

Acceptance of an annual COVID-19 booster vaccine by healthcare workers: the effect of burnout and anti-vaccination attitudes

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Abstract

Background: The emergence of several SARS-CoV-2 variants may necessitate an annual COVID-19 booster vaccine. This study aimed to evaluate healthcare workers (HCWs) acceptance of an annual COVID-19 booster vaccine, if recommended, and its association with their attitudes and burnout levels.

Methods: We used an online self-administered questionnaire to conduct a cross-sectional study in all West Bank and Gaza Strip districts between August and September 2022. The VAX scale was used to assess HCWs' vaccination attitudes, and the Maslach Burnout Inventory was used to assess work-related burnout. In addition, we used logistic regression analyses to identify factors that were independently associated with the acceptance of the annual COVID-19 booster vaccine.

Results: The study included 919 HCWs; 52.3% were male, 58.8% were under 30, 46.5% were physicians, 30.0% were nurses, and 63.1% worked in hospitals. 33.5% of HCWs (95% CI: 30.5%-36.7%) said they would accept an annual COVID-19 booster vaccine if recommended. HCWs who are suspicious of vaccine benefits [aOR= .70; 95%CI: .65-.75] and those concerned about unforeseeable future effects [aOR= .90; 95%CI: .84-.95] are less likely to accept an annual COVID-19 booster vaccine if recommended, whereas those who receive annual influenza vaccine are more likely to accept it [aOR= 2.9; 95%CI: 1.7-5.0].

Conclusion: an annual COVID-19 booster vaccine is poorly accepted by HCWs. Mistrust of the vaccine's efficacy and concerns about side effects continue to drive COVID-19 vaccine reluctance. Health officials need to address HCWs' concerns to increase their acceptance of the annual vaccine if it is recommended.

Introduction

COVID-19 first appeared in Wuhan, China, in December 2019 and rapidly spread worldwide, prompting the World Health Organization (WHO) to declare it a pandemic in March 2020. As of September 2022, it is estimated that 610 million people have contracted the disease, with 1.5 million fatalities [1]. In Palestine, approximately 620,000 cases have been confirmed, resulting in 5,403 deaths over the same period [2]. Additionally, it also significantly impacted the healthcare system, increasing admissions and infection of healthcare workers (HCWs), as well as decreases in essential healthcare utilization [3].

Vaccination is among the most advantageous health interventions due to its positive effects on both population health and the economy [4]. COVID-19 vaccination has been shown to effectively prevent the disease and lower the risk of hospitalization and death [5]. This protection, however, declines over time due to waning immunity and, most importantly, the emergence of new virus variants [6]. Several SARS-CoV-2 variants have emerged since the pandemic's beginning, the most significant of which were Alpha, Beta, Gamma, Delta, and Omicron. These variants were linked to increased transmissibility or virulence and decreased vaccination effectiveness and were responsible for multiple waves of infections worldwide [7]. Accordingly, maintaining vaccine efficacy against emerging variants is crucial [8]. This

emphasizes the needs for booster doses and raises the possibility that an annual COVID-19 booster vaccine is required.

The vaccination practices and attitudes of HCWs are central to primary prevention strategies. HCWs can protect not only themselves and their families, but also those who rely on them for medical care, by getting vaccinated and maintaining a positive attitude. They also play an important role as vaccine enablers and communicators to patients and the general public [9]. The reluctance of HCWs to accept COVID-19 booster doses may undermine public trust in the vaccine [10]. Studies revealed a high level of COVID-19 vaccine hesitancy among HCWs, which has been attributed to inadequate knowledge, low confidence in the vaccine, and many other factors [11]. Palestinian HCWs were initially hesitant to accept the vaccination [12, 13], but once it was implemented, their actual uptake increased [14].

Negative attitudes toward healthy behaviors may result from the stress of HCWs [15]. Burnout, a self-reported state of care- or work-related physical and mental stress [16], is a common psychological syndrome among HCWs, exacerbated by the COVID-19 pandemic [17]. Palestinian HCWs experience high levels of burnout, which can be attributed to the pressures of daily work and the challenges Palestine faces as a developing country still under occupation [18, 19]. Besides its direct effects, burnout may indirectly affect HCWs by lowering service quality regarding adherence to guidelines, poor communication, patient outcomes, and safety [20].

