

Examining healthcare worker willingness to promote COVID-19 vaccines in South Africa: the importance of a clear evidence base

Gavin George^{1,2}, Phiwe B. Nota¹, Michael Strauss¹, Emma Lansdell¹, Remco P.H. Peters³, Petra Brysiewicz⁴, Nisha Nadesan-Reddy⁴, Douglas Wassenaar⁵

¹ Health Economics and HIV and AIDS Research Division (HEARD), University of KwaZulu-Natal,

² Division of Social Medicine and Global Health, Lund University,

³ Research Unit, Foundation for Professional Development,

⁴ School of Nursing and Public Health, University of KwaZulu-Natal,

⁵ South African Research Ethics Training Initiative, School of Applied Human Sciences, University of KwaZulu-Natal

South African Health Review

Vol. 25, 2022

Background

Studies have shown that healthcare workers (HCWs) are considered trusted sources of coronavirus disease 2019 (COVID-19) information in their communities, ideally placing them as effective vaccine advocates. However, limited data exist on the role of HCWs in the promotion of vaccines, and whether they feel adequately equipped to fulfil this role. This study therefore aimed to determine the willingness of HCWs in promoting COVID-19 vaccines, how this correlated with their own vaccination behaviour and attitudes to alternative therapies, and whether they felt they had adequate knowledge and skills to communicate effectively with patients.

Methods

A mixed-methods design was adopted, involving an online web-based survey and in-depth interviews (IDIs). HCWs were recruited for the online survey from an integrated health system database in South Africa using voluntary response sampling, with follow-up qualitative interviews conducted with HCWs who indicated interest in participating in an interview. Univariate and multivariate logistical regression models were used to understand how demographic characteristics, HCW roles, vaccination status, attitudes and practices around alternative medications, and information on COVID-19 vaccines were related to the willingness of HCWs to recommend vaccination to their patients.

Results

Most of the survey sample were vaccinated (90.7%) and indicated that they would recommend vaccination (81.7%). However, a significant proportion of the sample (58.6%) felt that they did not have enough information on COVID-19 vaccines, while 59.8% felt that they required additional guidance on how to educate their patients on COVID-19 vaccines. Vaccinated HCWs were more likely to recommend vaccination (OR=10.63 [95% CI: 6.53-17.31]) than their unvaccinated counterparts. The qualitative results provide further insights into why HCWs were willing or unwilling to administer and promote vaccines, with three themes emerging: (i) HCWs' belief in the value of vaccines and their promotion strategies; (ii) challenges facing HCWs in fulfilling their mandate of administering and promoting COVID-19 vaccination; and (iii) the rationale for HCWs discouraging vaccination and promoting alternative medicines for COVID-19 prevention and treatment.

Conclusions

This study posits that if HCWs are key to the success of national vaccination programmes, then they will need to be provided with clear, contextual, up-to-date information in order to enhance patient communication and vaccine uptake.

Introduction

Healthcare workers (HCWs) have and will continue to be central to the success of any vaccination programme because they are trained and tasked to administer vaccination injections and to work in the health system, which is the custodian of any national vaccination programme. In the recent case of the coronavirus disease 2019 (COVID-19) pandemic, their role became critical, not only for the administration of COVID-19 vaccines, but also as they were expected to play a role in increasing vaccine uptake rates by advocating for vaccination to patients and others with whom they interacted.¹⁻⁵ Well before the COVID-19 pandemic, research had already established a strong relationship between HCW attitudes, their personal vaccine behaviour, and their willingness to recommend vaccines to patients.⁶

Low vaccination rates among HCWs and high levels of vaccine hesitancy can have a ripple effect, resulting in decreased vaccination uptake among those who engage with HCWs at professional and personal levels.⁷ Conversely, research suggests that HCWs who are vaccinated exhibit positive attitudes towards vaccines, making them ideal advocates or vaccine ambassadors.⁸⁻¹⁰ HCWs can increase vaccine confidence among patients by providing information and through effective communication. However, this reflects an inherent expectation that HCWs are knowledgeable about the potential risks and benefits of vaccinating against COVID-19, and that they possess the skills and confidence to communicate this to patients, which is not always the case.^{11,12} Furthermore, in cases where HCWs are themselves hesitant to be vaccinated, they are likely to transmit their concerns and doubts about vaccination to their patients and the broader community.^{6,11} Research has highlighted that HCWs may share some of the same questions and concerns as the general public regarding vaccination.^{13,14}

Previous public health events of the 21st century – including outbreaks of the Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome, influenza A, and Ebola virus disease – have shown that risk communication and community engagement are integral to successfully responding to public health emergencies.¹⁵ As a trusted source of information, HCWs typically act as a conduit for information, and they are largely tasked with engaging with communities on matters related to public health.¹⁶ However, HCW communication practices regarding COVID-19 vaccines hinge on their confidence in the safety and the effectiveness of the vaccine, while other factors, including preference for physiological immunity through natural infection, distrust in

government and pharmaceutical companies, and an emphasis on autonomy and personal freedom, may affect both their own vaccination choices and the recommendations they make to patients.^{17,18} Additionally, hesitancy and reluctance to promote vaccination to patients may also be fuelled by a combination of ignorance, misinformation, conspiracy theories, doubt about scientific evidence, concerns relating to medical histories, and cultural, religious and philosophical beliefs.^{6,19}

In the South African context, there are reports that some HCWs, including doctors, have actively discouraged patients from getting COVID-19 vaccinations.²⁰ While this evidence is largely anecdotal, it remains cause for concern, and could be a factor in the country's stubbornly slow vaccine and booster uptake rates.²¹ Based on this premise, the present study aimed to explore HCW willingness to promote COVID-19 vaccines to family, friends and patients and how this correlated with selected demographic characteristics, their own vaccination or alternative therapeutic behaviour, and whether they had sufficient information and adequate skills with which to engage patients on COVID-19 vaccines. The study further qualitatively explored both the content and nature of these interactions, expanding on what were limited insights into HCW interactions with patients around COVID-19 preventive and treatment options. The findings are relevant, not only in the context of the COVID-19 vaccination programme in South Africa, which has largely been scaled back (at time of writing), but for vaccination programmes more broadly, in which the role of HCWs will continue to remain both central and critical to an effective public health response.

