

Mandatory or Voluntary COVID-19 Vaccination: Insights into the Knowledge, Attitude and Perception among Healthcare Workers at a Nursing College in South Africa

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12 Abstract

13 Vaccine hesitancy has emerged as a significant global challenge impacting healthcare
 14 institutions, workplaces and governments alike. Despite concerted efforts by the
 15 government and numerous other institutions in South Africa, low vaccination rates
 16 persist (33% as of November 13, 2023), reflecting the persistence of this global
 17 challenge. This challenge is particularly pronounced in educational institutions such
 18 as institutions of higher learning in South Africa, where many people converge,
 19 increasing the risk of viral exposure. This study aims to assess the knowledge,
 20 attitudes, and perceptions of healthcare workers (HCWs) at a Nursing College
 21 regarding voluntary and mandatory COVID-19 vaccination. Employing a quantitative
 22 approach, a survey with closed-ended Likert-type questions was administered to 504
 23 individuals at the College. The sample size of 218 respondents was calculated based on
 24 a margin of error of 5%, a confidence level of 95%, and an additional 25% contingency
 25 for potential incomplete data, resulting in a final representative sample of 270
 26 respondents. The Statistical Package for Social Sciences (SPSS) was used for the
 27 analysis. Findings indicate a high uptake of voluntary COVID-19 vaccinations among
 28 HCWs, with some being mandated. Most HCWs demonstrated a strong commitment to
 29 safeguarding themselves and others. Despite concerns, HCWs thought the COVID-19
 30 vaccines were effective, and their views were supported by a low level of infection
 31 among the participants, underscoring its efficacy in preventing transmission. Effective
 32 communication emerged as a critical factor in addressing post-vaccination behaviours
 33 and enhancing vaccine acceptance. However, the findings also highlighted the need for
 34 tailored outreach strategies to specific audiences, such as pregnant women, and the
 35 importance of addressing concerns about adverse effects through clear and open
 36 communication. Several factors influencing the choice between mandatory and
 37 voluntary vaccination were identified, including eligibility concerns, religious
 38 convictions, and financial considerations. Notably, concerns about safety and
 39 knowledge gaps outweighed these factors, suggesting the need for targeted educational
 40 initiatives to bolster vaccine acceptance. In conclusion, this study provides valuable
 41 insights into the dynamics of vaccination acceptance among an influential occupational
 42 group, with implications for the acceptance of other vaccines. Vaccination efforts can
 43 be strengthened by addressing concerns, enhancing communication strategies, and
 44 tailoring outreach efforts to promote public health in light of future outbreaks.

45
 46 **Keywords:** vaccine hesitancy, vaccine uptake, vaccination acceptance, disease
 47 prevention, risk reduction

48 **Author summary**

49 Conception and design of the study: LM, TS
 50 Data acquisition: LM
 51 Data analysis: LM
 52 Interpretation of the data: LM, TS
 53 Drafting of the paper: LM
 54 Critical revision of the paper: TS
 55 Both authors approved the final manuscript

57 **Introduction**

58 The evaluation of healthcare workers' (HCWs) views on voluntary and mandatory
 59 COVID-19 vaccination exposes various factors that impact their decision to get
 60 vaccinated. Research suggests that a notable portion of HCWs have an understanding
 61 of COVID-19 vaccines, which is a key determinant in their willingness to be vaccinated.
 62 For instance, a study conducted at a hospital in southern Nigeria showed that 76.6% of
 63 HCWs had good knowledge about COVID-19 vaccines, and 63% expressed readiness to
 64 receive the vaccine. Factors like age, sex, duration of employment and knowledge about
 65 the vaccines were found to influence their willingness.¹ Similarly, in Ghana, over half of
 66 HCWs were knowledgeable about COVID-19 vaccination. The majority held positive
 67 views on its efficacy, as evidenced by 85.9% having received at least one vaccine dose.²
 68 While HCWs generally have a positive attitude towards vaccination, initial hesitancy
 69 among some is not uncommon. The latter is corroborated by the findings of another
 70 study where 93.3% of HCWs got vaccinated, with 24.2% initially hesitant but later
 71 swayed by reliable information.³ In Morocco, 93.3% of healthcare professionals were
 72 inoculated, with 53.1% opting for vaccination voluntarily, highlighting the significance
 73 of acceptance.⁴
 74 In Indonesia, the perceptions of the COVID-19 vaccine were good however, their belief
 75 in its effectiveness was contrary. This highlights the importance of implementing
 76 strategies to reduce hesitancy and build trust.⁵ The views on vaccination vary among
 77 HCWs, with some expressing worries about long-term effects and profit-driven
 78 motives. Such concerns were revealed in a Malaysian study despite a low vaccine
 79 hesitancy.⁶ Other issues flagged among the Indian population were the lack of
 80 confidence in the vaccination and fear of side effects which influenced the uptake of
 81 booster doses. Furthermore, demographic factors like age, sex and residence are
 82 significant predictors.⁷ The influence of HCWs on public attitudes towards vaccination
 83 cannot be underestimated; their acceptance and endorsement of vaccines are crucial
 84 for achieving herd immunity and ensuring healthcare services.⁸ Research from Greece
 85 indicates that training HCWs and health science students on evidence-based practices
 86 is vital for improving vaccine uptake.⁹ While the level of knowledge and positive

