Taylor & Francis
Taylor & Francis Group

RESEARCH PAPER

🔓 OPEN ACCESS | Check for updates

A study on the willingness and influencing factors of novel coronavirus vaccination among medical personnel in North China

Jinqi Hao[a]*, Huimin Liu[a]*, Jihai Shi[a], Qiufeng Wang[a], Xiaoyou Su [b], Zhengyang Shi[a], Yanqin Yu[a,c], Bo Liu[a], and Youlin Qiao[b,c]

[a]Baotou Medical College/The First Affiliated Hospital of Baotou Medical College, Baotou, China; [b]School of Group Medicine and Public Health, Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing, China; [c]Department of Cancer Epidemiology, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

ABSTRACT

Aim: To understand the awareness of the willingness to be vaccinated and influencing factors of the new coronavirus vaccine (neo-crown vaccine) among medical personnel in North China and to provide a theoretical basis and application guidelines for the feasibility of coronavirus vaccination by medical personnel to guide the public to actively be vaccinated by taking initiative and obtaining a coronavirus vaccination as soon as possible.

Methods: From April 2021 to June 2021, medical staff in North China were selected to complete an online questionnaire survey using Questionnaire Star to analyze the willingness rate to be vaccinated with the new coronavirus vaccine, and the influencing factors were analyzed using binary logistic regression.

Results: Among 621 respondents, 85.7% were willing to be vaccinated after the launch of the new vaccine. In the questionnaire, respondents were asked to answer questions such as "Do you think it is better to receive as few vaccines as possible at the same time?," "If I get the new coronavirus vaccine, I may have serious side effects.," "The new coronavirus vaccine is safe.," "Specifically, for the new coronavirus vaccine, do you think it is safe?," and "Specifically, for the new coronavirus vaccine, do you think it is easy to administer?." These beliefs have an important influence on the vaccination of medical staff with the new coronavirus vaccine in Northern China ($OR = 1.610, 95\%$ CI: $1.055 \sim 2.456$; $OR = 1.715, 95\%$ CI: $1.164 \sim 2.526$; $OR = 0.401$, 95% CI: $0.212 \sim 0.760$; $OR = 0.352, 95\%$ CI: $0.147 \sim 0.843$; $OR = 3.688, 95\%$ CI: $1.281 \sim 10.502$, respectively; All P values $< .05$).

Conclusions: Medical staff have a high willingness to be vaccinated with the new coronavirus vaccine, which plays a positive role in the publicity of the vaccine.

1. Introduction

Coronavirus disease 2019 (COVID-19) is an acute respiratory disease with rapid transmission, high pathogenicity and high mortality caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 was reported in more than 136 million patients in April 2021. Over 2 million patients have died from COVID-19.[1] It is not only a major global public health emergency but also has a great negative impact on the economy and social lives of people worldwide. Although China has taken effective measures to control COVID-19, the risk of spread in some areas is still high, especially by asymptomatic individuals, who have a significant impact on the spread of COVID-19.[2] At the same time, there is an ever-present risk of breakthrough infection with the new delta (δ) coronavirus variant strain from India. Vaccination has always been the most effective way to prevent infectious diseases. For COVID-19, which may coexist with humans for a long time, the development of the new coronavirus vaccine is particularly important. At the same time, the safety and effectiveness of the new

coronavirus vaccine are the key factors affecting the epidemic prevention of the new coronavirus.[3] At present, nearly 200 kinds of COVID-19 vaccines are in the preclinical research stage, and more than 90 kinds are in the clinical research stage. Three inactivated vaccines, one adenovirus vector vaccine and one recombinant protein vaccine in China have been urgently approved for marketing for population vaccination.[4] Studies have shown that people's knowledge of the disease affects their self-management and compliance with interventions, thus influencing the general population's vaccination behavior.[5] Therefore, novel coronavirus pneumonia and the new coronavirus vaccine are important factors that determine the current popularity of the new coronavirus vaccine. The population is aware of COVID-19, new coronavirus pneumonia and new coronavirus vaccines. In China, although the new coronavirus vaccine was fully launched in April 2021, the understanding of medical staff regarding the new coronavirus vaccine is still unclear. The high cognition of medical staff on the new coronavirus vaccine is of great significance for the

prevention of breakthrough infections. Therefore, it is necessary to understand current medical staff's understanding of COVID-19 and the new coronavirus vaccine and to guide medical staff to actively inoculate with it. This study took medical staff in North China as the research object and conducted an online questionnaire survey in April 2021 to understand the willingness of the medical staff to vaccinate with the new coronavirus vaccine and potential influencing factors to provide a basis for the further promotion of the vaccination plan for the new coronavirus vaccine and its specific implementation.