This is, to the best of our knowledge, the first study in the WHO Eastern Mediterranean Region to examine HCWs' willingness to accept and attitudes toward an annual COVID-19 booster vaccine. A better understanding of the acceptance rate of an annual COVID-19 booster vaccine among HCWs, as well as the factors influencing it, would aid in the development of interventions to reduce hesitation and increase uptake. Therefore, this study aims to determine the percentage of Palestinian HCWs who would accept an annual COVID-19 booster vaccine if recommended, as well as the relationship between acceptance, attitude toward the vaccine, and level of burnout.

Methods

Study design and population

We conducted a cross-sectional study in all West Bank and Gaza Strip districts between August and September 2022, using an online self-administered questionnaire. We targeted Palestinian physicians, nurses, and allied health professionals (lab technicians, radiology technicians, and occupational and physiotherapists) working in hospitals and primary health care centers, both government and non-government. A minimum sample size of 911 HCWs was calculated using the formula $n = \frac{DEFF * Np(1-p)}{[(d^2/Z^2(1-\alpha/2)^2(N-1) + p^*(1-p))]$, where $Z = 1.96$ is the confidence level statistic, $DEFF = 1$ is design effect, $P = 33\%$ is the estimated proportion of HCWs willing to receive an annual COVID-19 booster vaccine based on previous studies [12], and $d = 3\%$ is the absolute precision. Thus, a minimum sample size of 911 HCWs was necessary to achieve the study objectives .

We recruited participants using a convenience sampling strategy, sending out Google Forms links and introductory invitations to closed institutional groups of HCWs (WhatsApp and Messenger). We used a convenience sampling technique to invite participants, where we distributed a web link to the questionnaire via Google forms. The study was carried out in compliance with current laws on ethical standards and privacy protection. Along with the questionnaire, we enclosed an introductory note explaining the study's purpose and assured respondents that their anonymity and the confidentiality of their responses would be strictly protected. In addition, participants were asked to confirm their agreement with the information provided and their willingness to participate online by tapping the "I agree" item. The Institutional Review Board of An-Najah National University approved the study [Ref. #: Med. August 2022/26].

Measurement tools

This questionnaire was created by the research team using related literature and previous studies. Before being finalized and distributed to participants, the questionnaire was reviewed by three experts in the field and piloted with 30 HCWs. It is divided into four sections. The first section assessed HCWs' background, professional, and clinical characteristics, which included age, gender, profession, working place, marital status, smoking status, and presence of chronic disease. The second section evaluated variables associated with COVID-19 in terms of past disease exposure, history of vaccination, and vaccine side effects, as well as the history of influenza vaccine uptake.

The third section used the Vaccination Attitudes Examination Scale (VAX) adjusted to the COVID-19 vaccine to assess the HCWs' vaccination attitudes [21]. It has 12 items divided into four sub-scales: mistrust of vaccine benefits, worries over future effects, concerns about commercial profits, and preference for natural immunity. Each subscale has three items scored from 1 (strongly agree) to 6 (strongly disagree), except items of the first subscale, which are reversely coded. Higher scores indicate anti-vaccination attitudes. We used the Arabic version of the VAX scale, which has been used in previous studies, and found a high degree of internal consistency [14]. The internal consistency coefficient (Cronbach's α) of the VAX scale used in this study was 0.84.

