68)			-0.09*
Respiratory system	132 (13.2)	38.50 (5.47)				66.3%				73%				77.74 (11.29)			
Endocrine system	76 (7.6)	37.22 (5.89)				71.3%				71.5%				78.58 (11.01)			
Blood system	13 (1.3)	38.08 (5.24)				71.1%				70.5%				79.23 (8.87)			
Bone and skin	14 (1.4)	37.86 (5.46)				73.9%				74.4%				80.79 (11.33)			
Nervous system	53 (5.3)	38.32 (6.26)				63.2%				70.9%				75.89 (10.99)			-0.08*

TABLE 1 (Continued)

Variable	Attitudes				Knowledge				Willingness				Total scale				
	N (%)	M (SD)	t/F	p	β	Scoring rate	Z/H	p	β	Scoring rate	Z/H	p	β	M (SD)	t/F	p	β
Reproductive system and breast	94 (9.4)	43.01 (6.20)			0.19**	68.7%				75.7%				83.69 (10.29)			0.11**
Urinary system	270 (27.1)	37.34 (5.55)			-0.09*	67.9%				66%				76.50 (10.50)			-0.13**
Duration of illness																	
<1 year	46 (4.6)	37.98 (6.58)	5.32	<0.001	-0.13**	67.2%	0.50	0.97		71.7%	24.77	<0.001	-0.09**	77.52 (10.74)	4.44	0.001	-0.1**
1-9 years	744 (74.5)	38.92 (5.80)				68.8%				72%				79.18 (10.55)			
10-19 years	159 (15.9)	37.25 (5.28)				68.1%				64.9%				76.35 (11.33)			
20-29 years	35 (3.5)	36.43 (5.73)				67.1%				68.3%				75.51 (10.86)			
≥30 years	14 (1.4)	35.07 (4.98)				63.5%				62.5%				71.79 (15.56)			
Place of residence																	
Urban	520 (52.1)	38.49 (5.74)	0.12	0.90		70%	-3.31	0.001		70.7%	-0.39	0.70		79.15 (10.25)	2.22	0.03	
Rural	478 (47.9)	38.44 (5.87)				66.8%				70.5%				77.62 (11.43)			
Family economic conditions																	
Good	163 (16.3)	38.67 (6.36)	0.76	0.47		69.8%	24.18	<0.001		73.1%	17.14	<0.001	0.08*	79.55 (10.59)	12.71	<0.001	
Medium	665 (66.6)	38.54 (5.72)				69.6%				71.2%				79.11 (10.66)			
Poor	170 (17)	37.98 (5.54)				62.6%				65.9%				74.66 (11.12)			
Travelling to above medium risk areas in the past six months																	
Yes	18 (1.8)	38.72 (6.22)	0.19	0.85		67.5%	-0.35	0.73		74.5%	-1.99	0.047		78.72 (11.52)	0.12	0.91	
No	980 (98.2)	38.46 (5.79)				68.5%				70.5%				78.42 (10.85)			
Total number of family members aged over 60 and under 18																	
0-1	344 (34.5)	38.28 (5.33)	1.63	0.18		70.3%	15.62	0.001		69.1%	7.32	0.06		78.93 (10.06)	3.16	0.02	
2-3	524 (52.5)	38.33 (6.07)				66.9%				71.7%				77.71 (11.32)			
4-5	117 (11.7)	39.55 (5.86)				70.8%				70.2%				80.55 (10.94)			
≥6	13 (1.3)	39.15 (5.54)				58.9%				66.7%				74.23 (7.66)			
Family members engaged in the medical profession																	
No	902 (90.4)	38.48 (5.83)	0.20	0.84		67.9%	-3.37	0.001		70.6%	-0.19	0.85		78.19 (10.69)	-2.07	0.04	
Yes	96 (9.6)	38.35 (5.51)				73.4%				70.7%				80.59 (12.14)			
The relationship between family members																	
Good	751 (75.3)	38.58 (5.62)	1.03	0.36		69.9%	24.02	<0.001		71.3%	5.68	0.06		79.29 (10.53)	10.24	<0.001	
Medium	226 (22.6)	38.24 (6.34)				64.1%				68.4%				75.91 (11.40)			
Poor	21 (2.1)	36.95 (6.00)				62.8%				69.8%				74.24 (11.59)			

(Continues)

TABLE 1 (Continued)

Variable	Attitudes				Knowledge				Willingness				Total scale			
	N (%)	M (SD)	t/F	β	Scoring rate	Z/H	p	β	Scoring rate	Z/H	p	β	M (SD)	t/F	p	β
Family members received the COVID-19 vaccine																
Yes	286 (28.7)	39.13 (5.59)	2.30	0.02	72%	-4.51	<0.001	0.1**	72.6%	-2.46	0.01	0.09*	80.99 (10.74)	4.79	<0.001	0.12**
No	712 (71.3)	38.20 (5.86)			67%				69.7%				77.39 (10.73)			
Family members had side effects after receiving other vaccines																
Yes	19 (1.9)	37.89 (6.25)	-0.43	0.66	79.3%	-2.89	0.004	0.08*	81.1%	-2.96	0.003	0.1**	84.11 (7.13)	3.46	0.002	0.08*
No	979 (98.1)	38.48 (5.79)			68.2%				70.4%				78.31 (10.89)			

Note: (Multivariate regression analysis was carried out after normalizing knowledge and willingness scores.)

