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Evaluation of Israeli healthcare workers knowledge and attitudes toward the COVID-19 vaccine

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Abstract

Objectives: Healthcare workers (HCWs) are considered an important target group for the COVID-19 vaccines. The current study assesses the knowledge and attitudes of Israeli HCWs regarding COVID-19 immunization, and how various occupational and demographic factors may underlie COVID-related knowledge and attitudes differences.

Methods: Following a pre-test to validate measures, a cross-sectional online anonymous survey was distributed to HCWs using a snowball sampling method.

Results: The survey was completed by 714 participants (mean age 39.9; range 18–74; 447 female), 52% doctors, 32% nurses, and the remainder by paramedical staff. Of the respondents, 553 (77.4%) answered the question are you in favor of getting the COVID-19 vaccine, 105 (14.7%) were not sure, and 56 (7.8%) were not in favor. Doctors had higher odds of agreement as compared to both nurses ($p < .025$) and paramedical staff ($p < .001$). Multivariate logistic regression analysis revealed that increased age (OR: 1.075; 95% CI: 1.04–1.11, $p < .001$), profession (physician vs. nurse; OR: 2.73; 95% CI: 1.32–5.65; $p < .007$), and getting the current influenza vaccine (OR: 4.96; 95% CI: 2.47–9.95) were significant predictors of *agreement*.

Conclusions: A high level of HCWs knowledge and in favor attitudes were observed. Yet negative attitudes were also noted, particularly among nurses, paramedical staff, and young employees.

KEYWORDS
Health behaviors, Health beliefs, Infectious diseases, Pandemic, Vaccination

1 | INTRODUCTION

The SARS-CoV-2 (COVID-19) pandemic, first declared by the World Health Organization (WHO) on March 11, 2020 has caused a high health burden and had severe social and economic global impacts. As of this writing, there were nearly 100 million confirmed cases of COVID-19 worldwide, and over 2 million deaths attributed to the disease (WHO Coronavirus Disease (COVID-19) Dashboard, 2021). In the months following the outbreak, the best available preventative measures were behavioral (Thanh et al., 2020). Authorities worldwide, including Israel, have implemented lockdowns and other restrictions in an effort to keep the spread of the virus. Yet, limited success has been observed leaving hope for newly developed vaccines as the best way forward.

Beginning in December 2020, a number of novel vaccines aimed at COVID-19 were approved, of which the three most important were produced, respectively, by Pfizer-BioNtech, Moderna, and Oxford-AstraZeneca. All three vaccines rely on new technology based on

genetic material, with the first two employing messenger RNA (mRNA). These new techniques have proved effective in clinical studies and could lay the foundation for rapid production of a wide range of vaccine types. However, the use of novel technology could also give rise to neophobia.

Healthcare workers (HCWs) are particularly exposed to transmissible diseases such as influenza and COVID-19, and can play a role in their nosocomial transmission. This makes HCWs an important target group for vaccination. Many institutions recommend that HCWs be routinely vaccinated against influenza. However, annual vaccination rates among HCWs are almost universally low, and differ between physicians and nurses (Hofmann et al., 2006; Martinello et al., 2003).

HCWs can serve as role models for the general population, thereby increasing the success of the broader vaccination campaign. Currently, however, little is known about the intention to get the new COVID-19 vaccine among HCWs (Detoc et al., 2020; Wang et al., 2020).

The current study assesses knowledge and attitudes regarding COVID-19 immunization among HCWs in Israel during the initial states of Israel vaccination campaign. Aside from identifying knowledge gaps and behavioral patterns that can serve as a basis for interventions to enhance vaccine compliance, a secondary aim of the study was to assess occupational and demographic differences in COVID-related knowledge and attitudes among HCWs in Israel.

2 | MATERIAL AND METHODS

A pilot study with 175 participants (113 Males; mean age 32.5, range 17–65) comprised of 109 doctors (62.3%), 47 (26.9%) nurses with a median of 4 years of experience (range 0–32 years) was performed in order to validate the attitudinal measures described below. Subsequently, a cross-sectional anonymous survey was constructed and distributed using Google Forms. The survey was distributed to HCWs workers in Israel who were not surveyed for the pretest. Pre-test data regarding participants' knowledge and beliefs about, as well as attitudes regarding CoVID-19 vaccination, were subject to exploratory factor analysis. Principal components analysis revealed meritorious sampling adequacy (KMO = 0.895) and Bartlett's test of sphericity was significant ($p < .001$). Two main dimensions were identified, namely, (a) knowledge of and false beliefs regarding COVID-19, and (b) attitudes to taking the vaccine, explaining over 50% of the common variance.