attitudes towards COVID-19 vaccination in report studies is promising, understanding the knowledge, attitudes and perceptions in a multiracial country like South Africa is important so that interventions are targeted among HCWs to address the specific issues pertaining to vaccine hesitancy. By taking this approach, healthcare workers will be able to make an impact on public health initiatives aimed at managing other emerging vaccine-related diseases. Therefore, this study aimed to assess the knowledge, attitude, and perceptions of HCWs at a Nursing College in South Africa regarding voluntary and mandatory COVID-19 vaccination. It also aimed to assess vaccination uptake, understand demographic influences, explore attitudes, and identify factors influencing the choice between mandatory and voluntary vaccination.

Materials and methods

Study design

This study used a quantitative cross-sectional research approach.

Study setting

The research site is a publicly funded Nursing College situated in the Mpumalanga Province, South Africa that provides training for nurses. The respondents were employed at the research location and had convenient access to vaccination facilities. They gained valuable knowledge about the factors that may impact individuals' decision to be vaccinated. The college's suggestion for compulsory vaccination brought extra importance, adding to the current discussion on the choice between voluntary and mandatory immunisation.

Study population

The study population included HCWs and nursing students enrolled at the college. The categories included the Diploma in General Nursing (R171) students, Degree in General Nursing (R425), totalling 504 individuals. Since nursing students are in the process of becoming fully qualified nurses, their involvement in patient care and the healthcare environment means they are recognised as part of the broader healthcare workforce in South Africa and thus is covered in the title by Healthcare workers. Individuals aged 18 years and above of both sexes and those who were eligible for the COVID-19 vaccination according to the National Department of Health Guidelines (SA Department of Health, 2023) met the inclusion criteria.¹⁰ The study adopted a stratified random sampling, ensuring that each group was represented. The sample size of 218 respondents was calculated based on a margin of error of 5% and a confidence level of 95%. Adding an additional 25% contingency for incomplete data brought the total sample size to 270 respondents, thus forming a representative sample. This sample

size was allocated to each stratum based on proportional representation from the university population.

Data collection and analysis

A closed-ended Likert-type questionnaire was utilised (S1 file). The questionnaire covered demographics, vaccination prevalence and statements related to HCWs' knowledge, perceptions and attitudes toward voluntary and mandatory COVID-19 vaccination. The questionnaire was designed based on a comprehensive literature review and theoretical framework that identified key factors influencing COVID-19 vaccine hesitancy and acceptance. The questionnaire was piloted on ten people who were excluded from the main study. The pilot research results indicated a Cronbach's alpha value over 0.7, confirming the consistency and reliability of the findings. Google Forms was used during the anonymised survey to collect data. A link was distributed to all students and staff randomly selected through the College email system. Follow-ups were done through email reminders three days after the questionnaire had been sent. Each respondent was expected to take 15 minutes to complete the survey. The questionnaire was administered to respondents over a period of one month, from 1 October 2023 to 31 October 2023.

Data underwent a cleaning process where incomplete surveys were eliminated and coded before being exported to the Statistical Package for Social Sciences (SPSS) (IBM, United States) for analysis. The uptake of COVID-19 vaccines among HCWs was described using measures of central tendency and measures of dispersion as of November 2023. It was also used to assess the respondents' level of knowledge, attitude and views on voluntary and mandated COVID-19 vaccines. Inferential analyses were conducted to ascertain if there were variations in the knowledge, attitude and views of HCWs about voluntary and required COVID-19 vaccines based on socio-demographic variables. Factor analysis was used to discover the characteristics or attitudes that predict volunteer immunisations.