* $p < .05$, ** $p < .01$.

being infected with COVID-19 (47.6%). The top three reasons for unwillingness to be vaccinated were physical reasons (44.5%), worrying about vaccine side effects (35.8%) and having a wait-and-see attitude toward the effect of vaccination in others (33.8%). In terms of vaccine selection, patients were more willing to choose domestic vaccines (65.1%). They hoped that communities could organise collective vaccination (59.7%) and that the protection period of the vaccine would be more than 10 years (52.8%). If the vaccine would not be given for free, only 58.5% of patients were willing to be vaccinated, but most patients (80.1%) would accept a price within 100 RMB¥ (about 15.5 US\$) for the vaccine. The main methods to obtain information on COVID-19 vaccines involved television (78.1%), mobile phones (77%) and community (42.3%). Table 2 and Figure 1 show the results.

4.3 | Differences between groups and influencing factors

Demographic characteristics, diseases and family factors were used as grouping variables to analyse the differences between groups. Given that knowledge and willingness showed a skewed distribution, the *U* test or *H* test was used. Attitudes and total scales were normally distributed, and *t*-test or analysis of variance was used.

4.3.1 | Attitudes

As seen from the statistical results, there were statistically significant differences in the attitude scores of patients with different genders, ages, political affiliations, diseases, duration of illness and vaccination status of family members against COVID-19. Female participants had more positive attitudes toward vaccines than male participants (female vs. male: 38.98 vs. 38 respectively). Elderly patients had a significantly lower attitude than other age groups (≥ 70 years old vs. 18–29.9, 30–39.9, 40–49.9, 50–59.9, and 60–69.9 years old: 36.79 vs. 38.21, 38.17, 39.49, 38.69, and 38.38 respectively). In terms of disease type, the low-ranked diseases were endocrine system illness (37.22), urinary system (37.34), circulatory system (37.51) and bone and skin (37.86). The top-ranked diseases were reproductive system illness (43.01), head and face (41.11), rheumatic immune system (38.71) and digestive system diseases (38.64). The attitudes' scores of patients with more than 1 year of disease decreased with the prolongation of disease course. Patients with family members having received the COVID-19 vaccine scored higher than another group (yes vs. no: 39.13 vs. 38.2).

4.3.2 | Knowledge

In terms of knowledge, there were differences between patients with different ages, education levels, political status, occupations, high-risk profession, marital status, types of diseases, places of

TABLE 2 Patients' scores of attitudes, knowledge and vaccination willingness (N = 998)

Dimension	Item	Score range	Mean (SD)	P50 (P25, P75)	Scoring rate (%)
Attitudes		11–55	38.47 (5.80)		69.9
	Do you think that contracting COVID-19 has a significant impact on your health?	1–5	4.05 (1.18)		81
	Do you think it will affect the people around you or the environment if you get COVID-19?	1–5	4.26 (0.96)		85.2
	Do you think the current pandemic is serious?	1–5	3.25 (1.09)		65.1
	Do you think the pandemic will recur in China?	1–5	2.86 (1.16)		57.3
	How much has the pandemic affected your life in the past 6 months?	1–5	3.37 (1.07)		67.4
	How much will the pandemic affect your life in the next 6 months?	1–5	2.88 (1.00)		57.7
	Do you think you are at high risk of contracting COVID-19?	1–5	2.79 (1.10)		55.9
	Do you think that you can get prevention from COVID-19 by vaccination?	1–5	3.89 (0.78)		77.8
	Do you think that COVID-19 vaccines available on the market are safe?	1–5	3.78 (0.78)		75.7
	Do you think that the vaccine is effective?	1–5	3.82 (0.77)		76.5
How much do you care about vaccine-related information?	1–5	3.49 (1.04)		69.8	
Knowledge		1–46		32 (26, 38)	68.4
	Which are the priority groups for vaccination?	0–8		8 (6, 8)	84.4
	What is the recommended age group for the vaccination?	0/5		4 (4, 4)	74.7
	What are the correct methods of vaccination?	0–8		3 (2, 6)	49.7
	What are the contraindications for the vaccine?	0–5		5 (4, 5)	82.5
	Regarding adverse reactions to vaccination, which of the following statements are true?	0–5		3(2, 4)	62.5
	Matters needing attention	0–5		5(3, 5)	78.8
	How can herd immunity be achieved through vaccination?	0/5		5 (0, 5)	57
In general, how familiar are you with the COVID-19 vaccine?	1–5		3 (2, 4)	59.7	
Vaccination willingness		2–12		9 (7, 10)	70.6
	Do you want to be vaccinated against COVID-19?	1–6		5 (4, 5)	78.2
	Would you be willing to receive the COVID-19 vaccine if you are charged for it in the future?	1–6		4 (3, 5)	62.9
Total scale		14–113	78.42 (10.85)		69.4

residences, economic levels, number of family members >60 and <18 years old, family members engaged/not engaged in medical professions, good/poor family relations and family members who had been vaccinated against COVID-19. After the age of 30, the degree of knowledge mastery gradually decreased. However, higher education levels led to a gradual increase in knowledge regarding the vaccine. Patients having no political affiliations had lower attitudes than Party members and League members (having no political affiliations vs. Party members and League members: 67.8% vs. 71.4% and 75.1%), patients with stable jobs scored higher than those of patients with other occupations (medical staff, civil servant and public

institution personnel vs. unemployed, self-employed and farmers: 79.9%, 75.8% and 72.6% vs. 62.8%, 65.1% and 65.5%), patients in high-risk occupations had better vaccination knowledge (high-risk occupation vs. non-high-risk occupation: 78.7% vs. 68%), divorced/widowed patients had significantly lower knowledge mastery levels than the married and unmarried groups (divorced/widowed vs. married/cohabiting and unmarried: 59.5% vs. 68.9% and 69.6%) and patients with poor family economic level had a significantly lower knowledge mastery level than patients with medium and good family economic levels (poor vs. good and medium: 62.6% vs. 69.8% and 69.6%). Patients whose family members were engaged in medical