Methods

This study was part of a larger mixed methods study conducted between the 18th of July and the 28th of October 2022, that aimed to investigate reasons for HCW vaccine acceptance and hesitancy in South Africa. Details of the larger study are available elsewhere.²² Data for this study were drawn from a web-based quantitative survey which explored HCW beliefs and attitudes about vaccines, perspectives on patients being vaccinated, views and use of complementary and alternative medicine for COVID-19, and patient-targeted communication. These data were augmented by qualitative data collected through a series of virtual online in-depth interviews (IDIs) with participants who completed the survey and indicated willingness to participate. The Foundation for Professional Development's (FPD) database was used to recruit HCWs. The FPD is a private higher-education in-

stitution that provides training to HCWs, and with permission, records their details in the database. All HCWs who were part of the FPD database were invited through email and social media platforms to participate in the survey, and all the study participants were self-declared HCWs. A total of 7763 HCWs participated in the full survey. Only study participants randomised²² to answer the two sections (Sections 4 and 5) containing questions on HCW willingness to promote vaccines to patients, and participants who were in direct contact with patients, were included in the final analysis, which included a total of 2011 participants.

The survey was divided into two parts. The first part included demographic information and data on vaccination behaviour, and was completed by all participants. The second part was divided into five sections. Participants were randomly assigned to complete one of the five sections to decrease the time it would take them to complete the survey and to ensure high response rates and better data quality. The full study design, along with recruitment and data-collection details, has been described elsewhere.²² This chapter presents analyses using variables from two of these sections focusing on HCW willingness to promote vaccines to friends, family and patients.

Section 1 explored factors influencing vaccination decision and general attitudes towards vaccination. Section 2 covered perceived COVID-19 vaccine benefits, both specific and general. Section 3 included questions on perceived vaccine safety, efficacy and perceived risk. The present chapter reports on HCW willingness to promote vaccines to friends, family and patients, which was only asked in Sections 4 and 5. Additionally, Section 4 included questions on COVID-19 vaccine information among HCWs and skills to enable engagement with patients. Section 5 included questions on using and recommending alternative medicines for prevention and/or treatment of COVID-19 including: "Have you used alternative medicines for prevention and/or treatment of COVID-19?" and "Have you recommended alternative medicines for prevention and/or treatment of COVID-19?"

The primary outcome measure was a binary variable for whether or not participants would recommend vaccination. Two survey items were used to create the outcome variable.²³ The first item was from Section 4. Participants were asked to indicate the degree to which they agreed with the following statement: "I would not recommend the COVID-19 vaccine to my patients, family, and friends because I am concerned about the safety of the vaccine". Responses were given on a four-point Likert scale: 'strongly disagree', 'disagree', 'agree', and 'strongly agree'. 'Strongly disagree' and 'disagree' were combined as 'recommend', while 'agree' and 'strongly agree' were combined as 'not recommend'. The second item was from Section 5 of the survey. Participants were asked: "Would you recommend COVID-19 vaccination to eligible patients?" This was captured as 'no', 'yes', and 'unsure'.

Responses given as 'no' and 'unsure' were combined as 'not recommend', while 'yes' was 'recommend'.

A binary variable was created for composite COVID-19 vaccine knowledge.²³ Participants were asked five questions about their COVID-19 vaccine knowledge: "Do you have enough information about how COVID-19 vaccines work?", "Do you have enough information about how effective COVID-19 vaccines are?", "Do you have enough information about how safe COVID-19 vaccines are?", "Do you have enough information about COVID-19 vaccines' side-effects?", and "Do you have enough information about how to use COVID-19 vaccines?" All questions were captured as 'no', 'yes', or 'unsure'. Responses given as 'no' and 'unsure' were combined as 'not enough information', while 'yes' was captured as 'enough information'. These five questions were combined to form an independent variable, which was coded using a binary approach.

Three univariate logistical regression models were used to regress different measures against the same outcome variable. In the first model, the outcome variable was regressed against demographic characteristics. In the second model, the outcome variable was regressed against vaccination status and against using and recommending alternative medicines for prevention and/or treatment of COVID-19. In the third model, the outcome variable was regressed against vaccination status and COVID-19 vaccine knowledge and perspectives. In every model, the aim was to determine how significantly each measure influenced whether a participant recommended vaccination or not.

In addition, one multivariate logistical regression model regressed the outcome variable against the measures that emerged as significant in the third model, namely vaccination status and COVID-19 vaccine knowledge. Control variables in the model were age, gender, race, religion, nationality, chronic conditions, occupation, health sector, facility, and years worked.

Qualitative data were collected to further elucidate perspectives on HCW COVID-19 vaccine behaviours and patient interaction. As part of the survey, participants had the option to indicate their willingness to be contacted for a follow-up interview. Random selection was done among those who indicated such willingness, using the 'randbetween' formula in Microsoft Excel for IDs by vaccination status. Participants were then contacted, recruited, and interviews were done with 10 vaccinated and 20 unvaccinated interviewees. Interviews were conducted by two authors (PBN and GG), both experienced researchers with a background in conducting qualitative research and using interview guides. Two interview guides were developed (one for vaccinated and another for unvaccinated HCWs) with open-ended questions and probes on the following: (i) vaccination behaviour; (ii) experiences with administering vaccines; (iii) perspectives on the national vaccine programme; (iv) the vaccines and how HCWs gather and appraise information sources; and (v) perspectives on educational resources that can be used to support HCWs. The virtual IDs were conducted on Zoom and were 30-45 minutes in duration. The Zoom

transcribing software was used to transcribe the recorded interviews. The transcripts were reviewed and edited by two research interns and one author (PBN) to eliminate typographical errors, and saved on Microsoft Word (version 16.70). Qualitative data were analysed thematically using an inductive approach as prescribed by Braun and Clarke.²⁴ The qualitative data were then triangulated with the quantitative data to gain deeper insight into HCW experiences with COVID-19 vaccines and patient engagement.