The last section evaluated HCWs' work-related burnout using the Maslach Burnout Inventory (MBI) [22]. It is a 22-item tool that asks participants, on a 7-point Likert scale (from 0, 'never,' to 6, 'daily'), how frequently they had recently experienced specific feelings related to their work. The MBI is the most commonly used tool, and it consists of three scales: emotional exhaustion (EE) (nine items), which measures one's emotional and physical exhaustion as a result of his work; depersonalization (DP) (five items), which assesses work-related stress, lack of feeling, and impersonal responses to patient care, and reduced empathy; and personal accomplishment (PA) (eight items), which evaluates the individuals' perception of their work and reflects how they perceive its significance. High scores on the EE and depersonalization scales, and low scores on the PA scale, indicate a high level of burnout. While no definite cut-off points for MBI subscales exist, we used the following cut-off points from a previous study on HCWs in the region [23]: burnout was high when EE was ≥ 35 , the PA was ≤ 29 , and DP was ≥ 11 , and

moderate when EE was 21-30, the PA was 41-36, and DP was 6-10. Internal consistency (Cronbach's) values for the EE, DP and PA dimensions used in this study were all high: 0.88, 0.80, and 0.90, respectively.

Study outcome

The questionnaire included a direct question assessing the study's primary outcome by asking HCWs whether they would agree to receive an annual COVID-19 booster vaccine if it is recommended. Respondents were classified as acceptant or hesitant based on their response to the question. Acceptant are HCWs who said "yes," whereas hesitant are those who said "no" or "not decided yet."

Data Analysis

Data entry and analysis were done with the IBM SPSS Statistics for Windows, version 21 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequency distributions and proportions, and the associations were tested using the chi-square test. On the other hand, continuous variables were first tested for normality using the Kolmogorov-Smirnov test, then summarized using mean and standard deviation (SD), and the associations were tested using the independent t-test. We used logistic regression analyses to identify factors independently associated with acceptance to receive annual COVID-19 booster vaccine by including all relevant variables from the literature. Adjusted odds ratios (aOR) and 95% confidence intervals (CI) were used to express the findings. The significance level was set at a P-value of less than 0.05.

Results

Background characteristics

The study included 919 HCWs in total. Table 1 shows the sociodemographic and work-related characteristics of the study sample. It was found that 52.3% of respondents were male, 58.8% were under 30, and 53.6% were married. Almost half of the participants were employed by the government, 46.5% were physicians, 30.0% were nurses, and 63.1% worked in hospitals. About one-fourth of HCWs smoked, and 7.6% had chronic diseases.

[Insert table 1 here]

Annual COVID-19 booster vaccine

Overall, 308 HCWs (33.5%; 95% CI: 30.5%-36.7%) said they would accept an annual COVID-19 booster vaccine if recommended, while 611 (66.5%; 95% CI: 44.7%- 69.5%) were hesitant; said no, and 21.8% were undecided (Figure 1).

[Insert figure 1 here]

According to univariate analysis, Male HCWs, Physicians, and HCWs working in hospitals were more likely to accept an annual COVID-19 booster vaccine (Table 1), as well as HCWs who received COVID-19 vaccine and those who received annual influenza vaccine (Table 2). On the other hand, HCWs who are suspicious of vaccine benefits and concerned about unforeseeable future consequences are more likely to be hesitant (Table 2).

[Insert table 2 here]

Burnout among HCWs

Overall, 273 HCWs (29.7%) reported high EE, 454 HCWs (46.5%) reported high DP, and 300 HCWs (32.6%) reported high reduced PE. In addition, higher levels of vaccine hesitancy were observed among HCWs with moderate and high levels of burnout in the three domains, but none reached statistical significance (Table 3).

[Insert table 3 here]

Determinants of annual COVID booster vaccine acceptance

The results of multivariate logistic regression analysis showed that HCWs who are suspicious of vaccine benefits [p-value <.001, aOR= .70; 95%CI: .65-.75] and those concerned about unforeseeable future effects [p-value .001, aOR= .90; 95%CI: .84-.95] are less likely to accept an annual COVID-19 booster vaccine if recommended, whereas those who receive annual influenza vaccine are more likely to accept it [p-value <.001, aOR= 2.9; 95%CI: 1.7-5.0] (Table 4).