2. Materials and methods

2.1. Survey sample

The survey sample was from Inner Mongolia, Beijing and Hebei, and included current medical workers aged 18 to 60 years. A total of 663 people were surveyed, with 621 valid questionnaires returned and a response rate of 93.67%. Participants with missing main information and incomplete responses were excluded. Based on the formula $n = (Z_{(1-\alpha/2)}/\delta)^2 p(1-p)$ for the required sample size for the cross-sectional survey and the vaccination rate of $P \approx 80\%$ obtained in a previous study, $\alpha = 0.05$, and the absolute tolerance error for $\delta = 5\%$, $Z_{(1-\alpha/2)} = 1.96$; for this survey, the design effect Deff = 2, and considering the 20% missing visit rate, the minimum required sample size was calculated as 590 people.

2.2. Survey content

The survey included general information about medical personnel in North China (age, usual residence, sex, ethnicity, education, marital status, annual household income, smoking status, alcohol consumption, whether they had received nucleic acid testing for the novel coronavirus and nucleic acid testing results), understanding of new coronavirus pneumonia, understanding of the new vaccine without vaccination, and awareness of the new coronavirus vaccine. The specific survey questions are shown in Appendix.

2.3. Survey method

The study from a national multi-center study at Peking Union Medical College, and we only selected the northern China.The questionnaire was designed with reference to the literature and in accordance with the actual situation and was presurveyed after expert discussion. The results of the presurvey showed that the Cronbach's α coefficient of the full questionnaire was 0.737. The Kaiser–Meyer–Olkin coefficient was 0.925. This indicates that the internal consistency and validity of the questionnaire was good. The questionnaire was revised, refined and finalized after the presurvey. Using the convenience sampling method and online survey, the questionnaire was designed through "Questionnaire Star" software, a two-dimensional code was generated, and the questionnaire was released to the medical staff in North China. The staff voluntarily participated in the online questionnaire survey.

2.4. Data analysis

The collected questionnaires were collated for information, and those with missing entries greater than 20% were excluded. SPSS 20.0 software was used to build a database and to statistically analyze indicators such as the proportion willing to be vaccinated. Factors influencing willingness to be vaccinated were first analyzed as independent variables using a 2-test for one-way analysis, and then binary logistic regression analysis was conducted to determine the independent factors. The test level was α = 0.05.

3. Results

3.1. Basic characteristics of the survey respondents

A total of 621 respondents were included, most of whom were women, accounting for 71.5%; Participants aged 18–30, 31–50 and ≥ 51 years accounted for 20.9%, 68.3% and 10.8%, respectively. Most of them lived in cities and towns, accounting for 97.7%, and most had a college degree or bachelor degree or above, accounting for 98.3%. Regarding marital status, most of the participants were married, accounting for 81.3%. The annual income was mostly 100000 yuan or less, accounting for 66.8%. The majority of participants were nonsmokers, accounting for 88.6%; nondrinkers accounted for 84.9%. Most of the participants had been tested for novel coronavirus nucleic acids, accounting for 90.3%. All participants nucleic acid test results were negative. The results are shown in Table 1.

Table 1. Respondents' general information.

Demographic characteristics		Total (n = 621)	(%)
Age (years)	18 ~ 30	130	20.9
	31 ~ 50	424	68.3
	≥51	67	10.8
Residence	Countryside	14	2.3
	Towns	607	97.7
Sex	Male	177	28.5
	Female	444	71.5
Ethnicity	Han Chinese	534	86.0
	Other	87	14.0
Education Level	Senior High School and below	11	1.8
	Bachelor's degree or college	409	65.9
	Postgraduate and above	201	32.4
Marital status	Unmarried	98	15.8
	Married	505	81.3
	Divorced or widowed	18	2.9
Annual household income (yuan)	100,000 and below	415	66.8
	110,000-3–50,000	195	31.4
	>350,000	11	1.8
Smoking status	Yes	71	11.4
	No	550	88.6
Drinking status	Yes	94	15.1
	No	527	84.9
Q1	Yes	561	90.3
	No	60	9.7
Q2	Negative	561	90.3
	Not tested	60	9.7
	Positive	0	0.0

Table 2. Intentions of survey respondents to receive the new coronavirus vaccine.

