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An Investigation of the South Khorasan Residents' Attitude toward COVID-19 Vaccination

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ABSTRACT

Introduction: Vaccination against severe acute respiratory syndrome coronavirus (SARS-CoV-2) plays a major role in the global fight against the COVID-19 pandemic. However, the availability of and access to a safe COVID-19 vaccine alone may not be sufficient to curb the epidemic. Vaccine hesitancy—including delays and refusals—remains a major obstacle to achieving herd immunity. This study aimed to investigate public attitudes toward the COVID-19 vaccine. **Methods:** This descriptive and analytical study was conducted on 1,544 individuals over 30 years of age in South Khorasan Province, selected via convenience sampling through the SIB system. Data were collected using a questionnaire to measure attitudes, administered via telephone interviews. Statistical analyses included mean and standard deviation, frequency and percentage distributions, chi-square tests, independent samples t-tests, and logistic regression analyses, with a significance level set at $P < 0.05$. **Results:** The findings revealed variations in vaccination rates across demographic categories, including gender, education level, marital status, occupation, and place of residence. Key factors influencing hesitancy included doubts about the accuracy of vaccine-related information, strong fears of vaccination, and the belief that individuals who had not contracted COVID-19 were naturally resistant and did not require vaccination. **Conclusion:** Public attitudes, doubts, and concerns regarding the COVID-19 vaccine significantly impact vaccination coverage rates. Therefore, understanding the reasons behind vaccine hesitancy is essential for designing targeted interventions.

INTRODUCTION

Since the end of 2019, COVID-19 has become a global threat to public health (1). Preventive behaviors play a crucial role in controlling the disease (2). However, vaccines offer the best hope for ending the pandemic (3), and vaccination remains a key strategy to achieve this (4). Vaccination can effectively control the disease when a significant portion of the population willingly receives it (3). Yet, the availability of vaccines does not guarantee widespread public uptake. Vaccine hesitancy and opposition pose major obstacles to vaccination efforts (5). When a new vaccine is introduced, doubts about its safety and efficacy often arise (6). In fact, vaccine skepticism was identified as one of the top ten global health threats in 2019. A major factor contributing to these doubts is misinformation (7). Concerns about vaccines are closely tied to public attitudes (7), which are shaped not only by knowledge (8) but also by socio-ecological factors such as demographics, individual characteristics, and social and organizational influences (9).

With the rapid development of COVID-19 vaccines and the production of various vaccine types worldwide, safety concerns have emerged (5). Additionally, the variety of available vaccines can influence public attitudes toward vaccination (3). Even among healthcare workers, hesitancy exists; however, those caring for COVID-19 patients or considering themselves at high risk report greater willingness to accept a vaccine if available (5). Attitudes are influenced not only by knowledge (8) but also by individual factors such as age, sex, income, education level (6, 9), and place of residence (10). Other key factors include the opinions of influential people, perceived behavioral control regarding vaccination (7), risk perception of the disease (5), health responsibility, and social cohesion (8).

Beyond the initial two-dose regimen, improving public attitudes toward booster doses is critical, especially given the waning protective effects of vaccines over time (11). Understanding varying attitudes toward vaccination and its necessity is essential for designing effective interventions (9). Assessing public attitudes—including reasons for vaccine acceptance or refusal—can help health planners develop targeted strategies to improve vaccination coverage. Therefore, this study aimed to investigate public attitudes toward the COVID-19 vaccine in South Khorasan Province in 2021.

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MATERIALS AND METHODS

Ethics Statement

This study was part of a research project approved by the Ethics Committee of Birjand University of Medical Sciences (approval code: IR.BUMS.REC.1400.410). All participants provided informed consent, and data were collected anonymously to ensure confidentiality.

Study Design

This descriptive-analytical study employed a cross-sectional design and was conducted from November to December 2021 in five cities of South Khorasan Province (Nehbandan, Darmian, Zirkouh, Qain, and Tabas), selected due to their lower-than-average COVID-19 vaccination rates relative to the provincial average. The study included 1,544 participants aged 30 years or older to assess attitudes toward the COVID-19 vaccine. Participants were recruited through convenience sampling using data from the SIB system. Sample sizes were allocated proportionally based on each city's population: Nehbandan, Darmian, and Zirkouh each contributed 200 participants, while Qain and Tabas provided 500 and 400 participants, respectively. **Inclusion criteria** comprised: (1) age ≥30 years, (2) residence in South Khorasan Province, (3) availability of personal records in the SIB system, and (4) sufficient mental and communicative capacity to respond to the questionnaire. The sole **exclusion criterion** was unwillingness to participate. Trained health experts administered the questionnaire via structured telephone interviews.