Ethical statement

Ethical clearance was obtained from the University of Johannesburg's Ethics Review Committee [ethical clearance number REC 2298-2023]. Ethical principles, including prevention of harm, confidentiality, the right to withdraw and permission-seeking, were strictly adhered to. In addition, written informed consent was obtained from participants.

Results

Demographic profile of respondents

The demographic profile of the 372 study respondents shows a predominance of young, single female students (table 1). The largest age group is 26-40 years, and most respondents are students. There is a significant gender imbalance, with a much higher proportion of female respondents. Marital status is mostly single, and other occupations besides students are minimally represented. This demographic profile suggests the study may be conducted in an educational setting focusing on young adult female students.

Table 1 Demographic characteristics of the study respondents (N = 372).

Characteristics	Number	Percent (%)
Participant's Age		
18 - 25 years	75	20.2
26 - 40 years	144	38.8
41 - 55 years	136	36.7
Above 55 years	16	4.3
Gender of Health Workers		
Male	70	18.8
Female	302	81.2
Marital status		
Single	252	67.9
Married	103	27.8
Divorced	6	1.6
Widowed	10	2.7
Occupation		
Student	344	92.5
Academic staff	21	5.6
Admin and support staff	7	1.9

COVID-19 vaccination and infection status

Table 2 shows that most of the respondents surveyed were vaccinated for COVID-19, with 28.1% getting booster shots while 42.4% were vaccinated without receiving their boosters. A smaller group were awaiting their second vaccination dose. Slightly less than a quarter (23.2) had not been vaccinated. The decision to get vaccinated was mainly left to the individuals (72.0%). There were instances of infection both before and after vaccination, highlighting the risks and the importance of booster shots for added protection.

Table 2 COVID-19 vaccination and infection status among respondents.

Characteristics	Number	Percent (%)
Vaccination status (N = 370)		
Fully vaccinated (including boosters)	104	28.1
Fully vaccinated (no boosters)	157	42.4
Vaccinated but awaiting 2 nd dose	23	6.2
Not vaccinated	86	23.2
Mandatory vs voluntary vaccination (N = 275)		
Mandatory	77	28.0
Voluntary	198	72.0
COVID-19 infections (N = 371)		

Yes (before vaccination/not vaccinated)	93	25.1
Yes (after vaccination)	52	14.0
No	226	60.9

187

188

189 Respondents' knowledge of COVID-19 vaccinations

190 The Likert Scale responses in Table 3 highlight a range of knowledge levels among
 191 participants regarding COVID-19 vaccinations. While 43.2% of those surveyed
 192 acknowledged the effectiveness of the vaccines, there is still scepticism, with 27.1%
 193 expressing disagreement. The majority (88.6%) recognised the importance of
 194 continuing measures post-vaccination. Opinions on the vaccine's ability to prevent
 195 illness were split, with 57.5% in agreement and 24.8% in disagreement. The topic of
 196 implementing restrictions based on vaccination status varied, with 50.3% against and
 197 35.1% in favour. Awareness of a vaccine information website in South Africa was high,
 198 with 80.1% agreeing with its existence. Concerning side effects, 87.6% believed there
 199 could be effects, while only 6.9% disagreed with this notion. Responses regarding
 200 vaccinating individuals with existing conditions showed mixed views, with 61.9%
 201 being supportive while 21.5% were against it. Views on vaccinating women garnered
 202 feedback, with 42.2% in favour and 39.4% opposing it. The majority (66.0%) believed
 203 that side effects typically diminish within days after vaccination; however, concerns
 204 about long-term health issues had perspectives 41.7% agreed and 30.1% disagreed.

Table 3 Likert Scale participant responses to knowledge on COVID-19 vaccinations (N = 372).