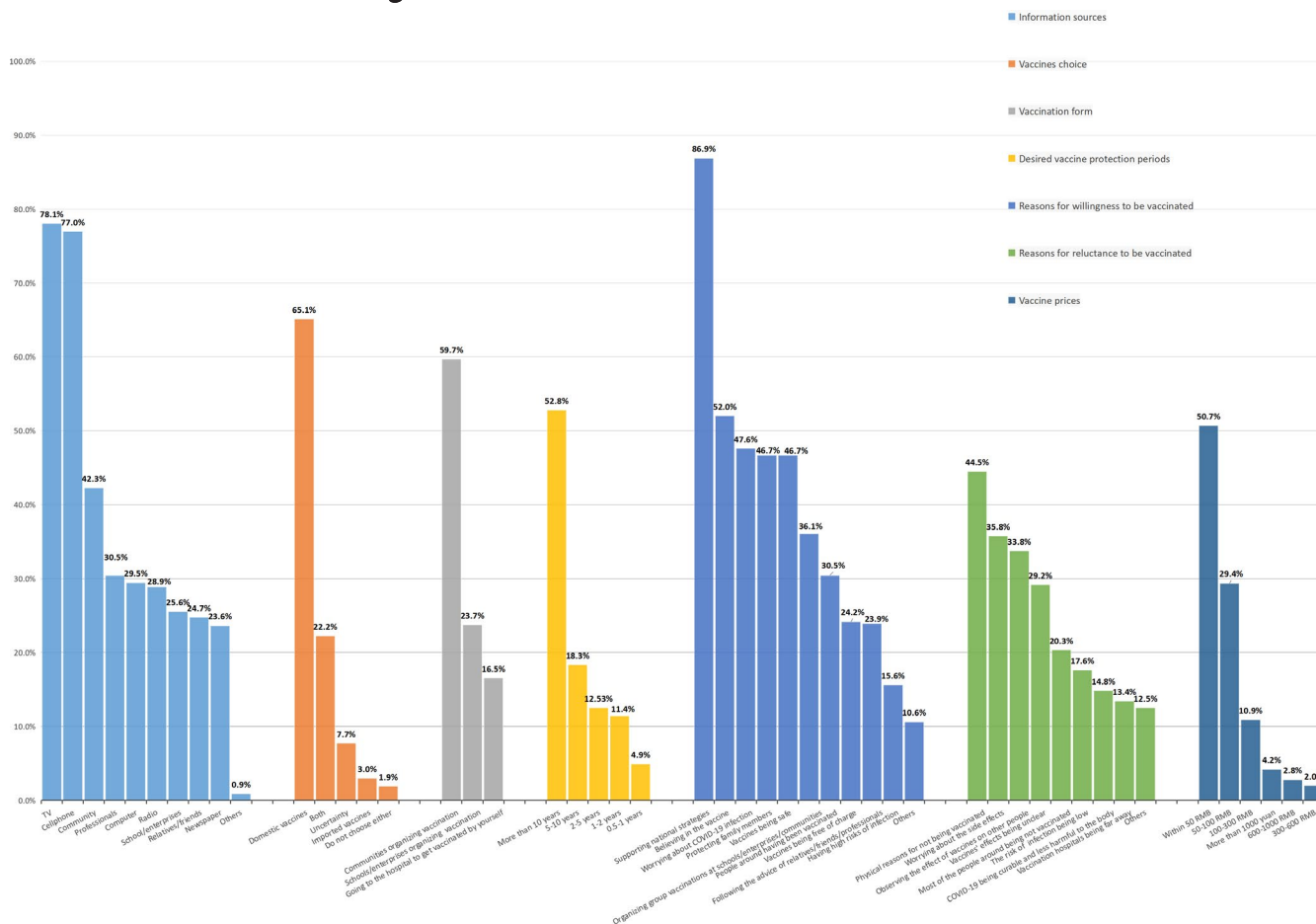


FIGURE 1 Information sources, Vaccines choice, Vaccination form, Desired vaccine protection periods, Reasons for willingness and reluctance to be vaccinated, Vaccine prices

professions scored significantly higher (yes vs. no: 73.4% vs. 67.9%) and patients with family members having received the COVID-19 vaccine and having side effects after receiving other vaccines had higher scores in knowledge.

4.3.3 | Willingness

In terms of willingness to be vaccinated, the differences in scores between the groups were statistically significant when the following were used as grouping variables: type of illness, time of illness and economic level, whether they had been to medium- and high-risk areas in the past six months, whether family members had been vaccinated and whether there were vaccine side effects. The low-ranked patients in terms of willingness toward vaccination were patients with diseases in the blood system (70.5%), circulatory system (68.5%) and urinary system (66%) and had rheumatic and immune disorders (64.3%). The top-ranked patients in terms of willingness to be vaccinated were patients with diseases of the head and face (76.8%), reproductive system (75.7%), bone and skin (74.4%) and respiratory system (73%). As the time of illness increased, the willingness toward vaccination of patients with different durations of

illness fluctuated. The willingness toward vaccination of patients with medium and high economic levels was significantly higher than that of patients with low economic levels (medium and high vs. low: 71.2% and 73.1% vs. 65.9%), patients who had been to medium- and high-risk areas in the past six months were more willing to be vaccinated (yes vs. no: 74.5% vs. 70.5%). Like knowledge scores, patients whose family members had received the COVID-19 vaccine and had side effects after receiving other vaccines also scored higher in willingness.

4.3.4 | Correlation analysis

The results of the correlation analysis showed that age, type of disease, and duration of illness were significant factors that influence attitudes. Among these factors, age was positive predictors of attitudes. The main factors affecting knowledge were education levels, disease types, vaccination status of family members against COVID-19 and vaccine side effects. Among them, education levels, vaccination status of family members against COVID-19 and vaccine side effects were important positive predictors of knowledge. The significant influencing factors of willingness toward vaccination

included political affiliations, type of disease, time of illness, economic level, vaccination status of family members against COVID-19 and vaccine side effects. Table 1 shows the results.