Variables		Yes n	Yes %	No n	No %	χ2-value	P value
Age (years)	18 ~ 30	111	20.9	19	21.3	2.928	.231
	31 ~ 50	359	67.5	65	73.0		
	≥51	62	11.7	5	5.6		
Residence	Countryside	9	1.7	5	5.6	5.334	.021
	Towns	523	98.3	84	94.4		
Sex	Male	156	29.3	21	23.6	1.227	.268
	Female	376	70.7	68	76.4		
Ethnicity	Han Chinese	456	85.7	78	87.6	0.235	.628
	Other	76	14.3	11	12.4		
Education Level	Senior High School and below	9	1.7	2	2.2	0.243	.886
	Bachelor's degree or college	352	66.2	57	64.0		
	Postgraduate and above	171	32.1	30	33.7		
Marital status	Unmarried	81	15.2	17	19.1	0.989	.610
	Married	436	82.0	69	77.5		
	Divorced or widowed	15	2.8	3	3.4		
Annual household income (yuan)	100,000 and below	347	65.2	68	76.4	5.282	.071
	110,000-350,000	174	32.7	21	23.6		
	>350,000	11	2.1	0	0.0		
Smoking status	Yes	62	11.7	9	10.1	0.179	.672
	No	470	88.3	80	89.9		
Drinking status	Yes	80	15.0	14	15.7	0.028	.866
	No	452	85.0	75	84.3		
Q1	Yes	487	91.5	74	83.1	6.157	.013
	No	45	8.5	15	16.9		
Q2	Negative	487	91.5	74	83.1	6.157	.013
	Not tested	45	8.5	15	16.9		
Q3	Yes	418	78.6	63	70.8	2.646	.104
	No	114	21.4	26	29.2		
Q4	Yes	490	92.1	75	84.3	5.706	.017
	No	42	7.9	14	15.7		

3.2. Willingness to receive the new coronavirus vaccine

After the launch of the new coronavirus vaccine, the total number of medical staff in North China was 621, of which 532 (85.7%) were willing to receive or make an appointment to receive the new coronavirus vaccine; 89 (14.3%) staff members were unwilling to receive the new coronavirus vaccine.

3.3. Factors influencing willingness to be vaccinated

3.3.1. Univariate analysis

Univariate analysis showed that in the questionnaire, respondents were asked to answer questions such as "place of usual residence"; "whether I have been tested for novel coronavirus nucleic acids"; "nucleic acid test results"; "If I get the new coronavirus pneumonia, is it considered a high risk to my health."; "If I do not get the new coronavirus vaccine, I have a high risk of getting the new coronavirus pneumonia."; "If I do not get the new coronavirus vaccine, I will always be at risk of getting the new coronavirus pneumonia."; "If I get the new coronavirus vaccine, my risk of getting the new coronavirus pneumonia will be reduced."; "If everyone gets the new coronavirus vaccine, the prevalence of new coronavirus

pneumonia can be reduced."; "If I get the new coronavirus vaccine, my risk of getting the new coronavirus pneumonia will be reduced."; "If I get the novel coronavirus, I may pass it on to family and friends who may contract the novel coronavirus."; "If I get the novel coronavirus, I have a greater risk of dying."; "I think getting the novel coronavirus vaccine will prevent the spread of the new coronavirus pneumonia to family members and relatives."; "I think that vaccination with the new coronavirus vaccine will prevent financial and labor losses due to the new coronavirus."; "I think the new coronavirus vaccination will instead cause me to the develop the new coronavirus pneumonia."; "I believe that the outbreak in China is under control, so there is no longer a need for the new coronavirus vaccine."; "Do you think that the new crown vaccination will prevent the new coronavirus pneumonia (which is a very serious disease)?"; "Do you think it is better to get immunity by having the new coronavirus pneumonia than by getting the new coronavirus vaccine?"; "Do you think it is better to receive as few vaccinations as possible at the same time?"; "I could have serious side effects if I get the vaccine."; "The new coronavirus vaccine is necessary to protect our health."; "The new coronavirus vaccine is good for preventing the new coronavirus pneumonia."; "The new coronavirus vaccine is safe."; "If I do not get the new coronavirus vaccine, I may get the new coronavirus pneumonia and cause others to contract it."; "Specifically, for the new coronavirus vaccine, do you think it is necessary to get the new coronavirus vaccine?"; "Specifically, for the new coronavirus vaccine, do you think it is important?"; "Specifically, for the new coronavirus vaccine, do you think it is safe?"; "Specifically, for the new coronavirus vaccine, do you believe that it is effective?"; and "Specifically, for the new coronavirus vaccine, do you find the new coronavirus vaccine easy to administer?." These were significant factors influencing the survey respondents' willingness to be vaccinated after the launch of the new coronavirus vaccine (all *P values* < .05). The results are shown in Tables 2 and 3.