The survey was conducted between January 5, 2021 and January 15, 2021, a period in which the Pfizer-BioNTech vaccine was first made available for HCWs in Israel, and in which the transmission rate of COVID-19 in Israel was at record levels, prompting the country's third lockdown. With many COVID-19 wards full and HCWs under immense time pressure at that time, we were concerned that the use of impersonal, random sampling would bias the resulting sample in favor of those HCWs less directly impact by COVID-19 (and thus having greater slack time to respond). Accordingly, snowball sampling, involving friend-based requests for survey completion, was used to better ensure a more representative sample, including those HCWs, who—at the time—were deemed more difficult to reach (Valerio et al., 2016).

More specifically, the survey was initially distributed to 500 HCWs in Bnai Zion Medical Center through their personal email address or via a phone message. After completing the survey themselves, these participants were asked to invite other HCWs in their contact lists and from across the country to complete the survey in order to assist "a friend and colleague." Ultimately, surveys were received back from 714 HCWs. Respondents provided consent before beginning the survey. Participants were also informed that participation was voluntary, and that completion of the entire survey, while not mandatory, was preferred.

The questionnaire began with a direct question regarding the willingness of the participant to receiving the COVID-19 vaccine. More specifically, participants were asked to indicate their level of agreement with the following statement: "I am in favor of getting the COVID-19 vaccine," using a five-point Likert scale (1 = fully disagree, 2 = partially disagree, 3 = uncertain, 4 = partially agree, 5 = fully agree).

Subsequent items covered participants' demographic characteristics, as well as the two dimensions identified in the pre-tests, namely knowledge of and false beliefs regarding COVID-19 (15 items)[1], and attitudes to taking the vaccine (11 items). Scores on items in each domain (knowledge, attitudes) were summed and a final score was calculated for each domain (after reverse-scoring where appropriate). The knowledge and false belief score could range from 15 to 75, while the attitudes score could range from 11 to 55. Reliability of the resulting knowledge and attitude scales was high as reflected by Cronbach's alpha levels of 0.903 and 0.854, respectively.

The survey instrument was translated to Hebrew for the purpose of this study. The study was approved by the Bnai Zion Medical Center ethical committee/ institutional review board. The measurement items can be found in Table 3.

3 | STATISTICAL METHODS

Differences in the demographic variables were tested by $\chi 2$ or Fisher's exact test, where appropriate, for categorical data, and by ANOVA or t-tests for continuous data. Continuous variables were deemed to be approximately normally distributed if their skewness and kurtosis were +/−1.5. Responses to the question "Are you in favor of getting the COVID-19 vaccine?' were categorized into three groups–an agreement group (4 or 5), a not sure group and a disagree group (i.e., those who responded 1 or 2). Multinomial logistic regression was used to identify demographic variables that were associated with agreement. Hierarchal Logistic regression was performed to find significant predictors of agreement (i.e., willingness to take the vaccine) versus each of the other two groups, first using the significant univariate demographic variables and then adding the knowledge and attitude variables.

Data were analyzed with IBM SPSS (Version 24). Significance was set to $p < .05$.

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[1] The questionnaire included items on the source of participants' knowledge which were not included in the Knowledge or Attitude score calculations.

TABLE 1 Participant characteristics (N = 714)

	Mean±SD
Age, years[a]	39.9±11.6
(median, range)	(36; 18–74)
Experience, years[b]	12.8±11.7
(median, range)	(8; 0–48)
	N (%)
Sex	
Male	267 (37.4)
Female	447 (62.6)
Marital status	
Married	490 (68.6)
Single	155 (21.7)
Other	69 (9.7)
Have children	498 (69.7)
Professional qualification	
Doctor	377 (52.8)
Nurse	233 (32.6)
Paramedical staff	104 (14.6)
Work in ICU/neonatal ICU	140 (19.6)
Suffer from one or more Chronic diseases	123 (17.2)
Know someone who suffers from one or more Chronic diseases	459 (64.3)
Up to date on recommended vaccines	
Yes	670 (93.8)
Partial	27 (3.8)
No	17 (2.4)
Vaccinated against influenza 2020-2021	604 (84.6)
Vaccinated against influenza 2019-2020	516 (72.3)
Work in COVID-19 ward or ER	361 (50.6)
Confirmed case of COVID-19	55 (7.7)
Was in quarantine from exposure to COVID-19	280 (39.2)

[a]N = 713.
[b]N = 668.