5 | DISCUSSION

In this study, we developed an AKW questionnaire via literature review and expert consultation. The content validity of the scale was 0.98, and Cronbach's alpha coefficient was 0.71. This indicated that the questionnaire was reliable.

5.1 | Demographic factors

In this study, male and female patients had significantly different attitudes toward vaccines. Women tend to have a more positive attitude toward COVID-19 vaccines. Their perception of individual diseases, health beliefs and vaccination willingness was significantly higher than that of men (Krawczyk et al., 2012). However, an uncomfortable experience with a previous vaccination was an important factor that affected women's willingness toward vaccination (Jamal et al., 2020). Xiao et al. (2005) indicated that vaccination willingness was consistent with 56% of the adverse reactions caused by influenza vaccinations. In this study, age was a significant influencing factor of vaccination knowledge, and this finding was consistent with the existing result (Yang et al., 2021). Furthermore, the degree of knowledge mastery gradually decreased with age. Although patients aged 18–29.9 years old were the youngest group in this study, their degree of knowledge mastery was not high. This may be because patients in this age group had suffered from their disease for less than three years and had obvious feelings of illness anxiety, in addition to the fact that the illness itself had a significant effect on their daily lives. So, they paid little attention to vaccine information. Similarly, patients ≥ 70 years of age had the lowest attitudes and knowledge among the groups. Although other studies have shown that the elderly are more willing to be vaccinated (Kabamba Nzaji et al., 2020; Shaw et al., 2021; Unroe et al., 2021), this study found that the willingness of elderly patients to be vaccinated was only moderate. Nurses should pay more attention to these two age groups to increase their vaccine acceptance.

In this study, patients with formal occupations, such as medical personnel, civil servants, enterprise employees and public institution personnel, have higher knowledge and total scores, whereas patients with relatively unstable occupations have lower scores. This is different from the study of Dorman et al. (2021). On one hand, patients with formal occupations had better education levels, which had obvious advantages in accepting new knowledge (Al-Mohaithef & Padhi, 2020). China is now vigorously pursuing a COVID-19 vaccination policy. Compared with the private sector, the public sector has a significantly more strengthened advocacy of the vaccine; therefore, patients who work in the public sector have higher scores. In the same way, patients with formal occupations had relatively higher income levels and stability. This was similar to the statistical

results for "family economic level." With increasing economic level, the vaccination knowledge, willingness, and total score of patients increased significantly. Patients with better economic conditions had a higher acceptance of the COVID-19 vaccine (Harapan et al., 2020). However, Liu et al. (2021) showed that high-income groups were more willing to accept paid vaccines than free vaccines. Follow-up studies should include a larger sample size and further analyse this point of contradiction to find the exact cause.

5.2 | Patients with different diseases

By using this survey, we identified that patients with chronic diseases had medium attitudes and knowledge mastery regarding COVID-19 vaccines, and their willingness to be vaccinated was relatively high. Only 4.5% of patients was unsure of COVID-19 vaccination, which showed that patients were very clear about their personal willingness toward vaccination and were willing to be vaccinated. This differed from other studies (Campochiaro et al., 2021; Ehrenstein et al., 2021; Kelkar et al., 2021; Vallée et al., 2021). After analysing the acceptance of COVID-19 vaccines in patients with different diseases, we found that patients suffering from diseases in nonvital organs or having mild illnesses (e.g. the head and face, reproductive system, bone and skin and respiratory system) had good acceptances of vaccines. By contrast, patients with lower acceptances were those with diseases of vital organs. On one hand, for patients with diseases in nonvital organs, their acceptances of COVID-19 vaccines were less impacted by the disease. On the other hand, given that the circulatory system, nervous system and respiratory system are important systems of the human body and that some patients were seriously ill. Many patients were concerned about whether certain components of the vaccine would increase the burden on the already damaged organs during the metabolic process or whether certain components of the vaccine could not be excreted from the body, which might worsen their conditions (Garcia et al., 2021). Both the primary disease and uncertainty about the vaccine composition may be the reasons affecting patients' acceptances of vaccines. In response to the situation, R&D departments should strengthen research on the metabolism of vaccine components in the body and develop a special monitoring report for populations with chronic diseases. Nurses are the most trusted group during the pandemic. If they have good knowledge of vaccines, they can provide patients with correct information on vaccines and increase the willingness of patients to be vaccinated (Kourlaba et al., 2021; Shaw et al., 2021). It is recommended that hospital administrators assess the level of knowledge mastery of nurses regarding COVID-19 vaccines and conduct targeted training to remedy any gaps in knowledge.

5.3 | Duration of illness

The duration of illness was an important factor that influenced the attitude and willingness toward COVID-19 vaccination. Udell

et al. (2013) found that early vaccination can help patients maintain stable health. However, in this study, we found that the acceptance of patients who had suffered from disease for more than one year exhibited a downward trend with increasing duration of illness. This is a question worthy of deep consideration. As the course of an illness progresses, disease recurrence and the emergence of complications could cause a patient to experience negative emotions toward medical practice, including fear, anger and anxiety (Vinaccia & Orozco, 2005). Certain diseases, such as cancer, not only cause physical changes but also financial difficulties, thus changing people's self-perception and affecting their relations with family and friends (Kimmel, 2001). Owing to psychological and economic conditions and the occurrence of complications, patients with a long course of illness during a pandemic may pay more attention to their own health status and take a wait-and-see attitude toward COVID-19 vaccines, which have only just been released. Similar to patients with a long course of illness, patients surveyed within one year of illness onset also scored lower in attitude and knowledge. This may be due to the fact that the patient had just recently acquired the disease and suffered from physical discomfort and anxiety; therefore, he/she may have not paid much attention to the vaccine. On the other hand, vaccination programmes in China require making an appointment in advance with the community and filling in a detailed declaration of physical condition. However, disease stigma (Dicker et al., 2020; Hatipoğlu & Aboussouan, 2014) might make patients reluctant to expose their disease to the community staff, thus resulting in a negative attitude.