3.3.2. Binary logistic regression analysis

With the willingness to receive the new coronavirus vaccine as the dependent variable and the factors influencing the willingness to receive the new coronavirus vaccine as the independent variables (Table 4 for the assignment table).The variables that were significant in the univariate analysis were included in the binary logistic regression analysis, and included the following survey questions: "Do you think it is better to receive as few vaccines as possible at the same time?"; "If I get the new coronavirus vaccine, I may have serious side effects."; "The new coronavirus vaccine is safe."; "Specifically, for the new coronavirus vaccine, do you think it is safe?"; and "Specifically, for the new coronavirus vaccine, do you think it is easy to administer?." They had an important influence on the vaccination of medical staff with the new coronavirus vaccine in Northern China (*OR* = 1.610,95% *CI*: 1.055 ~ 2.456; *OR* = 1.715, 95% *CI*: 1.164 ~ 2.526; *OR* = 0.401,95% *CI*: 0.212 ~ 0.760; *OR* = 0.352, 95% *CI*: 0.147 ~ 0.843; *OR* = 3.688, 95% *CI*: 1.281 ~ 10.502; All *P values* < .05). The results are shown in Table 5.

Table 3. Analysis of vaccine-related perceptions among survey respondents and their willingness to receive the new coronavirus vaccine [n (%)].

Variables		Disagree	Uncertainty	Agree	χ^2-value	P value
Awareness of unvaccinated/infected COVID-19:						
Q5	Yes	77 (14.5)	165 (31.0)	290 (54.5)	14.962	.001
	No	21 (23.6)	39 (43.8)	29 (32.6)		
Q6	Yes	94 (17.7)	153 (28.8)	285 (53.6)	9.476	.009
	No	22 (24.7)	35 (39.3)	32 (36.0)		
Q7	Yes	37 (7.0)	95 (17.9)	400 (75.2)	29.134	.000
	No	13 (14.6)	34 (38.2)	42 (47.2)		
Q8	Yes	32 (6.0)	81 (15.2)	419 (78.8)	34.908	.000
	No	8 (9.0)	36 (40.4)	45 (50.6)		
Q9	Yes	217 (40.8)	239 (44.9)	76 (14.3)	1.128	.569
	No	31 (34.8)	44 (49.4)	14 (15.7)		
Q10	Yes	134 (25.2)	206 (38.7)	192 (36.1)	2.922	.232
	No	19 (21.3)	43 (48.3)	27 (30.3)		
Q11	Yes	56 (10.5)	94 (17.7)	382 (71.8)	10.172	.006
	No	14 (15.7)	26 (29.2)	49 (55.1)		
Q12	Yes	92 (17.3)	135 (25.4)	305 (57.3)	8.797	.012
	No	22 (24.7)	31 (34.8)	36 (40.4)		
In the perception of vaccination with the new coronavirus vaccine:						
Q13	Yes	28 (5.3)	85 (16.0)	419 (78.8)	35.236	.000
	No	9 (10.1)	36 (40.4)	44 (49.4)		
Q14	Yes	31 (5.8)	85 (16.0)	416 (78.2)	26.955	.000
	No	14 (15.7)	28 (31.5)	47 (52.8)		
Q15	Yes	383 (72.0)	87 (16.4)	62 (11.7)	35.405	.000
	No	39 (43.8)	38 (42.7)	12 (13.5)		
Q16	Yes	405 (76.1)	67 (12.6)	60 (11.3)	20.318	.000
	No	50 (56.2)	27 (30.3)	12 (13.5)		
Q17	Yes	57 (10.7)	78 (14.7)	397 (74.6)	39.888	.000
	No	12 (13.5)	37 (41.6)	40 (44.9)		
Q18	Yes	288 (54.1)	150 (28.2)	94 (17.7)	23.867	.000
	No	25 (28.1)	46 (51.7)	18 (20.2)		
Q19	Yes	140 (26.3)	176 (33.1)	216 (40.6)	8.004	.018
	No	14 (15.7)	42 (47.2)	33 (37.1)		
Q20	Yes	295 (55.5)	162 (30.5)	75 (14.1)	33.519	.000
	No	20 (22.5)	45 (50.6)	24 (27.0)		
Q21	Yes	26 (4.9)	79 (14.8)	427 (80.3)	21.500	.000
	No	5 (5.6)	31 (34.8)	53 (59.6)		
Q22	Yes	21 (3.9)	96 (18.0)	415 (78.0)	38.317	.000
	No	4 (4.5)	42 (47.2)	43 (48.3)		
Q23	Yes	16 (3.0)	114 (21.4)	402 (75.6)	54.058	.000
	No	8 (9.0)	48 (53.9)	33 (37.1)		
Q24	Yes	53 (10.0)	124 (23.3)	355 (66.7)	18.033	.000
	No	10 (11.2)	39 (43.8)	40 (44.9)		
Q25	Yes	16 (3.0)	64 (12.0)	452 (85.0)	70.433	.000
	No	5 (5.6)	42 (47.2)	42 (47.2)		
Q26	Yes	11 (2.1)	61 (11.5)	460 (86.5)	61.197	.000
	No	6 (6.7)	37 (41.6)	46 (51.7)		
Q27	Yes	9 (1.7)	86 (16.2)	437 (82.1)	80.506	.000
	No	6 (6.7)	49 (55.1)	34 (38.2)		
Q28	Yes	10 (1.9)	80 (15.0)	442 (83.1)	74.496	.000
	No	6 (6.7)	46 (51.7)	37 (41.6)		
Q29	Yes	10 (1.9)	71 (13.3)	451 (84.8)	43.182	.000
	No	4 (4.5)	36 (40.4)	49 (55.1)		

Table 4. Assignment table for each variable.

