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ORIGINAL RESEARCH

Risk Perception and Hesitancy Toward COVID-19 Vaccination Among Healthcare Workers and Staff at a Medical College in Nepal

Sabita Paudel [1]
Subish Palaian [2,3]
Pathiyil Ravi Shankar [4]
Nuwadatta Subedi [5]

[1]Department of Pharmacology, Gandaki Medical College, Pokhara, Gandaki, Nepal; [2]Department of Clinical Sciences, College of Pharmacy and Health Sciences, Ajman University, Ajman, United Arab Emirates; [3]Center of Medical and Bio-Allied Health Sciences Research, Ajman University, Ajman, United Arab Emirates; [4]IMU Center for Education, International Medical University, Bukit Jalil, Kuala Lumpur, Malaysia; [5]Department of Forensic Medicine, Gandaki Medical College, Pokhara, Gandaki, Nepal

Purpose: The study was conducted to explore the perception of healthcare workers and staff towards the risk of COVID-19 vaccination and to study vaccine hesitancy amongst them.

Methods: A total of 266 healthcare workers working in a medical college in Nepal were studied using a questionnaire consisting of three sections: demographics, experiences and perception of COVID-19, and COVID-19 vaccine safety. Data were analyzed using IBM SPSS version 26. The total perception score was calculated by noting respondent's agreement with a set of eleven statements using a Likert-type scale. Non-parametric tests (Mann–Whitney U and Kruskal–Wallis) were used for analysis ($p<0.05$).

Results: Altogether, 13.9% of respondents had been diagnosed COVID-19 positive prior to the survey. Many considered themselves to be at increased risk of contracting COVID-19. Only over one third (38.3%) were willing to be vaccinated. The most common reason for refusal/hesitancy was concern about vaccine safety. The median (interquartile range) total perception score was 36 (4) (maximum possible score=55). The score was significantly higher among those who had been diagnosed COVID positive, those who perceived the pandemic as being moderate or severe and among those willing to be vaccinated

Conclusion: Addressing doubts related to vaccine safety and providing more data on the safety of vaccine may be helpful in overcoming hesitancy.

Keywords: knowledge score, nonparametric tests, staff, questionnaire

Introduction

Coronavirus disease 2019 (COVID-19) is still creating havoc globally. According to a report of the WHO on May 26, 2021, there were 3,482,907 deaths and 167,492,769 confirmed cases worldwide.[1] Since the start of the pandemic in December 2019,[2] several pharmacological and nonpharmacological solutions have been tested with limited benefits.[3] Multiple vaccines against the virus have now been produced.[4] Vaccines could be the best option to prevent the disease from spreading, with more virulent mutant strains being constantly identified. Presently, some vaccines are already on the Emergency Use Listing, whereas some are awaiting approval.[5]

Since healthcare workers are directly involved in diagnosing, treating, and taking care of patients, they are at high risk of infection.[6] Most countries have started their vaccination programs. Vaccination has been shown to be effective (to a varying extent) in reducing the severity of complications.[7,8] According to a study, 70% of the population should be vaccinated to attain herd immunity.[9] There are

Correspondence: Sabita Paudel
Gandaki Medical College, Rithepani, Pokhara, Gandaki, Nepal
Tel +977 61 538595, 550253, 534657
Fax +977 61 550254
Email drsabitapaudel@gmail.com

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vaccine skeptics, for both H1N1[10] and COVID-19,[11] who can hinder vaccination by creating and spreading speculations. Acceptance of misguided information regarding the COVID-19 vaccine by the public is likely to create hesitancy among the public to be vaccinated.[12] There are a large number and types of vaccines available with different storage and distribution logistics and possible adverse effects, which can create confusion among the public.