It is worth mentioning that, in patients with 10–19.9 years of illness, their willingness to be vaccinated significantly decreased. Among the 159 patients in this group, 73% was over 50 years old and 76.7% had damage in the vital organs (liver, kidney and cardiovascular system). The proportion of the elderly and the damage rate of vital organs in this group were higher than those in other groups. Previous studies have shown that the elderly had a higher willingness to be vaccinated against COVID-19 (Malik et al., 2020; Yoda & Katsuyama, 2021); therefore, the decline in the willingness in this study might be related to the damage of vital organs. The current guidelines stipulate that people with chronic diseases that are well-controlled by drugs and have stable health conditions can be vaccinated. Nurses are the most important influencers in decisions concerning vaccination (Kwok et al., 2021), and the strong recommendations of nurses can enhance public and personal support for COVID-19 vaccines.

5.4 | Family factors

This study found that family was an important factor affecting the vaccine acceptance of patients. Elderly people who are over 60 years of age and children, who are in the growth period, are highly susceptible to COVID-19, and serious complications may occur if they are infected (Oliver & Wood, 2014). Owing to the disease, patients need

to go in and out of the hospital frequently even during a pandemic, thus increasing their risk of contracting COVID-19. Therefore, the proportion of people who were willing to be vaccinated to protect family members from being infected increased (46.7%), and this finding agrees with the results of existing research (Bell et al., 2020). We found that the knowledge and attitude scores of patients were the highest when the number of family members over 60 and under 18 years old was 4–5, and the willingness to be vaccinated was strongest when this number was 2–3. We posit that when there were less than two disadvantaged members in the family, patients might not worry about the effects of COVID-19; when there were more than five such members, it would result in too much energy being spent trying to care for the disadvantaged members and might prevent patients from paying attention to vaccine news and information. In this study, patients having family members who were previously vaccinated with the COVID-19 vaccine and who showed side effects after receiving other vaccines were significant factors that influenced knowledge, willingness and total scales. The vaccination rate for family members in this study was 28.7%, which was higher than the current vaccination level in China (China NHC, 2021), and the side effect rate was lower than 6%, which was at the low level of current adverse reaction rates (Baden et al., 2021; China CDC, 2021). The positive effects driven by family members may be the reason for the improvements in patients' acceptance of COVID-19 vaccines.

6 | ADVANTAGES AND LIMITATIONS

Owing to the pandemic, most studies on the acceptance of COVID-19 vaccines were online surveys. Given the limitations of internet access and the particularities of the patients' physical conditions, this survey method might limit the participation of some populations with low incomes, low education levels, elderly age and frail bodies. This study was an onsite survey conducted by clinical nurses. Face-to-face communication between nurses and patients can allow elderly patients with low literacy levels or advanced age to complete the questionnaire, allow for an assessment of the completeness of the questionnaire and allow the surveyors to provide timely feedback to patients regarding uncertainties in the questions, thus improving the effective response rate of the questionnaire. However, given that this study mainly collected patient data in large general hospitals, caution needs to be exercised when promoting the results, and future surveys should be conducted in primary hospitals and specialised hospitals.

7 | CONCLUSION

Vaccines are an important means to prevent the spread of COVID-19, but the vaccine acceptance for patients with chronic diseases may be affected by factors such as age, education level, disease, economy and family. This survey found that the patients' attitudes,

knowledge and willingness to be vaccinated were medium. As healthcare providers, nurses should pass on correct vaccine knowledge to patients, help patients view the COVID-19 vaccine in a positive manner. Findings of this study could add important information about patients' acceptance of COVID-19 vaccines, which serves as a scientific foundation for nurses to optimise the pandemic medical education and clinical decision-making.

8 | RELEVANCE TO CLINICAL PRACTICE

Patients with chronic diseases are the key protection group for COVID-19 prevention and control. However, patients' acceptance of vaccines varies due to many reasons. As an important group closely related to patients' health, clinical nurses should not only look for the factors affecting patients' vaccination willingness from patients' physical conditions and demographic characteristics, but also from the perspective of families. At the same time, nurses should be alert to the fact that certain groups of patients who are male, under 30 and over 70 years old, have low education levels, have unstable jobs, have poor family relations, have no political affiliations, are suffering from damage to vital organs, have a long course of illness, have low income levels, family members have not received COVID-19 vaccines and had no side effects after receiving other vaccines, are more likely to have poor acceptances of COVID-19 vaccines. Nurses should take targeted measures to improve vaccine acceptance in these patients.

ACKNOWLEDGEMENTS

Our thanks should go to all patients in this survey for their time and sharing their experiences.