[Insert table 4 here]

Discussion

The findings of this study showed that the majority of HCWs are hesitant about receiving an annual COVID-19 booster vaccine if it is recommended. Only one-third of HCW would accept it. An unexpected outcome, particularly for the sample of HCWs. In a recent survey, three-quarters of Chinese adults said they would get a booster shot if necessary [24], and the same results were found in Poland among HCWs and medical students [25]. If these results continue as they are, they may have a negative impact on disease control efforts and the acceptance of vaccinations by other important groups in society, should annual vaccinations be required. However, the decision to receive an annual COVID-19 booster vaccine may change over time, especially if new evidence confirming its safety emerges. Prior to the launch of the COVID-19 vaccination campaign in early 2021, only 37.8% of Palestinians intended to receive the vaccine [12], whereas their actual uptake increased to 66.5% once vaccination was implemented [14].

The effectiveness of vaccines, particularly booster vaccine, was a major factor in the general public's acceptance of the COVID-19 booster vaccine among Algerians and Americans [26, 27]. These benefits do not appear to be recognized by the healthcare participants in our study; in fact, they are acting in the

opposite direction. In Palestine, and with comparable results in Africa, hesitance to receive a booster vaccination was strongly correlated with a lack of confidence in the value of vaccination [28]. Worries about unforeseen future effects was another factor that hindered COVID-19 booster vaccination acceptance. Also from Poland and Jordan, study participants disagreed that a booster dose of the COVID-19 vaccine would be as safe as the initial doses [25, 29]. Reassuring HCWs on the efficacy of COVID-19 vaccines and being transparent about their side effects are crucial strategies for addressing the concerns about vaccine benefits and fear of side effects, and thereby increasing acceptance to booster vaccination. The publication of new studies confirming the vaccine's effectiveness and lack of long-term complications in the near future could dispel many doubts among HCWs and increase the vaccine's acceptance.

Acceptance of an annual COVID-19 booster vaccine is greatly influenced by annual Flu vaccination. Numerous studies and hypotheses attempt to explain the propensity of individuals to utilize healthcare services. In studies of influenza vaccination, the Health Belief Model was used to explain how an individual's likelihood of engaging in protective behaviors depends on their belief about health threat (perceived susceptibility and severity of the disease) and the net benefits of engaging in the protective behaviors (perceived barriers and benefits of the behavior) [30, 31]. In addition, the theory of planned behavior was applied, with the additional premise that intent is the link between health-related attitudes and behaviors [30]. Family was the primary influencer to have the intention to get vaccinated, and worries about side effects from the flu vaccine were a major barrier to vaccination [32]. Almost identical results were reported for the COVID-19 vaccine in this analysis.

Gender doesn't affect the willingness to accept annual COVID-19 booster vaccine though previous studies. Women have historically been more reluctant to receive vaccinations than men [33]. In part, women have a pessimistic view of the medical and pharmaceutical industries as a whole [34], and specifically for the COVID-19 vaccine, people surveyed believed that the vaccine could cause infertility [35]. Previous COVID-19 intention and uptake studies demonstrated that female HCWs were less likely to intend to take and certainly take the COVID-19 vaccine [12, 14]. The disappearance of the gender gap in this study could be attributed to the low acceptance rate among all in general, as well as the high level of concern about unanticipated future effects is shared by both genders.

Profession also demonstrated no significant effect on accepting an annual COVID-19 booster. During the initial pandemic wave, French nurses were more reluctant to accept the COVID-19 vaccine.[36] Likewise, multiple studies reached the identical conclusion [37]. Despite the fact that our analysis did not uncover this correlation, the rate of vaccination acceptance among nurses remains low. This low vaccination acceptance rate among nurses may have a negative impact on the vaccination compliance of individuals who interact professionally or personally with vaccine-hesitant nurses in the future.

Even though EE was present in one-third of the sample and high DP and low PA were present in approximately half of the sample, these factors were not significantly associated with acceptance of annual COVID-19 booster vaccination. A survey conducted in the United States also revealed that stress

has no effect on COVID-19 hesitancy [38]. In the univariate analysis, however, those who reported higher burnout levels for the three subscales were more likely to be hesitant to receive an annual booster. Notable that we reported burnout among HCWs in a country with a well-known conflict and a stressful work environment. It is significantly higher than oncology department workers in Turkey [39], but lower than emergency department workers in Lebanon and Palestine [18, 40], given that our sample consists of hospitals, PHC, and private workers.