In Nepal, there were 535,525 confirmed cases and 6845 deaths, according to the report of John Hopkins University of Medicine on May 23, 2021.[13] Nepal has initiated vaccination of healthcare workers and frontliners on January 27, 2021, with COVISHIELD vaccine from Oxford/AstraZeneca manufactured in the neighboring country, India.[14] The efficacy of this vaccine is reported to be 63.09% against symptomatic COVID-19 infection.[15] In a medical college, different categories of staff work include healthcare workers involved directly in the management of COVID-19 patients and staff working in academic and managerial roles who are not directly involved in patient management. Nonetheless, they may have an essential role in communicating to the public regarding vaccines as it is very likely that they may be approached for information. Studies have mainly focused on the overall perception of COVID-19 and acceptance of vaccines.[16,17] To date, the perception of the Nepalese population toward the safety of the COVID-19 vaccine has not been documented. The study conducted by Barry et al revealed that healthcare workers who believed in the safety of the vaccine and regarded the vaccine as a means to stop the spread of an illness were more willing to be vaccinated.[17]

Information regarding the perception of vaccines among staff working in a medical college would be beneficial for the institution to design appropriate educational programs. Studies focusing on the perception of vaccine safety are few, so this study can be a valuable addition to the literature. This study also provides an opportunity to compare perceptions of vaccine safety among different countries. Understanding healthcare workers' perceptions on vaccine safety can enable governments to institute appropriate early strategies to improve vaccination rates among the public. Hence, the present study was conducted to assess the safety concerns and reasons for vaccine hesitancy among medical and nonmedical staff at a medical college in Nepal.

Method

Study Design

A cross-sectional descriptive study was conducted among healthcare workers and staff of a medical college.

Ethical Approval

Ethical approval was obtained from the Institutional Review Committee of Gandaki Medical College with the approval number 94/77/78 dated January 25, 2021. This study was conducted following the Declaration of Helsinki.

Informed Consent and Confidentiality

The respondents were provided with a written summary regarding the research and contact information of the principal investigator. They were assured of the confidentiality of the information collected, and written informed consent was obtained. Among respondents completing the survey online, information was provided at the beginning of the form, and consent was obtained online.

Study Site

The study was conducted at a medical college. A total of 800 employees working at various levels such as general workers, paramedics, medical doctors, and academic faculties were invited to participate.

Study Timing

The data collection was performed between January 27 and February 3, 2021.

Study Tool

Questionnaire Content

COVID-19 vaccine safety questionnaire was developed on the basis of the information obtained from previous studies.[10,18–22] The questionnaire had three sections: Section 1, demographics; Section 2, experiences and perception of COVID-19; and Section 3, vaccine safety (Supplementary File 1). Questions were divided into five themes of experience of COVID-19: choice of vaccine, willingness to be vaccinated, perception on efficacy and safety of the vaccine, information on vaccine safety, and trust in vaccine producers. There were three to five questions in each theme.

Questionnaire Validation

The face validation was performed by a clinical faculty, and his suggestions were incorporated. He examined the sequence of questions, number of questions, any

ambiguity, and grammatical errors. Construct and content validation of the questionnaire were performed by two pharmacology experts from Nepal working in two different extramural institutions.

Reliability Testing

The questionnaire was pilot tested among 30 respondents not participating in the study. The Cronbach's alpha value obtained was 0.76.

Inclusion and Exclusion Criteria

Adults aged >18 years working at the study site who provided consent were included. Staff who were already vaccinated were excluded because the response to a few questions may be biased if answered by vaccinated individuals.

Sample Size Calculation

Being a descriptive survey, the sample size was calculated as per Cochran's formula:

$N = Z^2pq/e^2$

Z = value is obtained from Z table at a given value of precision, 1.96

p = estimated proportion of the population which has the attribute in question; for our heterogeneous group of population, we assumed greater variability of 50%, so p = 0.5

$q = 1 - p = 1 - 0.5 = 0.5$

e = desired level of precision (ie, the margin of error) = 5% = 0.05

· Including these values in the formula

$N = 1.96^2 * 0.5 * 0.5/0.05^2$

$N = 384.16$

Although the calculated sample size was 384, the authors could only obtain responses from 266 respondents.

Sampling Method and Stratification

Samples were obtained from different clusters of the population such as managerial and administrative staff, nurses, faculties, medical doctors and postgraduate residents, and general workers in a proportionate manner. We further divided these clusters on the basis of their gender.

Data Collection

The questionnaire was self-administered (using either online or printed form) to 211 respondents; however, for 55 respondents who could not interpret the questionnaire properly, data were collected through interviews. The interviewers were trained data collectors. They were trained by one of the coinvestigators on interviewing, communicating with respondents, and completing the form. Demographic details of all staff were obtained from the administration of the college. Questionnaires were sent using an online form to the ones whose email address/messenger account could be accessed (55 samples) and who could complete the questionnaire online. For the rest, questionnaires were administered in printed form in English to those who could comprehend English and in Nepali to those who could only comprehend Nepali.