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTIONS

Ning Jiang: Conception and design, acquisition of data, analysis of data, drafting the article and final approval of the version. Pengfei Gu: Analysis of data, revising the article and final approval of the version. Xian Sun: Acquisition of data, revising the article and final approval of the version. Hui Han: Acquisition of data and final approval of the version. Wenwen Liu: Acquisition of data and final approval of the version. Na Song: Acquisition of data, supervision and final approval of the version. Xiaolian Jiang: Conception, acquisition of data, supervision and final approval of the version.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Ning Jiang  <https://orcid.org/0000-0003-3620-1456>

Xiaolian Jiang  <https://orcid.org/0000-0001-9129-0012>

REFERENCES

- Al-Mohaithef, M., & Padhi, B. K. (2020). Determinants of COVID-19 vaccine acceptance in Saudi Arabia: A web-based national survey. *Journal of Multidisciplinary Healthcare*, 13, 1657–1663. <https://doi.org/10.2147/JMDH.S276771>
- Baden, L. R., El Sahly, H. M., Essink, B., Kotloff, K., Frey, S., Novak, R., Diemert, D., Spector, S. A., Roupheal, N., Creech, C. B., Mcgettigan, J., Khetan, S., Segall, N., Solis, J., Brosz, A., Fierro, C., Schwartz, H., Neuzil, K., Corey, L., ... COVE Study Group (2021). Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. *The New England Journal of Medicine*, 384(5), 403–416. <https://doi.org/10.1056/NEJMoa2035389>
- Bell, S., Clarke, R., Mounier-Jack, S., Walker, J. L., & Paterson, P. (2020). Parents' and guardians' views on the acceptability of a future COVID-19 vaccine: A multi-methods study in England. *Vaccine*, 38(49), 7789–7798. <https://doi.org/10.1016/j.vaccine.2020.10.027>
- Boulle, A., Davies, M. A., Hussey, H., Ismail, M., Morden, E., Vundle, Z., Zweigenthal, V., Mahomed, H., Paleker, M., Pienaar, D., Tembo, Y., Lawrence, C., Isaacs, W., Mathema, H., Allen, D., Allie, T., Bam, J. L., Buddiga, K., Dane, P., Heekes, A., ... Tamuhla, T. (2021). Risk factors for coronavirus disease 2019 (COVID-19) death in a population cohort study from the Western Cape province, South Africa. *Clinical Infectious Diseases*, 73(7), e2005–e2015. <https://doi.org/10.1093/cid/ciaa1198>
- Campochiaro, C., Trignani, G., Tomelleri, A., Cascinu, S., & Dagna, L. (2021). Potential acceptance of COVID-19 vaccine in rheumatological patients: A monocentric comparative survey. *Annals of the Rheumatic Diseases*, 80(6), 816–817. <https://doi.org/10.1136/annrheumdis-2020-219811>
- Chinese Center for Disease Control and Prevention (China CDC). (2021). *Overview of surveillance information on adverse reactions of Novel Coronavirus vaccine in China*. Retrieved from http://www.chinacdc.cn/jkzt/yymjz/yymjjz_6758/202105/t20210528_230908.html
- Dicker, D., Bettini, S., Farpour-Lambert, N., Frühbeck, G., Golan, R., Goossens, G., Halford, J., O'Malley, G., Mullerova, D., Ramos Salas, X., Hassapiou, M. N., Sagen, J., Woodward, E., Yumuk, V., & Busetto, L. (2020). Obesity and COVID-19: The two sides of the coin. *Obesity Facts*, 13(4), 430–438. <https://doi.org/10.1159/000510005>
- Dorman, C., Perera, A., Condon, C., Chau, C., Qian, J., Kalk, K., & DiazDeleon, D. (2021). Factors associated with willingness to be vaccinated against COVID-19 in a large convenience sample. *Journal of Community Health*, 46(5), 1013–1019. <https://doi.org/10.1007/s10900-021-00987-0>
- Ehrenstein, B., Schwarz, T., Fleck, M., & Günther, F. (2021). Hygienemaßnahmen bezüglich COVID-19 in der ambulanten Versorgung: Akzeptanz durch die Patienten? [Hygiene measures against COVID-19 in routine outpatient care: Acceptance by the patients?]. *Zeitschrift Für Rheumatologie*, 80(4), 348–352. <https://doi.org/10.1007/s00393-021-00990-9>
- European Centre for Disease Prevention and Control. (2021). *Overview of the implementation of COVID-19 vaccination strategies and deployment plans in the EU/EEA*. ECDC. Retrieved from <https://www.ecdc.europa.eu/en/publications-data/overview-implementation-covid-19-vaccination-strategies-and-deployment-plans>
- Finney Rutten, L. J., Zhu, X., Leppin, A. L., Ridgeway, J. L., Swift, M. D., Griffin, J. M., St Sauver, J. L., Virk, A., & Jacobson, R. M. (2021). Evidence-based strategies for clinical organizations to address COVID-19 vaccine hesitancy. *In Mayo Clinic Proceedings*, 96(3), 699–707. <https://doi.org/10.1016/j.mayocp.2020.12.024>
- García, P., Montez-Rath, M. E., Moore, H., Flotte, J., Fults, C., Block, M. S., Han, J., Dittrich, M., Parsonnet, J., Chertow, G. M., Block, G. A., & Anand, S. (2021). SARS-CoV-2 vaccine acceptability in patients on hemodialysis: A nationwide survey. *Journal of the American Society of Nephrology: JASN*, 32(7), 1575–1581. <https://doi.org/10.1681/ASN.2021010104>