Results

Table 1 shows the demographic characteristics of the sample. As evident in the table, most of the sample was younger than 35 years old (31.4%), and 35-49 years old (42.0%). More than half the sample was female (71.1%), identified as black (55.1%) and South African (92.5%). The majority of the sample did not have a chronic condition (65.7%). The main occupation in the sample was nurse (45.7%), with doctors comprising 22.4% of the sample. Participants were mostly working in the public (43.9%) or private (36.6%) health sectors, and in hospitals (46.4%) and clinics (34.1%). Most of the sample had worked for 10 or more years (62.3%). Most of the sample were vaccinated (90.7%) and would recommend vaccination (81.7%).

Table 2 presents the study's COVID-19 vaccine measures of interest. As seen in the table, 39.1% of participants had used alternative medication, with a similar proportion (35.1%) recommending alternative medication to patients. Vitamins and dietary supplements were the main alternative treatments used (57.3%) and recommended (54.1%). Most of the sample indicated that they would encourage pregnant women (62.7%) and children over the age of 12 years (74.4%) to get vaccinated. More than half the sample (58.6%) felt that they did not have enough information on COVID-19 vaccines, and 59.8% reported needing guidance on how to educate their patients about COVID-19 and the available vaccines.

Table 3 presents the univariate analysis of the sample's demographic characteristics. As reflected, white HCWs were less likely to recommend vaccination than black HCWs (OR=0.58 [95% CI: 0.45 - 0.75]). In addition, all other HCWs such as pharmacists, allied health professionals, personal service workers, paramedics, and other health professionals were less likely to recommend vaccination than nurse HCWs (OR=0.46 [95% CI: 0.35 - 0.60]). Other facilities, including general practitioner practices, were less likely to recommend vaccination than hospitals (OR=0.62 [95% CI: 0.45 - 0.83]).

Table 4 presents the univariate analysis of vaccination status, and the use of and/or recommendation of alternative medicines. As reflected in the table, vaccinated HCWs were more likely than their unvaccinated counterparts to recommend vaccination (OR=10.63 [95% CI: 6.53-17.31]). HCWs who had themselves used alternative medicines for prevention and/or treatment of COVID-19, were less likely to recommend vaccination than those

who had not done so (OR=0.61 [95% CI: 0.43-0.86]). HCWs who had recommended alternative medicines for prevention and/or treatment of COVID-19 were less likely to recommend vaccination than those who had not made such recommendations (OR=0.69 [95% CI: 0.49-0.99]).

Table 5 presents the univariate and multivariate analysis on vaccination status, COVID-19 knowledge, and COVID-19 perspectives. As reflected in the table, vaccinated HCWs were more likely than their unvaccinated counterparts to recommend vaccination (OR=7.41 [95% CI: 4.57-12.01]). HCWs who felt they had enough information on COVID-19 vaccines were more likely to recommend vaccination than HCWs who felt insufficiently informed (OR=2.21 [95% CI: 1.57-3.11]).

Qualitative results

The qualitative results provide further insights into why most HCWs willingly administered and promoted vaccines, while others did so under duress or found it challenging as they felt inadequately supported to address concerns raised by patients. Further, the results draw attention to the use and promotion of alternative remedies among some HCWs. HCW narratives illustrate how personal beliefs, attitudes and perceptions influenced their engagement with patients on the subject of vaccines. Three themes emerged from the data: (i) HCW belief in the value of vaccines and their promotion strategies; (ii) challenges facing HCWs in administering and promoting COVID-19 vaccination; and (iii) the rationale for HCWs discouraging vaccination and promoting alternative medicine.

HCW belief in the value of vaccines and their promotion strategies

As confirmed in the quantitative data, the majority of HCWs were willing to recommend vaccination to family members and patients and felt comfortable addressing any concerns raised; this was the case among both vaccinated and unvaccinated HCWs. HCWs were at the coal-face of this pandemic, observing high morbidity and mortality rates. Some perceived the availability of vaccines as having brought about a sea change – they observed a reduction in the number of cases, reduced severity of illness in vaccinated patients in relation to those who remained unvaccinated, and reduced mortality.

What I have experienced, and I have seen a number of people that we have vaccinated, I think the vaccine has given us immunity. I would say it has really improved in terms of people getting infected with COVID. The number of people who are vaccinated, they never experience it again. Even if maybe you could, it was just in terms of a mild flu ... I think the vaccine is really effective. (P28, Nurse, female, vaccinated)

HCWs presented personal accounts of the perceived benefits of the vaccine.

My husband was sick, but I said to him after he had recovered "you would have been much worse, you prob-

Table 1. Demographic characteristics of the study sample

Measures		n	%
Age (n=2 005)	Younger than 35 years old	629	31.4
	35-49 years old	842	42.0
	50 years old or older	534	26.6
Gender (n=1 996)	Male	577	28.9
	Female	1 419	71.1
Race (n=1 961)	Black	1 081	55.1
	Coloured	138	7.04
	Indian	119	6.07
	White	623	31.8
Religion (n=1 945)	Christian	1 613	82.9
	Muslim	86	4.4
	Buddhist or Hindu	68	3.5
	African Spirituality	53	2.7
	Other	125	6.4
Nationality (n=1 982)	South African	1 834	92.5
	Non-South African	148	7.5
Chronic conditions ^a (n=2 010)	No	1 320	65.7
	Yes	690	34.3
Occupation (n=2 011)	Nurse	919	45.7
	Doctor	451	22.4
	All other ^b	641	31.9
Health sector (n=2 010)	Public	868	43.2
	Private	735	36.6
	NGO	161	8.0
	Public and Private	182	9.1
	Other	64	3.2
Facility (n=2 010)	Hospital	933	46.4
	Clinic	685	34.1
	Residential aged or disability care	41	2.0
	Other	351	17.5
Years worked (n=2 009)	Less than 5	292	14.5
	5 to 9	466	23.2
	10 or more	1 251	62.3
Vaccinated (n=1 975)	No	183	9.3
	Yes	1 792	90.7
Would recommend vaccination (n=1 914)	No	351	18.3
	Yes	1 563	81.7

^a Chronic conditions were defined as one or more of the following: diabetes, hypertension, respiratory disease, HIV, or other chronic diseases.