Data Analysis

The completed questionnaires were coded, entered, and analyzed using IBM SPSS version 21.0. Information regarding the respondents' gender, age, monthly income, which category of staff they belong to, whether they or their family members staying with them had been diagnosed to be COVID positive, their perception about the severity of the pandemic, whether they perceived themselves to be at increased risk of contracting COVID-19 and hence at priority for receiving the vaccine, and their willingness to be vaccinated were collected. These data were analyzed descriptively.

The total perception score about COVID-19 vaccines was calculated by noting the respondents' agreement with a set of 11 statements using a Likert-type scale. The scores of certain statements were reversed while calculating the total score. The normality of the distribution of the score was checked using the one-sample Kolmogorov–Smirnov test ($p < 0.05$). As the total score was not normally distributed (one-sample Kolmogorov–Smirnov test), nonparametric tests (Mann–Whitney U and Kruskal–Wallis) were used for analysis ($p < 0.05$). The average scores among different subgroups of respondents were compared using appropriate statistical tests ($p < 0.05$). Post hoc comparisons were conducted where appropriate.

Results

A total of 266 respondents (out of 384 calculated sample size representing a response rate of 69.27%) participated in the survey. The distribution according to categories of staff and gender was not significantly different in the sample when compared with the population.

Table 1 shows the demographic characteristics of the study respondents. The majority of the population were healthcare workers. Nursing staff and general workers were the most common categories.

Table 1 Demographic Characteristics of Study Respondents

Characteristics	Number (Percentage)
Gender	
Female	190 (71.4)
Male	76 (28.6)
Age (in years)	
20–30	122 (45.9)
30–40	78 (29.3)
40–50	33 (12.4)
50–60	19 (7.1)
Missing	14 (5.3)
Monthly income (NPR)	
Up to 13,450	45 (16.9)
13,450–30,000	169 (63.5)
30,000–60,000	16 (6.0)
Greater than 60,000	35 (13.4)
Missing	1 (0.4)
Education level	
Secondary	59 (22.2)
High school	105 (39.5)
Graduate	43 (16.2)
Postgraduate	56 (21.1)
Missing	3 (1.1)
Profession	
Healthcare worker	189 (71.1)
Non healthcare worker	77 (28.9)
Designation	
Managerial and admin staff	13 (4.9)
Faculty	49 (18.4)
Medical and dental officers, postgraduates	17 (6.4)
Nursing staff	81 (30.5)
General worker	66 (24.8)
Paramedic	39 (14.7)
Missing	1 (0.4)

Table 2 COVID-19 Related Information of the Respondents

Characteristics	Number (Percentage)
Have you been diagnosed to be COVID-19 positive?	
Yes	37 (13.9)
No	229 (86.1)
Have any of your family members staying with you been diagnosed COVID-19 positive?	
Yes	24 (9.0)
No	240 (89.5)
Missing	2 (0.8)
How concerned are you about you or your family member contracting COVID-19?	
Extremely concerned	74 (27.8)
Quite concerned	74 (27.8)
Little concerned	89 (33.5)
Not concerned	29 (10.9)
Do you identify yourself to be at increased risk for COVID-19?	
Yes	159 (59.7)
No	101 (38.0)
Do not know	6 (2.3)
Reason why you consider yourself at higher risk	
Comorbid illness	17 (6.4)
Old age	8 (3.0)
Increased contact with public due to nature of job	136 (51.1)
Provided care to family member who was suffering from COVID	17 (6.4)
Smoker	2 (0.8)
Obese	10 (3.8)
Pregnancy	10 (3.8)
Others	8 (3.0)
Perception about severity of the pandemic	
Mild	40 (15.0)
Moderate	130 (48.9)
Severe	90 (33.8)
Missing	6 (2.3)

Table 2 depicts that few respondents (13.9%; n=37) had been diagnosed as COVID-19 positive, whereas 24 (9%) had their family members staying with them diagnosed as COVID-19 positive. One hundred and forty-eight respondents were either extremely concerned or quite concerned about themselves or their family members contracting COVID-19. Many considered themselves at increased risk of contracting COVID-19 because of increased contact with the public and patients due to the nature of their job. Two hundred and twenty respondents (82.7%) perceived the severity of the pandemic to be moderate or severe.