- Harapan, H., Wagner, A. L., Yufika, A., Winardi, W., Anwar, S., Gan, A. K., Setiawan, A. M., Rajamoorthy, Y., Sofyan, H., Vo, T. Q., Hadisoemarto, P. F., Müller, R., Groneberg, D. A., & Mudatsir, M. (2020). Willingness-to-pay for a COVID-19 vaccine and its associated determinants in Indonesia. *Human Vaccines & Immunotherapeutics*, *16*(12), 3074–3080. <https://doi.org/10.1080/21645515.2020.1819741>
- Hatipoğlu, U., & Aboussouan, L. S. (2014). Chronic obstructive pulmonary disease: An update for the primary physician. *Cleveland Clinic Journal of Medicine*, *81*(6), 373–383. <https://doi.org/10.3949/ccjm.81a.13061>
- Jamal, D., Zaidi, S., Husain, S., Orr, D. W., Riaz, A., Farrukhi, A. A., & Najmi, R. (2020). Low vaccination in rural Sindh, Pakistan: A case of refusal, ignorance or access? *Vaccine*, *38*(30), 4747–4754. <https://doi.org/10.1016/j.vaccine.2020.05.018>
- Jorgensen, P., Mereckiene, J., Cotter, S., Johansen, K., Tsoolova, S., & Brown, C. (2018). How close are countries of the WHO European Region to achieving the goal of vaccinating 75% of key risk groups against influenza? Results from national surveys on seasonal influenza vaccination programmes, 2008/2009 to 2014/2015. *Vaccine*, *36*(4), 442–452. <https://doi.org/10.1016/j.vaccine.2017.12.019>
- Kabamba Nzaji, M., Kabamba Ngombe, L., Ngoie Mwamba, G., Banza Ndala, D. B., Mbidi Miema, J., Luhata Lungoyo, C., Lora Mwimba, B., Cikomola Mwana Bene, A., & Mukamba Musenga, E. (2020). Acceptability of vaccination against COVID-19 among healthcare workers in the democratic republic of the Congo. *Pragmatic and Observational Research*, *11*, 103–109. <https://doi.org/10.2147/POR.S271096>
- Kelkar, A. H., Blake, J. A., Cherabuddi, K., Cornett, H., McKee, B. L., & Cogle, C. R. (2021). Vaccine enthusiasm and hesitancy in cancer patients and the impact of a webinar. *Healthcare*, *9*(3), 351. <https://doi.org/10.3390/healthcare9030351>
- Kimmel, P. L. (2001). Psychosocial factors in dialysis patients. *Kidney International*, *59*(4), 1599–1613. <https://doi.org/10.1046/j.1523-1755.2001.0590041599.x>
- Kourlaba, G., Kourkouni, E., Maistreli, S., Tsopele, C. G., Molocha, N. M., Triantafyllou, C., Koniordou, M., Kopsidas, I., Chorianopoulou, E., Maroudi-Manta, S., Filippou, D., & Zaoutis, T. E. (2021). Willingness of Greek general population to get a COVID-19 vaccine. *Global Health Research and Policy*, *6*(1), 3. <https://doi.org/10.1186/s41256-021-00188-1>
- Krawczyk, A. L., Perez, S., Lau, E., Holcroft, C. A., Amsel, R., Knäuper, B., & Rosberger, Z. (2012). Human papillomavirus vaccination intentions and uptake in college women. *Health Psychology*, *31*(5), 685–693. <https://doi.org/10.1037/a0027012>
- Kwok, K. O., Li, K. K., Wei, W. I., Tang, A., Wong, S., & Lee, S. S. (2021). Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses: A survey. *International Journal of Nursing Studies*, *114*, 103854. <https://doi.org/10.1016/j.ijnurstu.2020.103854>
- Larson, H. J., de Figueiredo, A., Xiaohong, Z., Schulz, W. S., Verger, P., Johnston, I. G., Cook, A. R., & Jones, N. S. (2016). The state of vaccine confidence 2016: Global insights through a 67-country survey. *EBioMedicine*, *12*, 295–301. <https://doi.org/10.1016/j.ebiom.2016.08.042>
- Lin, Y., Hu, Z., Zhao, Q., Alias, H., Danaee, M., & Wong, L. P. (2020). Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLoS Neglected Tropical Diseases*, *14*(12), e0008961. <https://doi.org/10.1371/journal.pntd.0008961>
- Liu, R., Zhang, Y., Nicholas, S., Leng, A., Maitland, E., & Wang, J. (2021). COVID-19 vaccination willingness among Chinese adults under the free vaccination policy. *Vaccines*, *9*(3), 292. <https://doi.org/10.3390/vaccines9030292>
- Malik, A. A., McFadden, S. M., Elharake, J., & Omer, S. B. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EclinicalMedicine*, *26*, 100495. <https://doi.org/10.1016/j.eclinm.2020.100495>
- National Health Commission of the People's Republic of China (China NHC) (2021). COVID-19 vaccination data. Retrieved from <http://www.nhc.gov.cn/xcs/yqjzqk/202105/e129e5425ffb4686b053d5bd550e9305.shtml>
- Nikpouraghdam, M., Jalali Farahani, A., Alishiri, G., Heydari, S., Ebrahimmia, M., Samadinia, H., Sepandi, M., Jafari, N. J., Izadi, M., Qazvini, A., Dorostkar, R., Tat, M., Shahriary, A., Farnoosh, G., Hosseini Zijoud, S. R., Taghdir, M., Alimohamadi, Y., Abbaszadeh, S., Gouvarchin Ghaleh, H. E., & Bagheri, M. (2020). Epidemiological characteristics of coronavirus disease 2019 (COVID-19) patients in Iran: A single center study. *Journal of Clinical Virology*, *127*, 104378. <https://doi.org/10.1016/j.jcv.2020.104378>
- Olanipekun, T., Abe, T., Effoe, V., Kagbo-Kue, S., Chineke, I., Ivonye, C., & Bakinde, N. (2021). Attitudes and perceptions towards coronavirus disease 2019 (COVID-19) vaccine acceptance among recovered African American patients. *Journal of General Internal Medicine*, *36*(7), 2186–2188. <https://doi.org/10.1007/s11606-021-06787-5>
- Oliver, J. E., & Wood, T. (2014). Medical conspiracy theories and health behaviors in the United States. *JAMA Internal Medicine*, *174*(5), 817–818. <https://doi.org/10.1001/jamainternmed.2014.190>
- Papa, A., Gasbarrini, A., & Lopetuso, L. R. (2021). Winter is coming and COVID-19 vaccine is available! The role of gastroenterologist in increasing COVID-19 vaccine acceptability among IBD patients. *Gastroenterology*, *161*(1), 368–369. <https://doi.org/10.1053/j.gastro.2020.12.066>
- Puteikis, K., & Mameniškienė, R. (2021). Factors associated with COVID-19 vaccine hesitancy among people with epilepsy in Lithuania. *International Journal of Environmental Research and Public Health*, *18*(8), 4374. <https://doi.org/10.3390/ijerph18084374>
- The New York State Department of Health. (2021). *Distribution of the Vaccine*. Retrieved from <https://covid19vaccine.health.ny.gov/distribution-vaccine>
- Qiao, S., Tam, C. C., & Li, X. (2020). Risk exposures, risk perceptions, negative attitudes toward general vaccination, and COVID-19 vaccine acceptance among college students in South Carolina. *medRxiv: the preprint server for health sciences*, 2020.11.26.20239483. <https://doi.org/10.1101/2020.11.26.20239483>
- Reiter, P. L., Pennell, M. L., & Katz, M. L. (2020). Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? *Vaccine*, *38*(42), 6500–6507. <https://doi.org/10.1016/j.vaccine.2020.08.043>
- Salavisa, M., & Correia, A. S. (2021). Willingness to be vaccinated against COVID-19: An exploratory online survey in a Portuguese cohort of multiple sclerosis patients. *Multiple Sclerosis and Related Disorders*, *51*, 102880. <https://doi.org/10.1016/j.msard.2021.102880>
- Shaw, J., Stewart, T., Anderson, K. B., Hanley, S., Thomas, S. J., Salmon, D. A., & Morley, C. (2021). Assessment of US healthcare personnel attitudes towards coronavirus disease 2019 (COVID-19) vaccination in a large university healthcare system. *Clinical Infectious Diseases*, *73*(10), 1776–1783. <https://doi.org/10.1093/cid/ciab054>
- Udell, J. A., Zawi, R., Bhatt, D. L., Keshtkar-Jahromi, M., Gaughran, F., Phrommintikul, A., Ciszewski, A., Vakili, H., Hoffman, E. B., Farkouh, M. E., & Cannon, C. P. (2013). Association between influenza vaccination and cardiovascular outcomes in high-risk patients: A meta-analysis. *JAMA*, *310*(16), 1711–1720. <https://doi.org/10.1001/jama.2013.279206>
- Unroe, K. T., Evans, R., Weaver, L., Rusyniak, D., & Blackburn, J. (2021). Willingness of long-term care staff to receive a COVID-19 vaccine: A single state survey. *Journal of the American Geriatrics Society*, *69*(3), 593–599. <https://doi.org/10.1111/jgs.17022>
- Vallée, A., Fourn, E., Majerholc, C., Touche, P., & Zucman, D. (2021). COVID-19 vaccine hesitancy among French people living with HIV. *Vaccines*, *9*(4), 302. <https://doi.org/10.3390/vaccines9040302>