Variable	Assignment
Age (years)	1 = 18–30; 2 = 31–50; 3 = ≥51
Residence	1 = Countryside; 2 = Towns
Sex	1 = Male; 2 = Female
Ethnicity	1 = Han Chinese; 2 = Other
Education Level	1 = Senior High School and below
	2 = Bachelor's degree or college
	3 = Postgraduate and above
Marriage status	1 = Unmarried; 2 = Married
	3 = Divorced or widowed
Annual household income	1 = 100,000 and below; 2 = 110,000-350,000;
(yuan)	3 = >350,000
Smoking status	1 = Yes; 2 = No
Drinking status	1 = Yes; 2 = No
Q1	1 = Yes; 2 = No
Q2	1 = Positive; 2 = Negative; 3 = Not tested
Q3-Q4	1 = Yes; 2 = No
Q5-Q29	1 = Disagree; 2 = Uncertainty; 3 = Agree
Q30	1 = Yes; 2 = No

Table 5. Binary logistic regression models of the factors influencing willingness to receive the new coronavirus vaccine.

Variables	β	S_x	Waldχ^2	P value	OR (95% CI)
Residence	−1.044	0.701	2.215	.137	0.352 (0.089 ~ 1.392)
Q1	0.025	0.405	0.004	.950	1.026 (0.464 ~ 2.268)
Q4	0.369	0.418	0.778	.378	1.446 (0.637 ~ 3.281)
Awareness of unvaccinated/infected COVID-19:					
Q5	−0.117	0.237	0.245	.621	0.889 (0.559 ~ 1.415)
Q6	−0.122	0.224	0.298	.585	0.885 (0.571 ~ 1.372)
Q7	−0.357	0.324	1.215	.270	0.700 (0.371 ~ 1.320)
Q8	0.348	0.370	0.883	.347	1.416 (0.685 ~ 2.925)
Q11	0.298	0.282	1.116	.291	1.347 (0.775 ~ 2.343)
Q12	−0.289	0.235	1.513	.219	0.749 (0.472 ~ 1.187)
The perceptions of vaccination with the new coronavirus vaccine:					
Q13	−0.010	0.331	0.001	.976	0.990 (0.518 ~ 1.893)
Q14	−0.572	0.300	3.636	.057	0.564 (0.313 ~ 1.016)
Q15	0.331	0.245	1.821	.177	1.392 (0.861 ~ 2.249)
Q16	0.028	0.244	0.013	.910	1.028 (0.638 ~ 1.657)
Q17	−0.137	0.239	0.330	.566	0.872 (0.546 ~ 1.393)
Q18	0.294	0.200	2.160	.142	1.342 (0.907 ~ 1.986)
Q19	0.476	0.216	4.878	.027	1.610 (1.055 ~ 2.456)
Q20	0.539	0.198	7.455	.006	1.715 (1.164 ~ 2.526)
Q21	0.520	0.406	1.642	.200	1.682 (0.759 ~ 3.727)
Q22	0.031	0.392	0.006	.939	1.032 (0.479 ~ 2.223)
Q23	−0.914	0.326	7.850	.005	0.401 (0.212 ~ 0.760)
Q24	0.271	0.275	0.966	.326	1.311 (0.764 ~ 2.249)
Q25	−0.545	0.408	1.780	.182	0.580 (0.260 ~ 1.291)
Q26	−0.427	0.513	0.691	.406	0.653 (0.239 ~ 1.784)
Q27	−1.044	0.446	5.493	.019	0.352 (0.147 ~ 0.843)
Q28	−0.452	0.487	0.861	.353	0.636 (0.245 ~ 1.653)
Q29	1.300	0.537	5.867	.015	3.688 (1.281 ~ 10.502)