No.	Knowledge Statements	M (SD)	Likert Scale Responses (n, %)				
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
K1	COVID-19 vaccines are effective at keeping you from getting COVID-19.	3.15 (1.27)	59 (16.0%)	41 (11.1%)	109 (29.6%)	103 (28.0%)	56 (15.2%)
K2	Maintain the regulations for preventing COVID-19 after vaccination (e.g. social distancing).	4.34 (0.90)	7 (1.9%)	14 (3.9%)	20 (5.5%)	129 (35.6%)	192 (53.0%)
K3	COVID-19 vaccine will also help keep you from getting seriously ill even if you get COVID-19.	3.48 (1.29)	37 (10.2%)	53 (14.6%)	64 (17.7%)	115 (31.8%)	93 (25.7%)
K4	Fully vaccinated people are allowed to do everything while those not fully vaccinated have restrictions.	2.74 (1.38)	86 (23.8%)	96 (26.5%)	53 (14.6%)	79 (21.8%)	48 (13.3%)
K5	There is a website where you can apply for vaccination in South Africa.	4.12 (0.95)	7 (1.9%)	19 (5.2%)	46 (12.7%)	142 (39.2%)	148 (40.9%)
K6	Like all other vaccines, this vaccine has the potential for some side effects.	4.32 (0.96)	11 (3.0%)	14 (3.9%)	20 (5.5%)	119 (32.9%)	198 (54.7%)
K7	Vaccines can be given to a person with pre-existing health conditions.	3.57 (1.19)	24 (6.6%)	54 (14.9%)	60 (16.6%)	139 (38.4%)	85 (23.5%)
K8	The vaccine can be given to pregnant women.	2.99 (1.38)	73 (20.1%)	70 (19.3%)	67 (18.5%)	95 (26.2%)	58 (16.0%)
K9	If there are side effects due to COVID-19 vaccination, they normally go away in a few days.	3.69 (1.18)	26 (7.2%)	36 (9.9%)	61 (16.9%)	139 (38.4%)	100 (27.6%)

K10	The COVID-19 vaccine can create long-term physical and health problems.	3.21 (1.26)	38 (10.5%)	71 (19.6%)	102 (28.2%)	79 (21.8%)	72 (19.9%)
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m – mean; SD – standard deviation

205 Respondents' attitudes and perceptions towards mandatory and voluntary 206 vaccination

207 The responses on the Likert Scale in Table 4 show the attitudes and perceptions
208 regarding COVID-19 vaccinations among the participants. A significant number
209 (86.6%) showed concern about the pandemic. In contrast, only a small percentage,
210 1.7%, strongly disagreed. When it comes to the safety and effectiveness of the COVID-
211 19 vaccine, 54.2% agreed, while 14.2% disagreed. The need to get vaccinated was
212 acknowledged by 59.2% who agreed, although some (17.0%) disagreed. There was a
213 level of awareness that family and neighbours should receive the vaccine, with 81.2%
214 agreeing on this point. Many also felt motivated to encourage others to get vaccinated,
215 with 72.6% agreeing. A significant portion (68.9%) believed that vaccination could help
216 curb the spread of COVID-19, with a minority (10.2%) disagreeing. Nearly half (49.0%)
217 of the respondents felt uninformed about vaccines. Some hesitancy towards
218 vaccination was observed among respondents, with one-third agreeing. Regarding
219 opinions on mandatory vaccination for HCWs, 46.3% agreed however, slightly fewer
220 respondents disagreed (40.3%). On the contrary, opinions on the necessity of
221 mandatory vaccination for all South Africans varied, with fewer agreeing (36.6%) than
222 those disagreeing (44.3%).

Table 4 Likert Scale participant responses regarding attitudes and perceptions towards COVID-19 vaccinations (N = 372).

No.	Attitude and Perception Statements	M (SD)	Likert Scale Responses (n, %)				
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I am concerned about the COVID-19 pandemic.	4.26 (0.85)	6 (1.7%)	8 (2.2%)	34 (9.5%)	149 (41.6%)	161 (45.0%)
2	I think that the COVID-19 vaccine is safe and effective.	3.54 (1.06)	18 (5.0%)	33 (9.2%)	113 (31.6%)	124 (34.6%)	70 (19.6%)
3	If I am eligible for the vaccine, I need to take it as soon as possible.	3.59 (1.14)	23 (6.4%)	38 (10.6%)	85 (23.7%)	129 (36.0%)	83 (23.2%)
4	I am aware that my family and neighbours should take the vaccine.	4.11 (0.95)	12 (3.2%)	10 (2.7%)	48 (12.9%)	158 (42.5%)	144 (38.7%)
5	I should motivate my family and neighbours to take the vaccine.	3.92 (1.09)	19 (5.1%)	19 (5.1%)	64 (17.2%)	142 (38.2%)	128 (34.4%)
6	I think vaccination will help us stop the spread of COVID-19.	3.80 (1.10)	19 (5.1%)	29 (7.8%)	68 (18.3%)	149 (40.1%)	107 (28.8%)
7	I think I'm not informed enough about vaccines.	2.70 (1.27)	75 (20.2%)	107 (28.8%)	81 (21.8%)	71 (19.1%)	38 (10.2%)
8	Are you hesitant to take the COVID-19 vaccine?	2.89 (1.35)	71 (19.1%)	87 (23.4%)	89 (23.9%)	63 (16.9%)	62 (16.7%)
9	Should the vaccine be mandatory for healthcare workers?	3.08 (1.52)	86 (23.1%)	64 (17.2%)	50 (13.4%)	78 (21.0%)	94 (25.3%)