4 | RESULTS

The demographic data and participant characteristics are presented in Table 1. In brief, surveys were obtained from 714 participants (mean age 39.9; range 18–74; 447 female). More than half were doctors (52.8%) and about a third were nurses (32.6%); the remainder were paramedical staff. Of the 714 participants, 123 (17.2%) suffered from one or more chronic disease. Over 90% were up-to-date on all recommended vaccines according to the Israeli ministry of health HCWs guidelines (93.8%; 670) and over 80% had been vaccinated for influenza during 2020–2021. Approximately, half the participants worked in a COVID-19 ward (361; 50.6%). Fifty-five respondents (7.7%) had had a confirmed case of COVID-19 (31 males; 35 doctors and 18 nurses); of these, 55 (90.9%) were symptomatic.

With respect to the direct question on willingness to receive the vaccine ("Are you in favor of getting the COVID-19 vaccine?"), 553 respondents (77.4%) were in favor (agree or partially agree), 105 (14.7%) were not sure, and 56 (7.8%) were not in favor (partially disagree or disagree). Distribution of the demographic variables and the univariate prediction of agreement are presented in Table 2.

Profession was associated with willingness to take the vaccine ($p < .007$); physicians had higher odds of agreement as compared to both nurses (OR: 2.09; 95% CI: 1.10–3.98; $p < .025$) and paramedical staff (OR: 3.40, 95% CI: 1.64–7.07; $p < .001$).

Multivariate logistic regression analysis revealed that age, profession and getting the influenza vaccine in the current year were significant predictors of vaccine attitudes. For each year increase in age the odds of disagreement over agreement decreased by 5% (OR: 0.95; 95% CI: 0.924–0.98, $p < .001$). The odds of a physician agreeing to receive the vaccine over disagreeing was 2.73 times that of a nurse (OR: 2.73; 95% CI: 1.32–5.65; $p < .007$) and 3.76 times that of paramedical staff (OR: 3.76; 95% CI: 1.56–9.09; $p < .003$). The odds of agreement were nearly five times that of disagreement for participants who received the influenza vaccine in the current year (OR: 4.96; 95% CI: 2.47–9.95).

Table 3 presents the responses to the knowledge/beliefs and attitudes questions. Looking at the knowledge/beliefs items, it should be noted that 85.3% of the participants agreed or partially agreed with the statement "When vaccinated, the benefit is also for the entire population". Nearly 2/3 of the participants agreed or partially agreed that the vaccine prevents illness (65.4%) and that it was effective (67.6%). However, while 51.4% of the participants agreed or partially agreed with the statement "The COVID-19 virus vaccine prevents spread of the disease," 39.8% were not sure and 8.8% disagreed at least partially. Among the responses to the false belief questions, 20.7% agreed (7.3%) or partially agreed (13.4%) that "It is better to get the virus and develop natural immunity". The mean total knowledge score was 59.9 (median 62; range 20–75).

With respect to their sources of Knowledge, of the 714 participants, 55.7% agreed or partially agreed that they were knowledgeable about the vaccine, about a quarter were not sure (25.5) and the remaining 18.8% partially or fully disagreed. Similarly, 55.0% agreed that the information they received from health organizations was adequate, nearly 22% were not sure and 22.1% partially or fully disagreed.

Participants reported receiving their information from one or more sources (median two sources; range 1–7) with scientific articles being cited as the most frequent (74.9%). Of the 535 who cited scientific articles as their sources of information, 140 (26.2%) exclusively used scientific articles as their sources of information. Internet news sites and TV/radio were the next most common sources (46.1% and 45.1%, respectively). Participants who used scientific articles as a source of knowledge had significantly higher knowledge scores than those who did not use them (60.9 vs. 57.1, t(712) = 4.17). A significant greater percentage of doctors (82.2%) used scientific articles as a source compared with nurses (66.5%; $p < .001$) and others (61.5%; $p < .001$). Likewise, a significantly lower percentage of doctors (28.9%) used social media and/or family and friends or their doctor (18.3%) as a source of information compared to nurses (36.5%; $p < .05$; 28.3%, $p < .004$) and