Our findings should be interpreted with the following limitation in mind. First, the obtained results may be of limited representativeness due to the non-random sampling technique used to recruit participants for this study. Second, our study is susceptible to self-reporting bias because we asked HCWs to describe their attitude and practices about the COVID-19 vaccines rather than objectively measuring them. Third, the cross-sectional survey design limits our ability to establish causal relationships, and HCWs' attitudes may change over time. Despite these limitations, the study included a large sample of healthcare workers from various sectors, making it one of the first to address this issue in this population group. As a result, the findings should aid in a better understanding of the problem and future research.

Conclusion

In conclusion, the acceptance of an annual COVID-19 booster vaccine is low among Palestinian HCWs. Mistrust of the annual COVID-19 booster vaccine efficacy and concerns about unforeseen side effects remain significant factors in COVID-19 vaccine reluctance. This highlights the importance of health authorities addressing HCWs' concerns in order to increase their acceptance of the annual booster vaccine, if it is to be recommended, which is expected due to the recurrent emergence of different virulent strains in the previous two years, as has been the case for decades with the annual influenza vaccine.

Declarations

Funding. The authors did not receive support from any organization for the submitted work.

Competing Interest: The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval. All procedures performed in this study have been performed following the Declaration of Helsinki. The study was approved by the Institutional Review Board of An-Najah National University [Ref #: Farm. Med. August 2022/26].

Consent to participate: All subjects involved in the study were invited to participate voluntarily. Online informed consent to participate was obtained by all participants.

Consent for publication: not applicable

Availability of data and materials: The datasets supporting the conclusions of this article is included within the article and its additional files.

Code availability: not applicable

Author contributions: ZN and YE contributed to the idea conception and the study design. ZN and BM designed the methods, supervised data collection analysis, and wrote the first draft of the manuscript. MD, TJ, and HB contributed to data collection and analysis. All authors interpreted the results and commented on previous versions of the manuscript. All authors read and approved the final manuscript and have agreed to submit it to the journal.

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Tables

Table 1: Participants background and demographic characteristics with the willingness to get an annual COVID booster vaccine (n=919)

<i>Characteristic</i>	Total n(%)	Annual COVID-19 booster vaccine		P-value
		Acceptant	Hesitant	
Sex				
Male	480 (52.3%)	185 (38.5%)	295 (61.5%)	.001
Female	437 (47.7%)	122 (27.9%)	315 (72.1%)	
Age				
Under 30 years	539 (58.8%)	168 (34.5%)	353 (65.5%)	.635
30-39 years	263 (28.7%)	82 (31.2%)	181 (68.8%)	
≥ 40 years	114 (12.4%)	39 (34.2%)	75 (65.8%)	
Marital status				
Married	492 (53.6%)	155 (31.5%)	337 (68.5%)	.158
Single	423 (46.4%)	153 (35.9%)	273 (64.1%)	
Profession				
Physicians	425 (46.5%)	185 (43.5%)	240 (56.5%)	<.001
Nurses	274 (30.0%)	73 (26.6%)	201 (73.4%)	
Allied health professionals	215 (23.5%)	49 (22.8%)	166 (77.2%)	
Health care setting				
Governmental	467 (52.8%)	170 (35.7%)	306 (64.3%)	.176
Non- Governmental	082 (09.1%)	22 (26.8%)	60 (73.2%)	
Private	343 (38.1%)	107 (31.2%)	236 (68.8%)	
Work division				
Hospitals	543 (63.1%)	206 (37.9%)	337 (62.1%)	.001
Primary health care	232 (27.0%)	68 (29.3%)	164 (70.7%)	
Others	85 (9.9)	17 (20.0%)	68 (80.0%)	
Smoking				
Non-smoker	648 (60.5%)	213 (32.9%)	435 (67.1%)	.327
ex-smoker	033 (03.6%)	15 (45.5%)	18 (54.5%)	
Smoker	238 (25.9%)	80 (33.5%)	158 (66.4%)	