4. Discussion

This survey showed that 85.7% of the medical personnel in northern China were willing to receive the new coronavirus vaccine after its launch, which is higher than a survey that investigated willingness to receive the new coronavirus vaccine among the general population in China in May 2020, in which 83.5% were willing to receive the new coronavirus vaccine,[6] which was significantly higher than the following findings. In December 2020, Solís Arce et al. found that an average of 64.6% of individuals were willing to receive the new coronavirus vaccine and only an average of 30.4% were willing to receive the new coronavirus vaccine among the general population in Russia.[7] A survey by Harapan et al. in April 2020 found that 78.3% of individuals in Indonesia were willing for willing to receive the new coronavirus vaccine;[8] a survey by Detoc et al. in April 2020 found that approximately 77.6% of the general population in France definitely or probably agreed to receive the new coronavirus vaccine;[9] and an analysis conducted by Dror et al. in April 2020 of the willingness of the general Australian population to receive the new coronavirus vaccine showed that 85.8% were willing to receive the new coronavirus vaccine, similar to the results of this study.[10] The results suggest that the willingness of medical personnel to be vaccinated is higher in northern China, partly because of the in-depth knowledge of medical personnel about the clinical manifestations of the new coronavirus pneumonia and the data on the development of the new coronavirus vaccine, and partly because of the better results that have been achieved in the prevention of the new coronavirus and the promotion of the use of the new coronavirus vaccine. One of the most important factors influencing vaccination against the

new coronavirus is government action. The government and health community should strengthen the positive publicity of the new coronavirus vaccine and correct the negative reports it in a timely manner, and in addition to the traditional media, the government should also make use of the internet to vigorously publicize the positive effects of the new coronavirus vaccine and the relevant data on vaccination through various media channels such as Sina, Google and short video apps to increase the willingness of medical staff to receive the vaccine and to further guide the public's willingness to receive it. A study of the 2021 U.S. Health Care Workers New Coronavirus Vaccination Survey showed that 57.5% were interested in receiving the new coronavirus vaccine, with 80.4% of this group being physicians and medical scientists, as health care workers are often a reliable source of vaccine information and their vaccination may have a positive impact on the population.[11]

This survey also found that the important influencing factors for medical professionals in North China to receive the new coronavirus vaccine were as follows: "Do you think it is better to receive as few vaccines as possible at the same time?"; "If I get the new coronavirus vaccine, I may have serious side effects."; "The new coronavirus vaccine is safe."; "Specifically,

Medical Ethics Committee of the First Affiliated Hospital of Baotou

Medical College Research Project Approval Form

Project Title	Item number (article title): A study on the willingness and influencing factors of novel coronavirus vaccination among medical personnel in North China						
Item Category	☐Scientific Research Projects A. Applied Basic Research B. Clinical studies C. Pharmacy D.Combination of Chinese and Western Medicine E.Other ☐New technology applications ☐Clinical trials of new devices ☑Papers and others (please specify)						
Application Section	Clinical Epidemiology	Head of Section	Yanqin Yu	Project leader	Yanqin Yu	Start and finish times	2020.12-2021.12
Study Purpose	The willingness of medical personnel in North China to receive the New Crown vaccine and the factors influencing it were obtained by means of a questionnaire. The project did not involve the privacy of the respondents and only the above questions were answered. The project does not increase the medical costs or suffering of the subjects, and its research materials and findings are used for scientific purposes without conflict of interest.						
Research methods involving ethics	This project is based on a web-based questionnaire, and the content of the informed consent form covers a basic introduction to the project and whether or not you are willing to accept the project. There is no disclosure of patients' personal information involved in this research project, only questionnaires are administered to the study participants, and the information is managed by a dedicated person, has good confidentiality, and will not affect this study.						
Possible the adverse reactions reactions and hazards and prevention treatment and compensation measures	Does not involve any damage or adverse reactions to the patient.						

Applicant (project leader) commitment:

The above information is true and if approved, I will strictly abide by the Statute of the Medical Ethics Committee of the First Affiliated Hospital of Baotou Medical College and carry out the project research in accordance with the protocol provided, and I will assume full responsibility for any breach of the relevant regulations on the management of scientific research projects.

Signature: Yanqin Yu.   Date: 2021/12/03

Number of committee members present		People	Committee attendance		People	Number of people agreed by the committee	People

Unit Review Comments:

Medical Ethics Committee (stamp)   Scientific Research Section (stamp)
                                          Date:

Attachment: Brief information about the applicant (project leader/author of the article)

Name	Yanqin Yu	Gender	Female	Academic degrees	PhD student	Title position	Associate professor
Telephone	13488523406	Mobile phone	13488523406	E-mail	Yanqin0324@126.com		
Correspondence address	No.41 Linyin Road, Kundulun District, Baotou				Postcode	014010	
Research direction	Epidemiology and Health Statistics						