TABLE 2 In favor of getting the corona virus vaccine by select participant characteristics

	In favor of getting the corona virus vaccine			Overall	OR (95% CI)[a]	
	Agree (N = 553)	Not sure (N = 105)	Disagree (N = 56)	p	Not sure	Disagree
Age, years	41.5±11.9	34.0±8.7	35.8±8.1	.001	0.93 (0.91–0.95)	0.95 (0.92–0.98)
(range)	(18-74)	(23-66)	(24-57)			
Seniority (years)[b]	14.3±12.3	7.7±8.1	8.1±7.5	.001	0.94 (0.92–0.96)	0.95 (0.92–0.98)
(range)	(0-48)	(0-42)	(0-33)			
Sex				.14		
Male	196 (35.4)	46 (43.8)	25 (44.6)		1.42 (0.93–2.17)	1.47 (0.84–2.56)
Female	357 (64.6)	59 (56.2)	31 (55.4)		1.00 (reference)	1.00 (reference)
Profession				.007		
Doctor	298 (53.9)	61 (58.1)	18 (32.1)		1.00 (reference)	1.00 (reference)
Nurse	182 (32.9)	28 (26.7)	23 (41.1)		0.75 (0.46–1.22)	2.09 (1.10–3.98)
Student/other	73 (13.2)	16 (15.2)	15 (26.8)		1.07 (0.58–1.97)	3.40 (1.64–7.07)
Marital status				.03		
Married	395 (71.4)	60 (57.1)	35 (62.5)		1.00 (reference)	1.00 (reference)
Single	106 (19.2)	34 (32.4)	15 (26.7)		0.47 (0.30–0.76)	0.63 (0.33–1.19)
Other	52 (9.4)	11 (10.5)	6 (10.7)		0.66 (0.31–1.40)	0.82 (0.30–2.22)
Have children	409 (74.0)	51 (48.6)	38 (67.9)	.001	0.33 (0.22–0.51)	0.74 (0.41–1.34)
Chronic diseases	115 (20.8)	5 (4.8)	3 (5.4)	.001	5.25 (2.09–13.19)	4.64 (1.42–15.11)
Up to date vaccines	524 (94.8)	96 (91.4)	50 (89.3)	.07		
Influenza vaccine						
This year	495 (89.5)	75 (71.4)	34 (60.7)	.001	0.29 (0.18–0.49)	0.18 (0.10–0.33)
Last year	425 (78.0)	65 (64.4)	26 (50.0)	.001	1.96 (1.24–3.09)	3.54 (1.98–6.33)
Spent time in quarantine	210 (38.0)	50 (47.6)	20 (35.7)	.15	1.49 (0.98-2.26)	0.91 (0.51-1.61)
Had corona	41 (7.4)	13 (12.4)	1 (1.8)	.05	1.76 (0.91-3.42)	0.23 (0.03-1.68)
	In favor of getting the corona virus vaccine			Overall	Reference category OR (95% CI)	
Work in corona ward	277 (50.1)	62 (59.0)	22 (39.3)	.052	1.44 (0.94–2.19)	0.64 (0.37–1.13)

[a] Agree is the reference category.

others (43.3%; $p < .006$; 27.9%, $p < .04$). Use of social media/friends as a source of information was associated with lower willingness to get the vaccine ($p < .001$; vs. disagree OR:0.49, 95% CI: 0.28–0.86; vs. unsure: OR: 0.51, 95% CI: 0.33–0.77).

With respect to attitudes, almost three-fourths of the participants (522; 73.1%) agreed or partially agreed with the statement "Medical staff need to be vaccinated early to set an example for the rest of the population" while 16.8% disagreed or partially disagreed. With respect to perceived barriers, most of the participants reported agreement to getting another dose of the COVID-19 vaccine (71.7%; 512), recommending that others get vaccinated (72.4%; 517), feeling that the COVID-19 vaccine is safe (60.2%; 430) and getting vaccinated if their boss requests it (58.1%; 415). As to the issue of whether side effects were well-evaluated 249 (34.9%) at least partially disagreed, 294 (41.2%) at least partially agreed and the remaining 171 (23.9%) were not sure. The mean total attitude score was 36.5 (median 38; range 12–51).