^b This category included pharmacists, allied health professionals, personal service workers, paramedics, other health professionals, and other.

ably would have ended up being on a ventilator [if you had not been vaccinated]", because he ended up having bronchitis, and I said to him "your bronchitis is related to long-term COVID". And he now understands ac-

tually the benefits of having the vaccine. (P17, Nurse, female, unvaccinated)

Table 2. COVID-19 vaccine measures of interest

Measures		n	%
Has used alternative medicines for prevention and/or treatment of COVID-19 (n=980)	No	597	60.9
	Yes	383	39.1
Alternative medicines used (n=382)	African traditional	73	19.1
	Vitamins/dietary supplements	219	57.3
	Other ^a	90	23.6
Has recommended alternative medicines for prevention and/or treatment COVID-19 (n=979)	No	635	64.9
	Yes	344	35.1
Alternative medicines recommended (n=344)	African traditional	70	20.4
	Vitamins/dietary supplements	186	54.1
	Other ^b	88	25.6
Would encourage pregnant women to get vaccinated (n=957)	No	357	37.3
	Yes	600	62.7
Would encourage children over the age of 12 years to get vaccinated (n=956)	No	245	25.6
	Yes	711	74.4
Has enough information about COVID-19 vaccines ^c (n=958)	No	561	58.6
	Yes	397	41.4
Needs guidance on how to educate patients about COVID-19 and the available vaccines (n=956)	No	384	40.2
	Yes	572	59.8

^a This category included Chinese herbal medicine (2.1%), Western herbal medicine (7.1%), Ivermectin (10.5%), Chloroquine (1.1%), and other (2.9%).

^b This category included Chinese herbal medicine (1.5%), Western herbal medicine (7.6%), Ivermectin (11.1%), Chloroquine (1.7%), and other (3.8%).

^c The way this summary variable was generated is described in the Methods section.

HCWs trusted allopathic medicine and believed in the benefits of the available vaccines.

It's an evidence-based field of medicine. Just like medicine itself, so yes. You know the evidence is there. You need the vaccine. (P11, Other HCW, female, vaccinated)

HCWs have historically seen the value of vaccination and applied the same principles to the available COVID-19 vaccines.

Personally, I think it is important. I think that again I'm a believer, so I have taken the flu vaccine annually ... I actually did promote the [COVID-19] vaccine, and quite actively. (P18, Other HCW, female, vaccinated)

HCWs interact with patients and are tasked with addressing patient queries. HCWs reported having to allay patient concerns related to the safety of COVID-19 vaccines. HCWs well versed with the potential risks of the vaccine were able to effectively communicate the extent of the risk, drawing on their clinical training.

One of the females [said] "I'm going to get a blood clot, I'm taking hormone replacement therapy". So, I would respond ... "well I am on hormone replacement therapy and here are the stats, you'll have a greater chance of having a thrombosis [blood clot] from the hormone re-

placement itself as opposed to a vaccine". (P11, Other HCW, female, vaccinated)

Vaccinated HCWs were also able to share their personal experiences as a strategy to alleviate patient fears.

I don't want to sugar coat anything or sell people lies. So I tell them my experience of the vaccine, that okay, when I had the vaccine I only had a headache, and it lasted for three days ... That's what happened to me, so especially with family members, I got them to vaccinate. (P21, Other HCW, female, vaccinated)

Some HCWs didn't feel the vaccine was necessary for everyone, and rather focused their energy on convincing patients and family members considered to be at high risk, to get vaccinated.

I do not need to be vaccinated, but I do agree that those who are at risk should be vaccinated, the people with comorbidities ... like my husband is hypertensive, so I encouraged him to be vaccinated. And the elderly like my mother, she's also been vaccinated because she had COVID in the beginning of 2021. I think those are the people who I would see as people who are high risk and who need to be vaccinated. (P17, Nurse, female, unvaccinated)

Table 3. Univariate analysis on the demographic characteristics of the study sample

Measures		Recommend n (%)	Odds ratio [95% CI] ^a
Age	Younger than 35 years old	486 (81.3%)	1.00
	35-49 years old	667 (82.8%)	1.10 [0.84 - 1.45]
	50 years old or older	409 (80.8%)	0.97 [0.71 - 1.31]
Gender	Male	441 (79.3%)	1.00
	Female	1 118 (82.9%)	1.26 [0.98 - 1.62]
Race	Black	858 (85.0%)	1.00
	Coloured	109 (82.0%)	0.80 [0.50 - 1.29]
	Indian	98 (83.1%)	0.86 [0.52 - 1.44]
	White	465 (76.9%)	0.58 [0.45 - 0.75]
Religion	Christian	1 262 (82.5%)	1.00
	Muslim	63 (73.3%)	0.58 [0.35 - 0.95]
	Buddhist or Hindu	58 (85.3%)	1.23 [0.62 - 2.44]
	African Spirituality	37 (77.1%)	0.71 [0.35 - 1.41]
	Other	93 (76.9%)	0.70 [0.45 - 1.09]
Nationality	South African	1 442 (82.5%)	1.00
	Non-South African	110 (76.4%)	0.68 [0.45 - 1.03]
Chronic conditions ^b	No	1 035 (82.4%)	1.00
	Yes	528 (80.4%)	0.87 [0.68 - 1.11]
Occupation	Nurse	751 (86.2%)	1.00
	Doctor	359 (82.5%)	0.75 [0.55 - 1.03]
	All other ^c	453 (74.5%)	0.46 [0.35 - 0.60]
Health sector	Public	689 (84.0%)	1.00
	Private	561 (79.5%)	0.74 [0.57 - 0.96]
	NGO	131 (85.1%)	1.09 [0.67 - 1.76]
	Public and Private	133 (76.9%)	0.63 [0.42 - 0.94]
	Other	49 (81.7%)	0.85 [0.43 - 1.68]
Facility	Hospital	792 (82.6%)	1.00
	Clinic	554 (84.5%)	1.14 [0.87 - 1.50]
	Residential aged or disability care	30 (75.0%)	0.63 [0.30 - 1.32]
	Other	250 (74.6%)	0.62 [0.45 - 0.83]
Years worked	Less than 5	223 (79.4%)	1.00
	5-9	363 (82.3%)	1.21 [0.82 - 1.76]
	10 or more	977 (82.0%)	1.18 [0.85 - 1.63]