Data Collection Tool

This study utilized two questionnaires for data collection. The first was a 6-item demographic questionnaire assessing age, gender, occupation, marital status, education level, and place of residence. The second was an 8-item attitude scale developed by the Education and Health Promotion Office of the Ministry of Health. Due to the distinct cultural context of South Khorasan province, the research team conducted rigorous validation, obtaining a Content Validity Index (CVI) of 0.79 and Content Validity Ratio (CVR) of 0.45. Reliability analyses demonstrated strong psychometric properties, with Cronbach's alpha of 0.75 indicating good internal consistency and an intraclass correlation coefficient (ICC) of 0.90 showing excellent test-retest reliability. For scoring, responses were coded dichotomously, with positive answers assigned a value of 1 and negative answers scored as 2.

Statistical Analysis

Following data collection, all questionnaire responses were entered into SPSS version 19 (IBM, USA) for analysis. Quantitative variables were summarized using means and standard deviations, while qualitative variables were described using frequencies and percentages. Comparative analyses between vaccinated and non-vaccinated groups were conducted using chi-square tests for categorical variables and independent samples t-tests for continuous variables. To examine the relationship between vaccination status and attitudinal factors, we performed logistic regression analysis to calculate odds ratios with 95% confidence intervals. All statistical tests were two-tailed and conducted at a significance threshold of $P < 0.05$, with results considered statistically significant when meeting this criterion.

RESULTS

COVID-19 Vaccination Rates across Different Demographic Groups

The study included 1,544 participants from South Khorasan Province, representing all available individuals given both public sensitivity to COVID-19 and health system follow-up protocols. Participants had a mean age of 39.69 years (SD = 17.99). Educational attainment analysis revealed that 56.7% of respondents held qualifications below diploma level. Regarding vaccination status, 57.3% (n = 884) remained unvaccinated at the time of data collection, while 42.7% (n = 660) had received at least one dose of the COVID-19 vaccine.

Table 1. Comparison of the frequency of the rate of Covid-19 vaccination based on demographic variables

Variable		Vaccinated		Not vaccinated		*P*-Value*
		n	%	N	%	
Sex	Female	388	58.9	463	52.4	0.012
	Male	271	41.1	420	47.6	
Marital Status	Single	115	17.4	210	23.8	0.003
	Married	545	82.6	674	76.2	
Residence	Urban	209	31.7	366	41.4	<0.001
	Rural	451	68.3	518	58.6	
Education	Illiterate	117	17.8	99	11.2	<0.001
	High school	323	49.1	550	62.3	
	Diploma and higher	127	19.3	172	19.5	
	Bachelor's degree and higher	91	13.8	62	7	
Employment	Unemployed	389	59.2	520	59	<0.001
	Retired	17	2.6	31	3.5	
	Permanent job	85	12.9	36	4.1	
	Freelancer	166	25.3	294	33.4	
Marital status	Single	21	8.6	24	15.5	0.034
	Married	223	91.4	131	84.5	

***Chi-square test *P*-value**

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The analysis revealed statistically significant associations between all examined demographic variables and vaccination status. Vaccination rates were significantly higher among: women (compared to men), married individuals (versus single), rural residents (relative to urban), those with no formal education or holding bachelor's degrees/higher qualifications, permanent employees, and elderly individuals living with family members. Conversely, vaccine hesitancy was more prevalent among: male participants, single individuals, urban residents, those with diploma-level education or lower, self-employed workers, and elderly persons living alone (Table 1). These patterns demonstrate clear sociodemographic disparities in COVID-19 vaccine uptake within the study population.

Differential COVID-19 Vaccination Rates Among Those with Positive vs. Negative Views

The analysis demonstrated a significant positive association between overall attitude scores and vaccination uptake ($p < 0.001$). For each unit increase in attitude score, participants were 2.13 times more likely to be vaccinated (95% CI: 1.94-2.35). This dose-response relationship indicates that more favorable attitudes toward vaccination consistently predicted higher vaccination rates within the study population (Table 2).