- Vinaccia, S., & Orozco, L. M. (2005). Aspectos psicosociales asociados con la calidad de vida de personas con enfermedades crónicas. *Diversitas*, 1(2), 125–137. <https://doi.org/10.15332/s1794-9998.2005.0002.01>
- Wang, J. (1990). *Clinical epidemiology-Design, measurement and evaluation of clinical scientific research*. Shanghai Scientific and Technical Publishers.
- World Health Organization & United Nations Children's Fund (UNICEF). (2020). Guidance on developing a national deployment and vaccination plan for COVID-19 vaccines: interim guidance, 16 November 2020. Retrieved from <https://apps.who.int/iris/handle/10665/336603>
- WHO (2021). *R&D blueprint and COVID-19*. Retrieved from <https://www.who.int/teams/blueprint/covid-19>
- WHO (2021). *WHO Coronavirus (COVID-19) Dashboard*. Retrieved from <https://covid19.who.int/>
- WHO. (2021). *Vaccine Explained' series features illustrated articles on vaccine development and distribution*. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines/explainers>
- Williams, L., Gallant, A. J., Rasmussen, S., Brown Nicholls, L. A., Cogan, N., Deakin, K., Young, D., & Flowers, P. (2020). Towards intervention development to increase the uptake of COVID-19 vaccination among those at high risk: Outlining evidence-based and theoretically informed future intervention content. *British Journal of Health Psychology*, 25(4), 1039–1054. <https://doi.org/10.1111/bjhp.12468>
- Xiao, H. X., Sun, Y. Z., & Yan, Z. J. (2005). Analysis of adverse reaction assessment questionnaire for staff of medical institutions after influenza vaccination. *Epidemiological Bulletin*, 21(8), 618–631.
- Yang, K., Liu, H., Ma, L., Wang, S., Tian, Y., Zhang, F., Li, Z., Song, Y., & Jiang, X. (2021). Knowledge, attitude and practice of residents in the prevention and control of COVID-19: An online questionnaire survey. *Journal of Advanced Nursing*, 77(4), 1839–1855. <https://doi.org/10.1111/jan.14718>
- Yoda, T., & Katsuyama, H. (2021). Willingness to receive COVID-19 vaccination in Japan. *Vaccines*, 9(1), 48. <https://doi.org/10.3390/vaccines9010048>

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Jiang, N., Gu, P., Sun, X., Han, H., Liu, W., Song, N., & Jiang, X. (2022). cAcceptance of COVID-19 vaccines in patients with chronic diseases: A cross-sectional study. *Journal of Clinical Nursing*, 00, 1–15. <https://doi.org/10.1111/jocn.16284>