Regarding being eligible to receive the vaccine on priority (Table 3), 164 respondents thought they were eligible as they were healthcare workers and had frequent contact with patients who could be COVID-19 positive. One hundred and two respondents (38.3%) were willing to be vaccinated. The most common reason for vaccine refusal/hesitancy was concern about vaccine safety.

The median total perception score was 36, and the interquartile range was 4. The maximum possible score

Table 3 Respondents' Opinion About COVID-19 Vaccination

Characteristics	Number (Percentage)
Do you think you are eligible to receive the vaccine on priority?	
Yes	164 (61.7)
No	63 (23.7)
Do not know	35 (13.2)
Missing	4 (1.5)
Reason why you think you are eligible	
Comorbid illness	21 (7.9)
Old age	7 (2.6)
Healthcare worker	93 (35.0)
High contact with COVID-19 patients	78 (29.3)
Are you willing to be vaccinated if the vaccine is offered to you?	
Yes	102 (38.3)
No	90 (33.8)
Undecided	17 (6.4)
If there are less adverse effects	55 (20.7)
Reasons for refusal	
Vaccine is not necessary for me	6 (2.3)
I am concerned about vaccine safety	40 (15.0)
I do not have belief in vaccination	15 (5.6)
I have already been infected with COVID-19	12 (4.5)
Others	17 (6.4)
How concerned will you be if vaccine is not offered to you?	
Extremely concerned	46 (17.3)
Quite concerned	63 (23.7)
Little/no concerned	72 (27.1)
Do not know	23 (19.5)
Missing	10 (3.8)

was 55. Table 4 shows median perception scores that were significantly different among subgroups of respondents. The scores were significantly higher among males, those with a higher monthly income, those with postgraduate education, among medical and dental officers, postgraduates, and managerial and administrative staff. The score was also significantly higher among those who had been diagnosed as COVID positive, those who perceived the pandemic as being moderate or severe in intensity, and those who were willing to be vaccinated.

On conducting pairwise comparisons, the scores were significantly different among those with a monthly income of up to 13,450 Nepalese rupees (1 Nepalese rupee = 0.0084 US dollars), those with a monthly income of more than 60,000

Table 4 Median Perception Scores Which Were Significantly Different Among Subgroups of Respondents

Characteristics	Median Score	P value
Gender		
Male	37	0.003
Female	35	
Income (Nepalese rupees)		
Less than 13,450	35	0.007
13,450–30,000	35	
30,000–60,000	37	
Greater than 60,000	38	
Pairwise comparison		
Up to 13,450 per month-More than 60,000 NPR per month		0.046
13,450–30,000 NPR per month-More than 60,000 NPR per month		0.013
Level of education		0.006
Secondary	36	
High school	35	
Graduate	36	
Postgraduate	37.5	
Pairwise comparison		
High school- PG and above		0.003
Designation		0.016
Managerial and admin staff	37	
Faculty	36	
Medical and dental officers, postgraduates	37	
Nursing staff	35	
General worker	35	
Paramedic	36	
Pairwise comparison		
Nursing staff- Faculty		0.04
Have any of your family members staying with you been diagnosed to be COVID-19 positive?		
Yes	36.5	0.037
No	35	
Perception about severity of the pandemic		
Mild	34	
Moderate	35	0.042
Severe	36	
Pairwise comparison		
Mild-severe		0.037
Are you willing to be vaccinated if the vaccine is offered to you?		
Yes	37	<0.001
No	34	
Undecided	36	

Nepalese rupees, and those with a monthly income of 13,-450–30,000 and more than 60,000 Nepalese rupees. They were significantly different among those with high school education and postgraduate education. Scores were significantly higher among faculty than among nursing staff. Those who perceived the pandemic as severe had significantly higher scores compared with those who perceived it as mild.