Table 2. Comparison of the rate of Covid-19 vaccination in those with positive and negative attitudes towards vaccination

Item		Vaccinated		Not vaccinated		*P*-Value*
		n	%	n	%	
If I receive Covid-19 vaccine, I will suffer serious complications.	Yes	460	84.1%	87	15.9%	<0.001
	No	418	42.2%	572	57.8%	
I think only Iranian vaccines are effective against the Covid-19.	Yes	158	65.8%	82	34.2%	0.002
	No	707	55.1%	576	44.9%	
People are protected against Covid-19 with traditional medicine and no vaccine is needed.	Yes	192	79.7%	49	20.3%	<0.001
	No	689	53.2%	607	46.8%	
I am really afraid of vaccination.	Yes	396	86.1%	64	13.9%	<0.001
	No	488	45%	596	55%	
Vaccinating all people is not effective against the Covid-19.	Yes	208	73.5%	75	26.5%	<0.001
	No	676	53.7%	584	46.3%	
People who have never had the virus are more resistant to the virus and do not need to be vaccinated.	Yes	152	85.4%	26	14.6%	<0.001
	No	729	53.5%	633	46.5%	
People already afflicted with the disease do not need the vaccination anymore.	Yes	128	82.1%	28	17.9%	<0.001
	No	754	54.5%	630	45.5%	
I doubt the accuracy of the information exchanged, so I have no intention of vaccination.	Yes	292	92.1%	25	7.9%	<0.001
	No	591	48.2%	635	51.8%	
***: Chi-square test *P*-value**						

The most frequently cited reasons for vaccine refusal

Analysis of vaccination barriers revealed distinct gender differences in reported reasons for refusal. Among male participants, the predominant concern was fear of vaccine side effects, while female participants most frequently cited high workload as their primary barrier to vaccination (Table 3). These findings highlight the need for gender-tailored interventions addressing these specific concerns to improve vaccine uptake.

Table 3. Frequency of reasons for refusing to inject booster doses of the vaccine

Reason for refusal	Men		Women		Total
	N	(%)	N	(%)	
Not knowing when to inject the third dose	9	3.7	6	2.5	3.07
Fear of vaccination side effects	59	24.1	78	32	28.02
Lacking trust in vaccines	33	13.5	44	18	15.75
Special vaccine applicant	31	12.7	31	12.7	12.68
Comorbidities	22	9	9	3.7	6.34
Being symptomatic or testing positive	20	8.2	24	9.8	9.00
high work load	47	19. 2	36	14.8	16.97
false belief	9	3.7	1	0.4	2.04
Low risk perception	6	2.4	4	1.6	2.04
other items	9	3.7	11	4.5	4.09
Total (N)	245		244		489

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DISCUSSION

Despite the production and widespread availability of COVID-19 vaccines globally, vaccine hesitancy remains a significant challenge in controlling the pandemic (3). Both demographic characteristics and personal factors influence vaccine attitudes (9, 10). The present study found higher vaccination rates among women than men. This contrasts with multiple studies demonstrating that men generally exhibit more positive attitudes toward COVID-19 vaccination (5, 7, 12–14). Regarding employment status, permanent employees showed higher vaccination uptake. Existing literature supports this finding, particularly among healthcare workers caring for COVID-19 patients, who demonstrated greater vaccination willingness (5, 15). However, Vecchia's Italian study found lower vaccine acceptance among workers and farmers compared to teachers, office employees, and managers (16). Concerning education levels, this study found higher vaccine acceptance among less-educated individuals, aligning with some existing research (14). However, other studies report either lower acceptance among university-educated populations (12) or no significant education-vaccination correlation (7). While some literature suggests that higher education fosters belief in vaccines' protective benefits (7, 15), one study on parental vaccine decisions for children found that being married and holding a university degree positively correlated with child vaccination approval (17).

The present study revealed higher COVID-19 vaccine acceptance among rural residents, consistent with findings demonstrating greater vaccine skepticism in urban areas (10, 12). However, Babicki *et al.* found no association between vaccination acceptance and place of residence, suggesting these discrepancies may stem from varying sociocultural contexts across populations. Similar to other studies (7, 13, 14, 18, 19), our results showed greater vaccine uptake among elderly individuals, particularly those living with family members.

To improve vaccination coverage, targeted interventions should prioritize individuals with diploma-level education or lower, freelance workers, male populations, single individuals and urban residents Elderly living alone.

The study assessed vaccine attitudes through an 8-item questionnaire comparing vaccinated and unvaccinated groups. Notably, 92.1% of hesitant respondents endorsed the statement "I doubt, that's why I don't vaccinate." Comparable studies in Egypt found 67.5% of participants expressed moderate vaccine mistrust, with 12.3% reporting severe distrust (12). Widespread misinformation, particularly through social media, significantly fuels vaccine skepticism (7). These platforms directly and indirectly amplify vaccine doubts, as evidenced by an Italian study where 31.1% of participants reported vaccine-related uncertainties.