^a Univariate analysis, binary logistical regression.^b Chronic conditions were defined as one or more of the following: diabetes, hypertension, respiratory disease, HIV, or other chronic diseases.^c This category included pharmacists, allied health professionals, personal service workers, paramedics, other health professionals, and other.

Challenges facing HCWs in administering and promoting COVID-19 vaccination

Some HCWs felt conflicted about actively promoting vaccination because it was incongruent with their personal beliefs.

I'm conflicted, but duty bound. So my personal opinion about the subject matter I normally shove aside. I do

not share with patients, I don't want to be labelled that I am misleading the public. I don't do that. Whatever I've shared with you, I don't share with the public. Because being in the position that I am in, I may find it problematic, and I may be called into question and I may be regarded as misleading the public. (P3, Nurse, male, unvaccinated)

Table 4. Univariate analysis on recommending vaccination according the study's COVID-19 vaccine measures of interest

Measures		Recommend n (%)	Odds ratio [95% CI] ^a
Vaccinated (Section 5 only)	No	34 (42.0%)	1.00
	Yes	785 (88.5%)	10.63 [6.53 - 17.31]
Has used alternative medicines for prevention and/or treatment of COVID-19	No	518 (86.78%)	1.00
	Yes	307 (80.2%)	0.61 [0.43 - 0.86]
Has recommended alternative medicines for prevention and/or treatment of COVID-19	No	546 (86.0%)	1.00
	Yes	279 (81.1%)	0.69 [0.49 - 0.99]

^a Univariate analysis, binary logistical regression.

Table 5. Univariate and multivariate analysis on HCW vaccination status and COVID-19 vaccine measures of interest

Measures		Recommend n (%)	Odds ratio [95% CI] ^a	Odds ratio [95% CI] ^b
Vaccinated (Section 4 only)	No	32 (40.0%)	1.00	1.00
	Yes	697 (83.2%)	7.41 [4.57 - 12.01]	7.88 [4.59 - 13.53]
Has enough information about COVID-19 vaccines ^c	No	413 (73.6%)	1.00	1.00
	Yes	342 (86.2%)	2.21 [1.57 - 3.11]	1.91 [1.27 - 2.86]
Needs guidance on how to educate patients about COVID-19 and the available vaccines	No	303 (78.9%)	1.00	-
	Yes	451 (78.9%)	0.99 [0.72 - 1.36]	-

^a Univariate analysis, binary logistical regression.^b Multivariate analysis, binary logistical regression.^c The way this summary variable was generated is described in the Method section.

Participants raised concerns about not having sufficient information or the ability to respond adequately to the questions posed by patients. Several HCWs felt that their own knowledge deficit resulted in them struggling to navigate through conversations with patients about the COVID-19 vaccines.

I mean, there's all these new vaccines again, and talking about covering the different variants. I don't even know if I need another booster shot ... if I don't know it for myself, there's no way I can teach it to a patient. Yeah, especially with the newer updates. I definitely do not know enough to be able to adequately educate patients regarding this. (P19, Doctor, male, vaccinated)

Several participants expressed frustration regarding their lack of accessible information to address questions raised by patients.

The old age home pressurised everybody [to vaccinate], and a lot of people didn't ask beforehand, they came back later, and said "What's happening to me?"... So there was a lot of frustration around this whole thing,

where they said: "Why should I vaccinate if I sit in my office and am not in contact with many people, just because it's policy?" So yes, it was difficult to give proper answers, because it didn't make sense to me either... I can't lie. This is who I am. I can't tell people a story that I can't scientifically qualify. (P26, Doctor, female, unvaccinated)

Several HCWs also described how they often had similar questions and concerns as the public about the COVID-19 vaccines.

...so obviously because I'm working for the company, I also need to motivate people to do vaccination. So, most of our patients, when I do the call, they ask if the vaccine is appropriate. I also have those questions. (P30, Other HCW, female, unvaccinated)

Rationale for HCWs discouraging vaccination and promoting alternative medicine

Some HCWs discouraged patients from getting vaccinated based on perceived clinical and anecdotal evidence suggesting harmful effects of the vaccine.

So I haven't taken it and I'm telling every patient coming in here, they should not take it, and then I show them all my cases, how many strokes there were, deaths there were, all the side-effects, and I'm sure they are convinced. I tell them or show them. I've got some articles and even some little YouTube clips just stating the obvious and I show them all my statistics.

Interviewer: *So you don't recommend to patients or anyone to get vaccinated?*

Never. In the beginning I was hesitant, hesitating because I wasn't sure whether the vaccine was more beneficial than harmful, but as time progressed, I can clearly see with my own eyes and I read from all over the world, the vaccine is not helpful and it's not beneficial. There's no benefit, it's more harmful than beneficial. (P8, Doctor, male, unvaccinated)

A minority of HCWs advocated for alternative prevention and treatments. Some HCWs leaned towards treatment rather than prevention and believed that medication already existed that would be beneficial for infected patients, or that could be used as prophylaxis.