Age was positively associated with knowledge ($r = .27, p < .001$) and attitudes ($r = .32, p < .001$). In bivariate analysis, the following characteristics were significantly associated with the knowledge total score: sex, marital status, profession, chronic diseases, up to date on recommended vaccines and influenza vaccination currently and the previous year. The following characteristics were significantly associated with the attitudes total score: sex, marital status, profession, chronic diseases, up to date on recommended vaccines and influenza vaccination currently and the previous year. After adjustment for age and sex, marital status was no longer statistically significant predictor of attitude ($F(2,708) = 2.55, p > .08$).

Table 4 presents willingness to get the COVID-19 vaccine by knowledge and attitudes.

Hierarchal multiple logistic regression (see Table 5) revealed that both knowledge/beliefs and attitudes were significant predictors for agreement over disagreement after the significant demographic variables of age, profession and receival of influenza vaccine this year was

TABLE 3 Knowledge, attitude and perceived barriers

Knowledge questions		Agree (5)	Partially agree (4)	Not sure (3)	Partially disagree (2)	Disagree (1)
	COVID-19 vaccine prevents illness	230 (31.6)	241 (33.8)	203 (28.4)	15 (2.1)	25 (3.5)
	COVID-19 vaccine prevents spread	161 (22.5)	206 (28.9)	284 (39.8)	22 (3.1)	41 (5.7)
	COVID vaccine prevents complications of the disease	275 (38.5)	194 (27.2)	208 (29.1)	13 (1.8)	24 (3.4)
	My vaccination against COVID-19 can prevent infection and disease complications in others who cannot get the vaccine	250 (35.0)	207 (29.0)	198 (27.7)	23 (3.2)	36 (5.0)
	When vaccinated, the benefit is also for the entire population	425 (59.2)	186 (26.1)	73 (10.2)	10 (1.4)	20 (2.8)
	The COVID-19 vaccine is effective	260 (36.4)	223 (31.2)	186 (26.1)	24 (3.4)	21 (2.9)
	After vaccination one suffers from side effects	84 (11.8)	338 (47.3)	162 (22.7)	97 (13.6)	33 (4.6)
	False beliefs					
	Vaccines weaken the immune system	15 (2.1)	68 (9.5)	111 (15.5)	99 (13.9)	421 (59.0)
	It is better to get the virus and develop natural immunity	52 (7.3)	96 (13.4)	141 (19.7)	86 (12.0)	339 (47.5)
	Healthy people do not need a COVID-19 vaccine	35 (4.9)	46 (6.4)	108 (15.1)	111 (15.5)	414 (58.0)
	Young people do not need a COVID-19 vaccine	32 (4.5)	58 (8.1)	96 (13.4)	125 (17.5)	403 (56.4)
	Diseases like autism and multiple sclerosis can be caused as a result of vaccination	11 (1.5)	34 (4.8)	194 (27.2)	82 (11.5)	393 (55.0)
	Allergies are caused by the COVID-19 vaccine	10 (1.4)	66 (9.2)	222 (31.1)	93 (13.0)	323 (45.2)
	If vaccinated, you are more likely to get the disease	3 (0.4)	30 (4.2)	121 (16.9)	94 (13.2)	466 (65.3)
	Children get a lot of vaccines and do not need a vaccine for COVID-19	33 (4.6)	39 (5.5)	146 (20.4)	104 (14.6)	392 (54.9)
	Agree (5)	Partially agree (4)	Not sure (3)	Partially disagree (2)	Disagree (1)	
	Source of Knowledge					
	Do you consider yourself knowledgeable regarding the future COVID-19 vaccine?	115 (16.1)	283 (39.6)	182 (25.5)	74 (10.4)	60 (8.4)
	The information received from ministry of health is adequate	131 (18.3)	269 (37.7)	156 (21.8)	75 (10.5)	83 (11.6)
Attitude questions	If vaccinated, you are more likely to get the disease	3 (0.4)	30 (4.2)	121 (16.9)	94 (13.2)	466 (65.3)
	The vaccination policy is affected by financial aspects of pharma-companies	51 (7.1)	115 (16.1)	209 (29.3)	84 (11.8)	255 (35.7)
	I agree that a physician does not have to encourage patients to get vaccinated	86 (12.2)	177 (25.2)	131 (18.6)	117 (16.6)	192 (27.3)
	Medical staff need to be vaccinated early to set an example for the rest of the population	364 (51.0)	158 (22.1)	72 (10.1)	41 (5.7)	79 (11.1)
	If vaccinated, you are more likely to get the disease	3 (0.4)	30 (4.2)	121 (16.9)	94 (13.2)	466 (65.3)
Perceived barriers to get vaccine	If another dose of COVID-19 vaccine is required (3rd dose), I will agree to be vaccinated	437 (61.2)	75 (10.5)	129 (18.1)	25 (3.5)	48 (6.7)
	Recommend others around you to get vaccinated against the COVID-19 virus	413 (58.7)	104 (14.8)	112 (15.9)	25 (3.6)	49 (7.0)
	Agree if your boss asks you to get vaccinated	317 (44.4)	113 (15.8)	172 (24.1)	30 (4.2)	82 (11.5)
	COVID-19 vaccines are safe to use	172 (24.5)	243 (34.6)	206 (29.3)	32 (4.6)	50 (7.1)
	In favor of forcing vaccination against COVID-19	76 (10.8)	123 (17.5)	151 (21.5)	92 (13.1)	261 (37.1)
	Even without a vaccine the pandemic will end	48 (6.7)	109 (15.3)	301 (42.2)	96 (13.4)	160 (22.2)
	Vaccine side effects are not well evaluated	126 (17.6)	168 (23.5)	171 (23.9)	135 (18.9)	114 (16.0)