<i>Chronic disease</i>				
Yes	70 (7.6%)	20 (28.6%)	50 (71.4%)	.362
No	849 (92.4%)	288 (33.9%)	561 (66.1%)	

*Chi-squared test

Table 2: HCWs' history of COVID-19 infection, COVID-19 vaccine uptake, and vaccination attitudes with the willingness to get an annual COVID booster vaccine (n=919)

	Total n(%)	Annual COVID-19 booster vaccine		P-value*
		Acceptant	Hesitant	
Prior COVID-19 infection				
Yes	580 (63.4%)	196 (33.8%)	384 (66.2%)	.631
No	335 (36.6%)	108 (32.2%)	227 (67.8%)	
Handled severe COVID-19 cases				
Yes	529 (58.7%)	186 (34.5%)	353 (65.5%)	.447
No	380 (41.3%)	122 (32.1%)	258 (67.9%)	
COVID-19 vaccination				
Yes	722 (78.6%)	270 (37.4%)	452 (62.6%)	<.001
No	197 (21.4%)	38 (19.3%)	159 (80.7%)	
Side effects of COVID-19 vaccine				
Yes	412 (42.9%)	143 (34.7%)	269 (65.3%)	.085
No	310 (57.1%)	127 (41.0%)	183 (59.0%)	
Received annual Flu vaccine				
Yes	123 (13.4%)	70 (56.9%)	53 (43.1%)	<.001
No	796 (86.6%)	238 (29.9%)	558 (70.1%)	
Mistrust of vaccine benefits		6.6 ± 2.7	10.6 ± 3.8	<.001
<i>(Mean ± SD)</i>				
Worries over future effects		13.7 ± 2.8	14.4 ± 3.2	.002
<i>(Mean ± SD)</i>				
Concerns about commercial profits		9.5 ± 4.0	11.4 ± 3.9	.242
<i>(Mean ± SD)</i>				
Preference for natural immunity		11.3 ± 3.8	12.9 ± 3.8	.936
<i>(Mean ± SD)</i>				

*Chi-squared test and *Independent t-test*

Table 3: Burnout among HCWs and its association with the willingness to get an annual COVID-19 booster vaccine (n=919)

	Total <i>n</i> (%)	Annual COVID-19 booster vaccine		P-value*
		Acceptant	Hesitant	
Emotional exhaustion				
High	273 (29.7%)	85 (31.1%)	188 (68.9%)	.137
Moderate	273 (29.7%)	84 (30.8%)	189 (69.2%)	
Low	373 (40.6)	139 (37.3%)	234 (62.7%)	
<i>Depersonalization</i>				
High	454 (49.4%)	91 (30.3%)	209 (69.7%)	.363
Moderate	193 (21.0%)	82 (35.2%)	151 (64.8%)	
Low	272 (29.6%)	135 (35.0%)	251 (65.0%)	
<i>Personal accomplishment</i>				
High	300 (32.6%)	151 (33.3%)	303 (66.7%)	.809
Moderate	233 (25.4%)	62 (32.1%)	131 (67.9%)	
Low	386 (42.0)	95 (34.9%)	177 (65.1%)	

*Chi-squared test

Table 4: Multivariable analysis of variables associated with willingness to get an annual COVID booster vaccine

	SE	P Value*	Adjusted OR (95%CI)
Sex			
Male	.209	.929	1.1 (.68-1.5)
Female†			1
Profession			
Physicians	.286	.096	1.6 (.92-2.8)
Nurse	.313	.601	1.2 (.64-2.2)
Allied health professionals†			1
Work division			
Hospitals	.393	.285	1.5 (.71-3.3)
Primary health care	.417	.650	1.2 (.54-2.8)
Other health care settings†			1
COVID-19 vaccination			
Yes	.244	.208	1.4 (.84-2.2)
No†			1
Received annual Flu vaccine			
Yes	.275	<.001	2.9 (1.7-5.0)
No†			1
Emotional exhaustion			
High	.290	.652	1.2 (.65-2.1)
Moderate	.288	.949	1.1 (.58-1.8)
Low†			1
Depersonalization			
High	.265	.367	1.3 (.76- 2.2)
Moderate	.265	.821	1.1 (.63-1.8)
Low†			1
Personal accomplishment			