I started people immediately on vitamin C and zinc and those basics. But I've seen actually many, many side-effects just with vitamin C because it's so toxic on your gastric lining ... So that was a bit of a worry. Zinc works with any viral disease, zinc works. It definitely makes a difference. The people who were more at risk I put on ivermectin, and it made an incredible difference. And since ivermectin got the Nobel Prize, I think in 2014 or 2015 for being such a safe medicine after how many million dosages. It's a wonderful anti-parasitic as well by the way. I'm actually very sad that they stopped it. (P26, Doctor, female, unvaccinated)

Some HCWs felt strongly about the use of ivermectin, a widely used antiparasitic medicine with known antiviral and anti-inflammatory properties to treat COVID-19. They expressed a clear stance that the government should not have prohibited HCWs from prescribing it.

The South African government does not want us to use ivermectin, crazy. That drug has a Nobel Prize attached to it, it's been used safely ... they don't want us to use it, they want us to use very expensive drugs. (P7, Doctor, male, unvaccinated)

Discussion

This study undertook a national cross-sectional survey of South African HCW willingness to recommend COVID-19 vaccination to patients in relation to their own vaccination behavior, use of alternative medicine, and availability of information. Using qualitative data, an examination

was done of HCW views on vaccines, types of engagements with patients, and the perceived value of alternative remedies.

The results showed that a high proportion (91%) of the HCWs in this study had been vaccinated. This correlated with the majority (82%) who indicated that they were willing to recommend vaccination to patients, family, and friends. The data suggest that there was a lower proportion of HCWs willing to recommend vaccines to pregnant women (61%) and children (73%). These findings affirm results from an Italian study on whether HCWs would recommend vaccination to their patients.²⁵ Papini et al.²⁵ found that only a small percentage of participants (1.7%) would not recommend the COVID-19 vaccine to their relatives, and even fewer participants (0.9%) would not recommend it to their patients. As in the Italian study, the present study found consistency between HCWs' personal vaccine behaviour and their willingness to promote vaccination; 9% of the sample were unvaccinated, and only 19% were not prepared to recommend the vaccine. A higher proportion of unvaccinated HCWs, compared with their vaccinated colleagues, were unwilling to promote vaccines. However, within the unvaccinated group, some still saw the benefit of, or felt duty-bound to recommend vaccines, with the qualitative data revealing that some HCWs found vaccines particularly beneficial for patients in high-risk groups. The results of the present study affirm data from one of the few studies done on HCW engagement with patients around COVID-19 vaccines,²⁶ which concluded that vaccine-hesitant HCWs were reluctant to promote vaccines, citing fear of inducing patient anxieties or complaints.

With only 51% of the South African adult population vaccinated by the end of January 2023²¹ and with research suggesting that HCWs remain a trusted source of information in their communities,²⁷⁻²⁹ it is evident that HCWs have not been adequately educated and utilised in the promotion of vaccination. The literature highlights HCWs' pervasive sub-optimal knowledge and communication skills around COVID-19 vaccination, which has negatively impacted interactions with patients³⁰ and possibly affected vaccine uptake. While HCWs participating in this study appeared perspicacious, an unmet appetite for additional up-to-date information remains, especially given that this is a relatively novel virus resulting in an evolving sequence of variants and understandings of its effects and effective available treatment and prevention options. The quantitative results of the present study revealed that the majority of participants (59%) felt that they did not have sufficient knowledge of the available COVID-19 vaccines, and a similar proportion (60%) required additional guidance on how to educate patients about COVID-19 and the available vaccines. Further analysis indicates that these factors negatively affected HCW willingness to promote vaccination to patients. Even for those HCWs willing to promote vaccination, the reportedly inadequate information at their disposal made their task more challenging. This is not unique, with other studies reporting that HCWs found it difficult to discuss

vaccines knowledgeably with peers and patients.²⁶ Qualitative analysis in the present study revealed the benefits of having HCWs well versed in the risk and benefits of vaccines, resulting in better communication and ability to adequately address patients' questions and fears.

This study further revealed that HCWs who personally used alternative medication to treat or prevent COVID-19, were less inclined to promote vaccination. Further, those recommending alternative approaches were less likely to recommend vaccines, suggesting that HCWs are not necessarily promoting alternative medication to supplement vaccines, but in some cases they are promoting it as a substitute. This study data supports this assertion, with some HCWs arguing for the benefits of alternative approaches such as traditional African medication, vitamins, and therapeutics such as ivermectin. There are limited studies on HCW prescription and promotion of alternative medicine. In China, scientists and doctors initially recommended using Traditional Chinese Medicine (TCM) as a cure for COVID-19.³¹ During the SARS epidemic, TCM had reportedly been effective in the treatment of infected people, and the Chinese Government ordered the use of TCM to treat COVID-19 patients. It was reported that about 85% of COVID-19 patients in China received combined treatment with TCM and regular medication. This stance is not parochial, as the World Health Organization (WHO) welcomes innovations such as traditional medicine, repurposed drugs, and development of new therapies. Africa and some parts of Asia have a long history of using traditional medicine, and the WHO recognises the many benefits of traditional medicines.³¹ In addition, the emergence of conflicting published results on some proposed therapeutic alternatives, including ivermectin, has added to confusion surrounding viable therapeutic alternatives.^{32,33} This led to support for the drug across social media and by some organisations.³⁴ This was picked up by HCWs and the public, including in South Africa, with some anti-vaxxers extolling the benefits of ivermectin.³⁵ A study in India explored knowledge and practices around ivermectin as a potential pre-exposure prophylaxis (PrEP.). They found that the majority (70.59%) of the sample of HCWs believed that ivermectin was protective against COVID-19, while more than half (57.37%) of the sample used or recommended the drug.³⁶ While advocacy for ivermectin and other alternative medicine among this sample was small, it suggests a lack of clear messaging, affirming the need to improve institutional communication addressed to HCWs to enhance their role as vaccination facilitators.³⁷

For HCWs to promote vaccines effectively to the public, they need both current scientific knowledge and communication skills. This was and continues to be challenging within an emergency context, and continues to evolve as different variants of the virus emerge and more efficacious vaccines and therapeutics become available. There remain numerous sources of information, all made more easily accessible through increased use of the internet and social media – many of these sources provide in-

formative and valuable information, but some propagate misinformation, sometimes persuasively. HCWs require trusted sources of information that deliver updated evidence-based messages that are easily understood by all cadres of HCWs. The value of the present study extends beyond the role of HCWs in promoting COVID-19 vaccines but applies to national immunisation programmes more broadly. Patients, are likely to question both the benefit and safety of available vaccines, with HCWs expected to communicate reliably from a clear evidence base.