Data is N (%).

TABLE 4 In favor of getting the COVID-19 vaccine by average total knowledge and attitude scores

	In favor of getting the COVID vaccine, mean ± SD (median; range)			
	Agree	**Not sure**	**Disagree**	
	(N = 542)	(N = 105)	(N = 56)	
Knowledge	63.5±7.4	51.4±8.	39.9±10.5	.001
	(65; 38–75)	(51;35–72)	(41; 20–64)	
Attitudes	39.9±6.1	27.8±5.2	20.4±5.7	.001
	(41;18–51)	(28;13–41)	(19;12–30)	

accounted for. The odds of disagreement over agreement decreased by 8% for every point increase in knowledge (adjusted OR: 0.92, 95% CI: 0.85–0.98, $p < .004$) and by 36% for every point increase in attitude (OR: 0.64, 95% CI: 0.57–0.72; $p < .001$) after adjustment for age, profession, and getting the influenza vaccine in the current year.

5 | DISCUSSION

Our report is the first to examine the knowledge and attitudes of Israeli HCWs in relation to the newly developed COVID-19 vaccines. Such an inquiry is important in that a common perception, even among many HCWs, is that the vaccines were rapidly developed and approved, thus raising apprehension over their effectiveness and safety (Lin et al., 2020). Indeed, these vaccines are the fastest ever developed (under 1 year), followed by the mumps vaccine, which took 4 years. The fact that the mRNA technology used in two of the vaccines has not been widely tested before in humans, along with the speed of their development, has given rise to fears about their long-term unknown effects.

Israel has emerged as the world leader in administering the COVID-19 vaccine, with the world's fastest campaign per capita (Kershner, 2021). Indeed, 20% of Israel population (9 million people), beginning with medical staff and elderly individuals, received at least one of their first two doses within a month of Israel beginning its vaccination campaign. HCWs were among the first to be vaccinated because of their greater risk of exposure (Dabholkar et al., 2020), the concomitant risk of nosocomial transmission, and the need to set an example for the rest of the population, who may doubt the vaccine's safety and effectiveness.

Given this background, we sought to better understand the COVID-related knowledge/beliefs and attitudes of Israeli HCWs, as well as the occupational and demographic characteristics that might underlies differences in these same knowledge/beliefs and attitudes. We found that, overall, HCWs are in favor of getting the vaccine—a response which may be explained by the physical and mental stress of the pandemic (Spoorthy et al., 2020; Vizeh et al., 2020) and the belief that only an effective vaccine can bring the pandemic to an end. Yet, we also encountered negative attitudes. In particular, unwillingness to take the vaccine was found among nurses at twice the rate of doctors, and

at even greater rates among other paramedical staff. A similar trend was observed in Hong Kong (Wang et al., 2020), Belgium and Canada (Verger et al., 2020).

In addition, we noted that nurses rely significantly less on scientific articles as a source for knowledge about vaccination for COVID-19. This was also observed with respect to the seasonal influenza vaccine (Pless et al., 2017).