High	.245	.144	1.4 (.89-2.3)
Moderate	.282	.941	.59-1.8
Low [†]			1
Mistrust of vaccine benefits	.036	<.001	.70 (.65-.75)
Worries over unforeseen future effects	.033	.001	.90 (.84-.95)

[†]Reference group, **OR**= Odds Ratio, **CI**= confidence interval

Figures

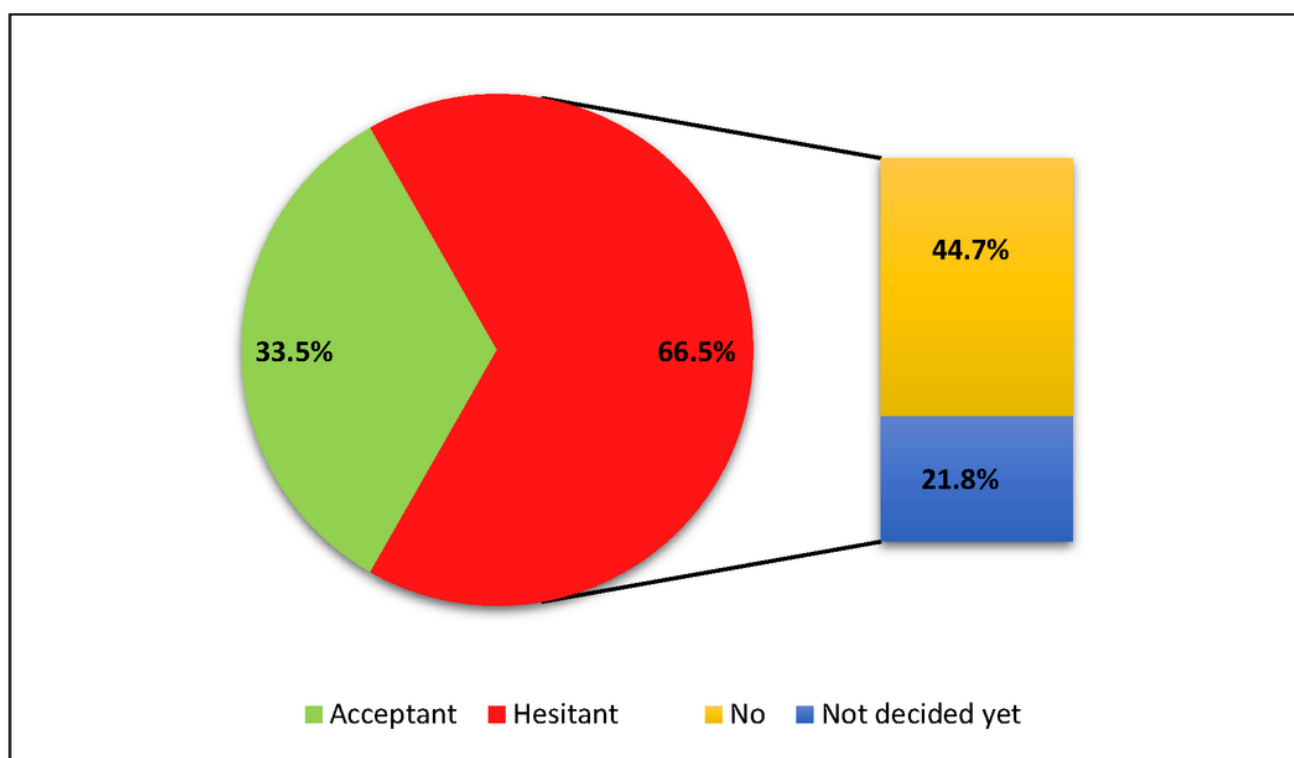


Figure 1

Healthcare workers' responses about receiving an annual COVID-19 booster vaccine

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Rowdata.xlsx](#)