The findings of this study contribute to the few studies to date that have explored HCW interactions with patients around COVID-19 vaccines. Specifically, there remains a dearth of data on HCW interactions with patients on the issue of COVID-19 vaccines in the South African and broader African context. A strength of the study is that it employed mixed methods, using both qualitative and quantitative approaches to fully capture the form and content of HCW engagement with patients in South Africa.

Use of an unrestricted self-administered survey was a limitation as the survey was dependent on HCW access to selected online databases. This limitation may have introduced selection bias and limited generalisability. Further, geographical distribution of the study participants was not factored into the survey and was therefore not known, and individual interpretation of the term 'patients' may have influenced how HCWs rated their willingness to promote vaccines.

Conclusions

This study indicates that personal vaccine behaviour of HCWs largely mirrored their willingness to promote vaccination to patients. This is positive given the high proportion of HCWs who were vaccinated and who were subsequently willing to assume the role of vaccine advocates. A large number of HCWs stated that they did not have sufficient information on the available vaccines, contributing to the majority who felt that they needed reliable guidance on how to educate patients. The data indicate that these factors contribute to HCW willingness to promote vaccines to patients. Although a minority, the study revealed that some unvaccinated HCWs were taking and recommending alternative therapies, possibly a consequence of a lack of clear, comprehensible, evidence-based and reliable sources of vaccine information. Therefore, if HCWs are to become the fulcrum of national vaccination programmes, they will need to be provided with clear, contextual, up-to-date evidence-based information, to enhance both workflow and patient communication.

.....

Acknowledgments

Funding: The DRILL project was supported by the Fogarty International Centre (FIC), National Institutes of Health (NIH) Common Fund, Office of Strategic Coordination, Office of the Director (OD/OSC/CF/NIH), Office of AIDS Research, Office of the Director (OAR/NIH), and National Institute of Mental Health/National Institutes of Health (NIMH/NIH) under award number D43TW010131 (under the scientific areas of HIV/AIDS, mental health, health professions education, health research ethics, and health systems research). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Conflicts of interests

Douglas Wassenaar is the Chair of the University of KwaZulu-Natal Biomedical Research Ethics Committee (BREC) that approved this study. The conflict of interest was declared to BREC and this application was managed

independently by a BREC Deputy-Chair. The other authors declare no conflict of interest.

Abbreviations

Abbreviation	Description
BREC	Biomedical Research Ethics Committee
CI	confidence interval
COVID-19	coronavirus disease 2019
DOH	Department of Health
FPD	Foundation for Professional Development
HCW	healthcare worker
IDI	in-depth interview
OR	odds ratio
PrEP	pre-exposure prophylaxis
SARS	severe acute respiratory syndrome
TCM	Traditional Chinese Medicine
WHO	World Health Organization



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-NC-4.0). View this license's legal deed at <https://creativecommons.org/licenses/by-nc/4.0> and legal code at <https://creativecommons.org/licenses/by-nc/4.0/legalcode> for more information.

References

1. Li M, Luo Y, Watson R, et al. Healthcare workers' (HCWs) attitudes and related factors towards COVID-19 vaccination: a rapid systematic review. *Postgrad Med J*. Published online 2021. doi:10.1136/postgradmedj-2021-140195
2. Wang J, Jing R, Lai X, et al. Acceptance of COVID-19 vaccination during the COVID-19 pandemic in China. *Vaccines*. 2020;8(3):482. doi:10.3390/vaccines8030482
3. Kwok KO, Li KK, Wei WI, Tang A, Wong SYS, Lee SS. Are we ready when COVID-19 vaccine is available? Study on nurses' vaccine hesitancy in Hong Kong. *medRxiv*. Published online 2020. doi:10.1101/2020.07.17.20156026
4. Al-Sanafi M, Sallam M. Psychological determinants of COVID-19 vaccine acceptance among healthcare workers in Kuwait: A cross-sectional study using the 5C and vaccine conspiracy beliefs scales. *Vaccines*. 2021;9(7):701. doi:10.3390/vaccines9070701
5. Harrison J, Berry S, Mor V, Gifford D. "Somebody like me": Understanding COVID-19 vaccine hesitancy among staff in skilled nursing facilities. *J Am Med Dir Assoc*. 2021;22(6):1133-1137. doi:10.1016/j.jamda.2021.03.012
6. MacDonald NE, Dubé E. Unpacking vaccine hesitancy among healthcare providers. *EBioMedicine*. 2015;2(8):792-793. doi:10.1016/j.ebio.2015.06.028
7. Dror AA, Eisenbach N, Taiber S, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35(8):775-779. doi:10.1007/s10654-020-00671-y
8. Afonso NM, Kavanagh MJ, Swanberg SM, Schulte JM, Wunderlich T, Lucia VC. Will they lead by example? Assessment of vaccination rates and attitudes to human papilloma virus in millennial medical students. *BMC Public Health*. 2017;17(1):1-8. doi:10.1186/s12889-016-3969-x
9. Lucia VC, Kelekar A, Afonso NM. COVID-19 vaccine hesitancy among medical students. *J Public Health*. 2021;43(3):445-449. doi:10.1093/pubmed/fd.aa230
10. Shaw J, Stewart T, Anderson KB, et al. Assessment of US health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system. *Clin Infect Dis*. 2021;73(10):1776-1783. doi:10.1093/cid/ciab054
11. Paterson P, Meurice F, Stanberry LR, Glismann S, Rosenthal SL, Larson HJ. Vaccine hesitancy and healthcare providers. *Vaccine*. 2016;34(52):6700-6706. doi:10.1016/j.vaccine.2016.10.042
12. Marcu A, Rubinstein H, Michie S, Yardley L. Accounting for personal and professional choices for pandemic influenza vaccination amongst English healthcare workers. *Vaccine*. 2015;33(19):2267-2272. doi:10.1016/j.vaccine.2015.03.028
13. Poland GA. The 2009–2010 influenza pandemic: effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns. *Vaccine*. 2010;28:D3-D13. doi:10.1016/j.vaccine.2010.08.024
14. Yaqub O, Castle-Clarke S, Sevdalis N, Chataway J. Attitudes to vaccination: a critical review. *Soc Sci Med*. 2014;112:1-11. doi:10.1016/j.socscimed.2014.04.018
15. World Health Organization. *Risk Communication and Community Engagement Readiness and Response to Coronavirus Disease (COVID-19): Interim Guidance*, 19 March 2020. WHO; 2020. <https://www.who.int/publications/i/item/risk-communication-and-community-engagement-readiness-and-initial-response-for-novel-coronaviruses>
16. Brauer E, Choi K, Chang J, et al. Health care providers' trusted sources for information about COVID-19 vaccines: mixed methods study. *JMIR Infodemiology*. 2021;1(1):e33330. doi:10.2196/33330
17. Biswas N, Mustapha T, Khubchandani J, Price JH. The nature and extent of COVID-19 vaccination hesitancy in healthcare workers. *J Community Health*. 2021;46(6):1244-1251. doi:10.1007/s10900-021-00984-3
18. Wilson RJI, Vergélys C, Ward J, Peretti-Watel P, Verger P. Vaccine hesitancy among general practitioners in Southern France and their reluctant trust in the health authorities. *Int J Qual Stud Health Well-being*. 2020;15(1):1757336. doi:10.1080/17482631.2020.1757336
19. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. *Vaccine*. 2015;33(34):4161-4164. doi:10.1016/j.vaccine.2015.04.036