Our study highlights the link between greater age and seniority and vaccine acceptance, which raises concerns regarding younger employees. False beliefs and concerns regarding side effects, and beliefs about the disease burden among the young, may lead younger HCWs to choose not to vaccinate. In addition, HCWs who are not vaccinated against influenza are most likely to refuse the COVID-19 vaccine. A similar trend regarding intention to get the COVID-19 vaccine was observed among the general population in the UK (Verger et al., 2020; Paul et al., 2020).

Interestingly, we did not find that side effects fears were a major barrier to the intention to get the vaccine. The recent studies which preceded the vaccines' approval were relatively low-scale, with small sample sizes (Baden et al., 2020; Polack et al,., 2020), leaving some individuals concerned about serious side effects. Indeed, even though scientific papers were the most common source of knowledge in our study, most of our respondents felt that the side effects of the vaccine are not yet well-understood. Nonetheless, a majority of HCWs in our study were in favor of vaccination similar to the trends observed in Belgium and Canada (Verger et al., 2020).

6 | LIMITATIONS

An important limitation of the current analysis is that the findings are based on a sample drawn on the basis of a snowball approach. On the one hand, as this approach is non-random, we cannot be sure of the generalizability of our findings to the population of HCW in Israel. On the other hand, due to the unique circumstances at the time of data collection, it offered the best means by which to secure a sizable sample including some of the more difficult-to-reach practitioners in some of the most hard-hit areas of the country.

7 | CONCLUSION

This survey examines Knowledge and attitudes regarding uptake of the COVID-19 vaccine among HCWs in Israel. The results highlight that overall, HCWs are in favor of getting COVID-19 vaccination. However, negative attitudes were found among nurses, paramedical staff, and young employees.

The interaction between HCWs and the general population is dynamic, with decision-making by HCWs affecting the rest of the population. Thus, there is ample room for authorities to run interventions aimed at increasing the uptake of COVID-19 vaccination among HCWs, especially among nurses and young HCWs. We believe that with sufficient and accurate information and good public health messaging, we

TABLE 5 Hierarchal regression analysis

		Unadjusted OR (95% CI)			Adjusted	
Step 1 demographics	p	Not sure	Disagree	p	Not sure	Disagree
Age, years (range)	.001	0.93 (0.91–0.95)	0.95 (0.92–0.98)	**.001**	0.93 (0.91–0.96)	0.95 (0.92–0.98)
Seniority (years)[1] (range)	.001	0.94 (0.92–0.96)	0.95 (0.92–0.98)	.61	–	–
Profession	.007			.02		
Doctor		1.00 (reference)	1.00 (reference)		1.00 (reference)	1.00 (reference)
Nurse		0.75 (0.46–1.22)	2.09 (1.10–3.98)		0.90 (0.54–1.50)	2.35 (1.20–4.58)
Student/other		1.07 (0.58–1.97)	3.40 (1.64–7.07)		0.82 (0.42–1.62)	2.32 (1.05–5.14)
Marital status	.03			.11	–	–
Married		1.00 (reference)	1.00 (reference)			
Single		0.47 (0.30–0.76)	0.63 (0.33–1.19)			
Other		0.66 (0.31–1.40)	0.82 (0.30–2.22)			
Have children	.001	0.33 (0.22–0.51)	0.74 (0.41–1.34)	.24	–	–
Chronic diseases	.001	5.25 (2.09–13.19)	4.64 (1.42–15.11)	.06	–	–
Influenza						
This year	.001	0.29 (0.18–0.49)	0.18 (0.10–0.33)	**<.001**	0.30 (0.17–0.52)	0.23 (0.12–0.43)
Last year	.001	1.96 (1.24–3.09)	3.54 (1.98–6.33)	.45	–	–
Had corona	.03	1.76 (0.91–3.42)	0.23 (0.03–1.68)	**.06**	—	—
Step 2						
Knowledge	.001	0.85 (0.83–0.88)	0.74 (0.70–0.78)	.008	1.01 (0.96–1.05)	0.92 (0.85–0.98)
Attitudes	.001	0.73 (0.69–0.78)	0.59 (0.54–0.64)	<.001	0.73 (0.67–0.79)	0.64 (0.57–0.72)

Reference category is "agree".

can enhance compliance and uptake of the vaccine among HCWs and the general population.

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