10	Should the vaccine be mandatory for all South Africans?	2.83 (1.45)	98 (26.3%)	67 (18.0%)	71 (19.1%)	72 (19.4%)	64 (17.2%)
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m – mean; SD – standard deviation

223 Association between sociodemographic characteristics and HCWs KAP

224 The study examined the knowledge, attitudes, and perceptions of HCWs towards
225 voluntary and mandatory COVID-19 vaccinations, focusing on sex and age differences
226 (Table 5). Analysis revealed that sex did not significantly impact attitudes and
227 perceptions, knowledge, or vaccine hesitancy, indicating similar levels of
228 understanding and acceptance between male and female HCWs. The ANOVA results
229 showed no significant sex-based differences in attitudes ($F = 2.335$, $p = 0.127$),
230 knowledge ($F = 0.002$, $p = 0.962$), or hesitancy ($F = 0.988$, $p = 0.321$).

231

232 Conversely, age significantly influenced attitudes and perceptions ($F = 5.629$, $p = 0.001$),
233 suggesting that older HCWs might have different views than their younger
234 counterparts. While the knowledge about COVID-19 vaccinations showed a trend
235 towards significance with age ($F = 2.005$, $p = 0.113$), it was not statistically significant,
236 implying potential age-related differences in understanding. Vaccine hesitancy was not
237 significantly affected by age ($F = 1.941$, $p = 0.123$), indicating that reluctance to
238 vaccinate was consistent across different age groups (Table 5). These findings suggest
239 that educational programmes could be tailored to address specific concerns across age
240 groups to enhance vaccine acceptance.

241

242 **Table 5 ANOVA Results for Mean Groups Based on Gender and Age.**

Variable	Source	Sum of Squares	Mean Square	F	Sig.
Attitudes and Perceptions	Gender	1.084	1.084	2.335	0.127
	Age (Between Groups)	7.606	2.535	5.629	0.001
	Age (Within Groups)	165.304	0.450		
Knowledge	Gender	0.001	0.001	0.002	0.962
	Age (Between Groups)	1.956	0.652	2.005	0.113
	Age (Within Groups)	119.338	0.325		
Vaccine Hesitancy	Gender	0.660	0.660	0.988	0.321
	Age (Between Groups)	3.856	1.285	1.941	0.123
	Age (Within Groups)	243.086	0.662		

243

244

245 Factors Influencing COVID-19 Vaccination Hesitancy: Summary of Exploratory 246 Factor Analysis

247 The study explored factors influencing COVID-19 vaccination hesitancy among
248 respondents using exploratory factor analysis (EFA) on Likert scale statements (Table

6). The Kaiser-Meyer-Olkin (KMO) measure confirmed sampling adequacy with a value of 0.755, and Bartlett's test of sphericity was significant, indicating suitable conditions for factor analysis ($\chi^2 = 483.602$, $df = 15$, $p < 0.001$). A single factor was identified, explaining 34.4% of the variance, with prominent loadings on fear of side effects (0.679) and insufficient knowledge (0.671), highlighting key contributors to vaccine hesitancy. Communalities analysis showed that concerns about eligibility, knowledge, and side effects saw increased explanation post-extraction, while cost and religious beliefs showed lesser impacts.

Table 6 Factor Analysis Results for factors influencing COVID-19 vaccine hesitancy.