20. South African Government News Agency. SAMA condemns healthcare workers discouraging patients from getting vaccinated. Published February 16, 2021. <https://www.sanews.gov.za/south-africa/sama-condemns-healthcare-workers-discouraging-patients-getting-vaccinated>
21. South African National Department of Health. Latest Vaccine Statistics, 15 February 2023. <http://sacoronavirus.co.za/latest-vaccine-statistics/>
22. George G, Nota PB, Strauss M, et al. Understanding COVID-19 vaccine hesitancy among healthcare workers in South Africa. *Vaccines*. 2023;11(2):414. doi:10.3390/vaccines11020414
23. Kaufman J, Bagot KL, Hoq M, et al. Factors influencing Australian healthcare workers' covid-19 vaccine intentions across settings: a cross-sectional survey. *Vaccines*. 2021;10(1):3. doi:10.3390/vaccines10010003
24. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101. doi:10.1191/1478088706qp063oa
25. Papini F, Mazzilli S, Paganini D, et al. Healthcare workers attitudes, practices and sources of information for COVID-19 vaccination: an Italian national survey. *Int J Environ Res Public Health*. 2022;19(2):733. doi:10.3390/ijerph19020733
26. Heyerdahl LW, Dielen S, Dodion H, et al. Strategic silences, eroded trust: The impact of divergent COVID-19 vaccine sentiments on healthcare workers' relations with peers and patients. *Vaccine*. 2023;41(4):883-891. doi:10.1016/j.vaccine.2022.10.048
27. George G, Strauss M, Lansdell E, et al. South African university staff and students' perspectives, preferences, and drivers of hesitancy regarding COVID-19 vaccines: A multi-methods study. *Vaccines*. 2022;10(8):1250. doi:10.3390/vaccines10081250
28. Rozek LS, Jones P, Menon A, Hicken A, Apsley S, King EJ. Understanding vaccine hesitancy in the context of COVID-19: the role of trust and confidence in a seventeen-country survey. *Int J Public Health*. 2021;66:636255. doi:10.3389/ijph.2021.636255
29. Hong H, Oh HJ. The effects of patient-centered communication: exploring the mediating role of trust in healthcare providers. *Health Commun*. 2020;35(4):502-511. doi:10.1080/10410236.2019.1570427
30. Collins R. COVID-19: Nurses have responded, now it is time to support them as we move forward. *Healthc Manage Forum*. 2020;33(5):190-194. doi:10.1177/0840470420953297
31. Muhammad F. COVID-19 pandemic: The role of traditional medicine. *Int J Infect*. 2020;7(3). doi:10.5812/iji.107090
32. Caly L, Druce JD, Catton MG, Jans DA, Wagstaff KM. The FDA-approved drug ivermectin inhibits the replication of SARS-CoV-2 in vitro. *Antiviral Res*. 2020;178:104787. doi:10.1016/j.antiviral.2020.104787
33. Swargiary A. Ivermectin as a promising RNA-dependent RNA polymerase inhibitor and a therapeutic drug against SARS-CoV2: evidence from in silico studies. *Research Square*. Published online 2020. doi:10.21203/rs.3.rs-73308/v1
34. Sharma R. What is Ivermectin? Why social media creates Covid 'miracle drugs' – and why you shouldn't trust the crowd. inews.uk. Published 2021. https://inews.co.uk/news/health/ivermectin-tablets-what-covid-miracle-drug-social-media-explained-882700?ito=copy-link_share_article-top
35. Hoare J, Mendelson M, Frenkel L. COVID-19 vaccine hesitancy and anti-vaxxers-supporting healthcare workers to navigate the unvaccinated: Reflections from clinical practice. *S Afr Med J*. 2022;112(1):11-13. http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S0256-95742022000100006
36. Verma AK, Pandey AK, Singh A, Bajpai J, Kant S, Bajaj DK. Assessing knowledge, attitude, and practices towards ivermectin pre-exposure prophylaxis for COVID-19 among health care workers. *Indian J Community Health*. 2021;33(3):430-434. doi:10.47203/ijch.2021.v33i03.004
37. Rapisarda V, Nunnari G, Senia P, et al. Hepatitis B vaccination coverage among medical residents from Catania University Hospital, Italy. *Future Microbiol*. 2019;14(9s):41-44. doi:10.2217/fmb-2018-0240