for the new coronavirus vaccine, do you think it is safe?"; and "Specifically, for the new coronavirus vaccine, do you think the it is easy to administer?." From this, we can see that the safety of the vaccine and the ease of administration are the main reasons for the willingness of medical staff to receive the vaccine. The safety of the new coronavirus vaccine was the main reason for the high willingness of medical staff to receive the vaccine, and doubts about the safety of the vaccine were consistent with the findings of Sheikh and Karpiński's study. The main concern about the safety of the vaccine is the unexplained illnesses that occur after vaccination,[12] and Karpiński found that Grimballi syndrome and allergic reactions were common side effects of the vaccine, with Grimballi syndrome being the most serious side effect.[13] The workload of medical staff has increased significantly during the new coronavirus epidemic, and their work is stressful. A retrospective survey analysis showed that the prevalence of anxiety among doctors and nurses was 26.1%;[14] therefore, the convenience and rapidity of vaccination became another major reason for the high willingness of medical staff to be vaccinated. Currently, the new coronavirus epidemic is still a global pandemic, and although the epidemic has been effectively controlled in China, the immunity acquired by the population due to new coronavirus infection is low, and it is important to build a joint immunity barrier against the new coronavirus through vaccination against it.[15] Therefore, the national promotion of new coronavirus vaccination occupies a key position in the prevention and control of the current epidemic. In recent years, there have been numerous questions about the safety and efficacy of vaccines, which have affected public confidence in vaccines for disease prevention.[16,17] Therefore, the establishment of sound vaccine regulatory laws and standardized vaccination practices are key to the effective promotion of the new coronavirus vaccine.

This survey has certain limitations. Due to this is a cross-sectional study, bias is inevitable.The study adopted convenience sampling instead of random sampling, which may affect the representativeness of the study sample. The network questionnaire survey was a self-report method, which leads to information bias. With the continuous development of global COVID-19 and the deepening of new coronavirus vaccine research, we need to constantly investigate and study the willingness of medical staff to be vaccinated at different times.

In conclusion, the new coronavirus vaccine will be a key public health strategy to reduce the burden of disease caused by COVID-19. Our study provides insights into the acceptability of a new coronavirus vaccine, and the results suggest that health workers in northern China are overwhelmingly willing to be vaccinated. As the vaccine development process continues, the safety and ease of administration of the vaccine will also be greatly enhanced.

Acknowledgments

Disclosure statement

Funding

ORCID

Xiaoyou Su 🆔 http://orcid.org/0000-0002-4216-2142

Ethics statement

The Ethical Review Committee of the Chinese Center for Disease Control and Prevention reviewed the proposed use of human subjects in the abovementioned project (Number 202020). This study was also approved by the Medical Ethics Committee of the First Affiliated Hospital of Baotou Medical College (Approval number: 20210010). Subjects participated voluntarily.

References

1. Alshammary AF, Al-Sulaiman AM. The journey of SARS-CoV-2 in human hosts: a review of immune responses, immunosuppression, and their consequences. Virulence. 2021 Dec;12(1):1771–94. doi:10.1080/21505594.2021.1929800.

2. Li H, Burm SW, Hong SH, Ghayda RA, Kronbichler A, Smith L, Koyanagi A, Jacob L, Lee KH, Shin JI, et al. Review of coronavirus disease 2019: epidemiology, transmission, risk factors, and international responses. Yonsei Med J. 2021 Jan;62(1):1–11. doi:10.3349/ymj.2021.62.1.1.

3. Laine C, Cotton D, Moyer DV. COVID-19 vaccine: promoting vaccine acceptance. Ann Intern Med. 2021 Feb;174(2):252–53. Epub 2020 Dec 21. PMID: 33347321; PMCID: PMC7901662. doi:10.7326/M20-8008.

4. Qian S, Wan R, Ping Z, Qi Z. Research progress of novel coronavirus vaccine[J/OL]. PLA Med J. 2021-Jul-19;{3},{4}{5}:1–12. http://kns.cnki.net/kcms/detail/11.1056.R.20210616.1003.002.html.

5. Li W, Yu J, Hong D, Ren C, Chen G. A study on people's perception of new coronary pneumonia based on health belief theory. China Rural Health Manage. 2021;41:372–76.

6. Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong LP, Understanding COVID-19. vaccine demand and hesitancy: a nationwide online survey in China. PLoS Negl Trop Dis. 2020 Dec 17;14(12):e0008961. doi:10.1371/journal.pntd.0008961.

7. Solís Arce JS, Warren SS, Meriggi NF, Scacco A. COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. Nat Med. Jul 16 2021. doi:10.1038/s41591-021-01454-y.

8. Harapan H, Wagner AL, Yufika A, Winardi W, Anwar S, Gan AK, Setiawan AM, Rajamoorthy Y, Sofyan H, Vo TQ, et al. Willingness-to-pay for a COVID-19 vaccine and its associated determinants in Indonesia. Hum Vaccin Immunother. 2020 Dec 1;16(12):3074–80. doi:10.1080/21645515.2020.1819741.

9. Detoc M, Bruel S, Frappe P, Tardy B, Botelho-Nevers E, Gagneux-Brunon A. Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. Vaccine. 2020 Oct 21;38(45):7002–06. doi:10.1016/j.vaccine.2020.09.041.

10. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrachi M, Zigron A, Srouji S, Sela E. Vaccine hesitancy: the next challenge in the fight against COVID-19. Eur J Epidemiol. 2020 Aug;35(8):775–79. doi:10.1007/s10654-020-00671-y.

11. Shaw J, Stewart T, Anderson KB, Hanley S, Thomas SJ, Salmon DA, Morley C. Assessment of U.S. health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system. Clin Infect Dis. 2021 Jan 25;ciab054. doi:10.1093/cid/ciab054.

12. Sheikh AB, Pal S, Javed N, Shekhar RCOVID-19. Vaccination in developing nations: challenges and opportunities for innovation. Infect Dis Rep. 2021 May 14;13(2):429–36. doi:10.3390/idr13020041.

13. Karpiński TM, Ożarowski M, Seremak-Mrozikiewicz A, Wolski H, The WD. 2020 race towards SARS-CoV-2 specific vaccines. Theranostics. 2021 Jan 1;11(4):1690–702. doi:10.7150/thno.53691.

14. Raoofi S, Pashazadeh Kan F, Rafiei S, Khani S, Hosseinifard H, Tajik F, Masoumi M, Raoofi N, Ahmadi S, Aghalou S, et al. Anxiety during the COVID-19 pandemic in hospital staff: systematic review plus meta-analysis. BMJ Support Palliat Care. 2021 Jul 26;bmjspcare-2021-003125. doi:10.1136/bmjspcare-2021-003125.

15. Leng A, Maitland E, Wang S, Nicholas S, Liu R, Wang J. Individual preferences for COVID-19 vaccination in China. Vaccine. 2021 Jan 8;39(2):247–54. doi:10.1016/j.vaccine.2020.12.009.

16. Mejri N, Berrazega Y, Ouertani E, Rachdi H, Bohli M, Kochbati L, Boussen H. Understanding COVID-19 vaccine hesitancy and resistance: another challenge in cancer patients. Support Care Cancer. 2022;30(1):289–93. doi:10.1007/s00520-021-06419-y.

17. Al-Qahtani WS, Alsafhi FA. A commentary on realities of developing COVID-19 vaccines discussed through the global health safety perspective. Vaccines (Basel). 2021 Mar 18;9(3):274. doi:10.3390/vaccines9030274.

Appendix. Question numbers

Number	Question
Q1	Have you been tested for novel coronavirus nucleic acids?
Q2	What were the results of your nucleic acid test?
Q3	Do you consider COVID-19 to be a major health problem affecting the population?
Q4	If you have contracted COVID-19, do you think it was a significant risk to your health?
Q5	If I have not received the new coronavirus vaccine, the possibility of contracting new coronavirus pneumonia is high.
Q6	If I am not vaccinated against the new coronavirus, I will always be at risk of contracting COVID-19.
Q7	If I get the new coronavirus vaccine, my risk of developing the new coronavirus pneumonia is reduced.
Q8	The new coronavirus pneumonia epidemic can be reduced if all people are vaccinated against the new coronavirus.
Q9	If I get the new coronavirus, I will die.
Q10	If I get the new coronavirus, I could die.
Q11	If I get the novel coronavirus, I may pass it on to family and friends who may get the new coronavirus.
Q12	If I get the novel coronavirus, I am at greater risk of death.
Q13	I believe that vaccination against COVID-19 can prevent the spread of COVID-19 to family members and relatives.
Q14	I believe that vaccination against the new coronavirus can prevent economic and labor losses due to the new coronavirus pneumonia.
Q15	I think the new coronavirus vaccine will cause me to develop COVID-19 instead.
Q16	I think the outbreak is under control in China, so there is no need for the new coronavirus vaccine.
Q17	Do you think that the new coronavirus vaccine will prevent new coronavirus pneumonia (which is a very serious disease)?
Q18	Do you think it is better to get immunity from COVID-19 than from the new coronavirus vaccine?
Q19	Do you think the fewer vaccinations you receive at the same time, the better?
Q20	I may have serious side effects if I get the new coronavirus vaccine.
Q21	The new coronavirus vaccine is necessary to protect our health.
Q22	The new coronavirus vaccine provides good protection against the novel coronavirus pneumonia.
Q23	The new coronavirus vaccine is safe.
Q24	If I am not vaccinated against COVID-19, I may develop COVID-19 and cause others to contract the disease.
Q25	Specifically, for the new coronavirus vaccine, do you think it is necessary?
Q26	Specifically, in relation to the new coronavirus vaccine, do you think it is important?
Q27	Specifically, for the new coronavirus vaccine, do you consider it to be safe?
Q28	Specifically, for the new coronavirus vaccine, do you think it is effective?
Q29	Specifically, for the new coronavirus vaccine, do you think it is easy to get it?
Q30	Would you be willing to receive or make an appointment to receive the new coronavirus vaccine if it becomes available?