Analysis Results	Values	Variables	Factor Loadings	Communalities
KMO Measure	0.755	Fear of Side Effects	0.679	Initial: 0.383
Bartlett's Test (χ^2)	483.602 (p < 0.001)	Insufficient Knowledge	0.671	Extraction: 0.461
Eigenvalue for Factor 1	2.064	Other Reasons	0.626	Initial: 0.338
% of Variance Explained	34.4%	Ineligibility Perception	0.561	Extraction: 0.391
		Religious Beliefs	0.509	Initial: 0.266
		Cost Concerns	0.432	Extraction: 0.260

Discussion

The inclusion of individuals aged 26 to 40 years in this study aligns with Karlsson and Antfolk's (2021) research, which, although not specifically focusing on age distribution, emphasizes the importance of understanding vaccination confidence and behaviour across different age groups within the healthcare profession.¹¹ The gender distribution among the 372 HCWs at the Nursing College, where 81.2% were female and 18.8% male, reveals a significant gender imbalance. This finding is consistent with global trends identified by Dror et al. (2020), who noted that women often exhibit greater vaccine reluctance. Understanding these gender-specific attitudes is crucial for contextualising our analysis of vaccine uptake.¹²

The marital status distribution among these HCWs shows a predominance of single respondents (67.9%). This observation supports Karlsson and Antfolk's (2021) assertion on the importance of considering demographic variables like marital status when examining vaccination confidence and behaviour.¹¹ Additionally, the study

276 population was comprised predominantly of students (92.5%), with a small percentage
277 in administrative (1.9%) and academic roles (5.6%). This distribution reflects global
278 patterns highlighted by Dror et al. (2020),¹² which suggest that educational attainment
279 and access to information influence vaccine willingness. These findings underscore the
280 importance of understanding vaccine attitudes among younger demographics, such as
281 students.

282

283 The current study revealed variability in COVID-19 vaccination uptake. While most
284 respondents were fully vaccinated without boosters, others received both full
285 vaccination and boosters. This high vaccination rate at the Nursing College indicates
286 effective disease prevention. The data shows that most HCWs were vaccinated
287 voluntarily, with only a few under mandate, demonstrating that their rights were
288 respected while they actively chose to protect their colleagues and patients.
289 Nonetheless, the debate on compulsory vaccination remains complex and warrants
290 further consideration. The effectiveness of the COVID-19 vaccine is evident, as most
291 respondents had not been previously infected, and only a few contracted the virus
292 despite being vaccinated. Preferences for receiving health-related information via
293 television and radio reflect the need for accessible communication, especially for older
294 adults who may not use modern digital media extensively.

295

296 Islam et al. (2021) conducted a community survey evaluating attitudes towards COVID-
297 19 vaccinations, providing essential context for understanding healthcare
298 professionals' acceptance.¹³ Their findings emphasise the importance of considering
299 diverse perspectives and experiences, which helps clarify the complex landscape of
300 vaccination uptake and hesitancy. Our study reveals that most HCWs at the Nursing
301 College were vaccinated, predominantly voluntarily, supporting the acceptance of
302 COVID-19 vaccinations. This result rejects the null hypothesis (H0) and confirms the
303 alternate hypothesis (H1) that HCWs generally accept COVID-19 vaccinations, whether
304 mandatory or voluntary.

305

306 The research indicates that COVID-19 vaccinations are considered highly effective.
307 Although a few individuals were infected post-vaccination, this outcome supports the
308 vaccine's safety and efficacy. The observed discrepancies in post-vaccination
309 preventative measures highlight the need for clear communication to address ongoing
310 preventive behaviours. Effective strategies must emphasise the continued importance
311 of preventive measures even after vaccination. Poor communication about the efficacy
312 of COVID-19 vaccinations in preventing severe disease reflects the need for better
313 information dissemination. The lack of consensus on vaccination status limitations
314 underscores the complexity of balancing individual liberties with public health
315 measures.

316

317 Awareness of vaccine-related resources varied among respondents, highlighting the
318 necessity of clear, accessible communication. Concerns about potential adverse effects
319 emphasise the need for effective communication strategies to address these issues and
320 reinforce the safety of vaccines. Divergent opinions on vaccinating individuals with pre-
321 existing conditions and pregnant women stress the importance of targeted outreach
322 strategies. The study reveals that adverse effects of COVID-19 vaccination are generally
323 mild and short-lived. However, concerns about potential long-term effects necessitate
324 skilful communication to build public confidence in vaccine safety. The correlation
325 between knowledge, attitudes, and vaccine acceptance indicates that understanding
326 these factors is crucial for enhancing vaccine uptake.