Among respondents, 71.9% obtained vaccine information from television, 43.4% from newspapers, 39.2% from corporate websites, and 18.9% from social media. A statistically significant relationship emerged between information sources and vaccine skepticism. Social media users showed 40.8% higher skepticism, while corporate website users demonstrated 24.2% lower skepticism (20). A social media analysis in India revealed that 17% of COVID-19 vaccine-related messages conveyed negative views (21). These findings underscore the need to: 1) enhance public awareness about collective protection efforts (8), 2) implement comprehensive education campaigns on vaccine safety and efficacy (5), and 3) engage media support to foster positive vaccine attitudes (7).

In our study, 86.1% of unvaccinated individuals reported substantial fear of vaccination. Participants without prior influenza vaccination or with previous vaccine side effects exhibited greater COVID-19 vaccine fear and doubt (7, 18). Notably, 84.1% of unvaccinated participants feared serious vaccine complications, aligning with studies identifying safety concerns as a primary barrier to vaccination (3, 10, 12, 15, 19, 22). Regarding the statement "Unexposed individuals develop natural virus resistance," 85.4% of unvaccinated respondents questioned vaccine efficacy (4, 5, 20, 23). Conversely, comorbidities increased vaccine acceptance due to heightened perceived COVID-19 risk (4, 14, 20).

Unvaccinated participants endorsed several misconceptions: 79.7% believed traditional medicine alone provided sufficient protection, 73.5% considered mass vaccination ineffective, and 54.5% thought previously infected individuals didn't require vaccination. Parallel findings from Pakistan showed 48.4% trusted natural immunity, while 39.9% relied solely on protective measures (24). Interestingly, although women more consistently practiced preventive behaviors (mask-wearing, hand hygiene, social distancing), they showed greater skepticism about vaccine protection (7).

Public attitudes toward COVID-19 vaccines have been significantly influenced by beliefs about their safety and effectiveness. In this study, 65.8% of unvaccinated participants believed only Iranian vaccines were effective against COVID-19. This finding aligns with Pogue's study in America, where 55.11% of respondents preferred their national vaccine (3). However, another study found that 61.8% of participants distrusted China's pandemic control interventions (1). Research in Egypt revealed distinct vaccine preferences: 27.1% favored the Pfizer vaccine, 6.9% preferred the Chinese vaccine, and 4.5% chose AstraZeneca (12). Key factors affecting vaccine acceptance include: Doubts about vaccine authenticity, Distrust in pharmaceutical companies, Concerns about health systems' pandemic control capacity (21)

Notably, such distrust is more prevalent among ethnic minorities (22). These findings emphasize the need to provide reliable vaccine information, combat misinformationand strengthen public trust in healthcare systems.

Vaccine acceptance strongly correlates with public attitudes (4, 7, 19, 22). Our study found vaccinated individuals had significantly higher attitude scores than unvaccinated participants (OR=2.13, $p<0.001$), with each attitude score increase raising vaccination likelihood by 2.14-fold. This aligns with Cordina's finding that belief in vaccine protection strongly predicted willingness for vaccination ($r=0.79$, $p<0.05$) (7). Primary reasons for refusing booster doses were:

- Fear of side effects (28.02%)
- High workload (16.97%)
- Vaccine distrust (15.75%)

These concerns mirror other studies' findings (3, 5, 15, 19, 21), including a Pakistani study where 32.2% feared complications (24). However, the workload barrier (16.97%) appears unique to our study, potentially reflecting cultural or logistical differences in vaccination processes. Distrust levels in our study (15.75%) were comparable to British research (16%) (22) and Egyptian findings (12.3%) (12). Such variations may stem from cultural, demographic, psychological, or temporal differences between studies.

In conclusion, Public attitudes toward COVID-19 vaccination significantly influence vaccine acceptance rates, underscoring the need for targeted interventions to improve these

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perceptions. Effective strategies must prioritize both access to accurate, compelling vaccine information and equitable availability of all vaccine types across diverse communities and time points. These measures are critical for enhancing vaccination coverage and mitigating the pandemic's impact. Furthermore, health authorities should develop tailored educational and logistical initiatives that account for population-specific characteristics and needs to optimize vaccination outcomes.

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CONFLICT OF INTEREST

The authors declare they have no conflict of interests.

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