327

328 The study also reflects varying degrees of apprehension about the COVID-19 pandemic,
329 with a majority expressing significant concern. Addressing the psychological impacts of
330 the pandemic and incorporating mental health considerations into public health
331 messaging is crucial. The survey indicates broad support for the effectiveness and
332 safety of the vaccine. These findings underscore the urgency of vaccination and the
333 need for focused communication strategies that highlight its importance. The study
334 emphasises the role of community-based communication and social media in
335 promoting vaccination. Encouraging family and neighbours to get vaccinated highlights
336 the impact of social influencers on vaccine perceptions.

337

338 **The public health implications of this study**

339 The significant adoption of COVID-19 immunisations among HCWs, mostly via
340 voluntary methods, highlights the need to encourage volunteer vaccination initiatives.
341 It demonstrates the readiness of HCWs to safeguard themselves, their peers and
342 patients against the illness. This is important for other vaccines, such as the influenza
343 vaccine. Public health initiatives should continue to highlight the advantages of
344 vaccination and address any lingering doubts or misunderstandings to sustain high
345 acceptance rates. The research emphasises the need to use efficient communication
346 tactics to influence vaccination attitudes and behaviours.

347

348 Although there has been a generally high acceptance of COVID-19 immunisations, the
349 research highlights that some HCWs still have reservations and are hesitant to be
350 vaccinated. These worries may arise from various sources, such as disinformation,
351 apprehension about negative impacts and ambiguity over long-term repercussions.
352 Public health interventions should prioritise resolving vaccination hesitancy among
353 HCWs via focused educational programmes, honest communication and personalised
354 methods that recognise and tackle unique concerns. The research emphasises the need

355 to maintain COVID-19 preventive measures, even among persons who have been
356 vaccinated.

357

358 The discourse pertaining to compulsory vaccination elicits significant ethical debates.
359 Although most HCWs in the survey chose to get vaccinated willingly, there were
360 differing views on whether vaccination should be mandated. Public health authorities
361 must thoroughly evaluate ethical principles, individual rights and the possible
362 ramifications of compulsory vaccination programmes on healthcare workers'
363 autonomy and faith in healthcare systems. When considering whether to require
364 vaccination, it is important to follow ethical guidelines and engage in effective
365 communication to address any concerns and create better understanding. The research
366 emphasises the need for customised strategies for vaccine outreach, specifically
367 targeting vulnerable groups such as pregnant women and persons with pre-existing
368 health issues. To guarantee fair distribution and acceptance of vaccines across all
369 demographic groups, it is important for public health campaigns to prioritise focused
370 communication, easy access to information, and healthcare settings that provide
371 support.

372

373 **Limitations of the Study**

374 Although the research achieved a high participation rate, sampling bias is possible,
375 especially if some HCWs were more inclined to participate than others. This has the
376 potential to restrict the applicability of the results to a wider community of HCWs. The
377 research depends on data that individuals describe about themselves, which might be
378 influenced by memory bias or a tendency to provide socially desirable responses.
379 Respondents may tend to exaggerate their favourable views towards vaccination or
380 downplay their reluctance, which might result in possible mistakes in the findings. The
381 study's cross-sectional design hinders demonstrating causal correlations between
382 variables. Although the research offers useful insights regarding vaccination attitudes
383 and behaviours at a single moment, longitudinal studies would be necessary to evaluate
384 changes over time and the effects of treatments.

385

386 The research was conducted at a solitary nursing institution, restricting the
387 applicability of the results to other healthcare settings or areas. Healthcare
388 infrastructure, cultural norms and vaccine delivery tactics in various situations may
389 have varying effects on vaccination dynamics.

390

391 **Conclusion**

392 This study demonstrates that while there is general support for COVID-19 vaccination,
393 concerns about vaccine safety and long-term effects persist. Addressing these concerns

through targeted communication and education is essential for increasing vaccine acceptance and utilisation. The diverse attitudes and perceptions revealed by the study underscore the need for a comprehensive strategy to address vaccine hesitancy, with a focus on safety and knowledge deficits.

Supporting information

S1 Appendix. Study questionnaire

Acknowledgments

Special thanks to the Nursing college management for permitting the study and to the participants for their involvement in realising the goals of the research.

Funding

This study was self-funded.

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