Discussion

History has shown that in many instances, vaccines can save millions of lives,[23] and the same hope continues for the present pandemic. Presently, more than a dozen COVID-19 vaccines are under development.[24,25] As COVID-19 vaccines are being rolled out, countries have prioritized frontline healthcare workers as candidates for vaccination.[26–29] Perception of healthcare workers can strongly influence the general public's opinion on vaccination. This is also true in Nepal where healthcare workers, especially medical doctors, are well respected[30] and considered as the final authority on health-related issues and medicines. Since COVID-19 vaccines were approved quickly and vaccine development phases were quickened, one cannot ignore the public's legitimate concerns regarding safety, especially those related to long-term adverse effects. Reports from several countries have documented safety concerns regarding COVID-19 vaccines among all groups of people, including college students,[31] healthcare workers,[32] and the general public.[33]

Healthcare workers who were directly involved in the care of COVID patients were willing to be vaccinated, whereas parents, nurses, and healthcare workers who were not directly involved were reluctant to do so.[34] In another study, medical students who were not willing to be vaccinated were concerned about the adverse reactions after vaccination.[35] Presently, the reported ADRs due to COVID-19 vaccines are mild,[36] although there have been newspaper reports on vaccine-associated deaths.[37] Conversely, there is no option other than vaccination, as there are no proven drugs for the cure of COVID-19 at this point.

In the present study, slightly over one-tenth of the respondents considered themselves not eligible for COVID-19 vaccination. As per the current evidence, the COVID-19 vaccine cannot be given to individuals aged <16 years and to those with previous allergies to any vaccine.[38] Consumers should be educated about their eligibility for COVID-19 vaccines, and the eligibility criteria should be widely publicized to increase public acceptance. There is a need for guidelines in vaccinating people who are not considered eligible to receive the vaccination as some of them may be high-risk individuals.

Of the respondents, 61.7% considered themselves to be a priority group for receiving the vaccination. The major reasons mentioned were being healthcare workers and having frequent contact with COVID-19 patients. Currently, the Nepal government prioritizes frontline workers and elderly people living in care homes as a priority group for COVID-19 vaccination.[39] Each country must analyze the morbidity and mortality pattern due to COVID-19 and make their own priority listing for COVID-19 vaccine because of the possible delay in supply of vaccines for the entire population.

Although the healthcare workers in the present study knew that they were a priority group for vaccination, their willingness to be vaccinated was not high. The situation can be even worse in the case of the public. Contrary to our findings, in China, 91.3% of the adult population were willing to be vaccinated.[33] But in the United States, a study conducted among adult people showed that only 57.6% were inclined toward vaccination.[40] Poor vaccination acceptance can prolong the pandemic, and hence, it is recommended to conduct educational programs focusing on the safety, benefits, and efficacy of COVID-19 vaccines.[41] A newspaper article described the recent status of vaccine hesitancy among the Nepalese population and urged immediate measures for tackling this issue.[42] So far, no visible approach to public education has been noted in the country, and the responsibility lies in the hands of the drug regulatory authority and health ministry, social organizations, pharmacy and other medical organizations, and individual researchers to immediately devise and implement strategies to promote vaccine acceptance among the public.

The reasons for the refusal of vaccination were predominantly related to "the safety of the vaccine." The present study findings are different from those reported by a US study conducted among the adult population in which demography, knowledge, and politics had an influence on vaccination.[43] Although the present study involved staff at a medical college, the comparison clearly demonstrates multiple factors that contribute to vaccine hesitancy, which must be further investigated.

Among the respondents, males had higher perception scores regarding COVID-19 vaccines. In a US study conducted among the adult population, males were more willing to be vaccinated than were females.[43] In a similar study conducted among healthcare workers in Saudi Arabia, males were 1.55 times more willing than were

females to be vaccinated.[17] It is also documented that males are more vulnerable to severe disease and mortality probably because the testes harbor the virus and delay viral clearance.[44] The increased scores among males in the present study could also be influenced by internet usage and the fact that information sources were more easily available for males than for females.

The educational status of health professionals had a significant impact on perceptions that are related to COVID-19 vaccine safety. Education is well understood to influence self-care behavior,[45] medication intake,[46,] and safety precautions.[47] Moreover, more qualified medical practitioners and other healthcare workers directly involved in patient care are more likely to have better perceptions compared with staff working in other areas.

Staying with family members who were COVID-19 positive was found to influence the scores of respondents. While staying with a family member with COVID-19, one must practice social distancing and should provide for the basic needs of the patient such as medications and adequate intake of fluids and watch for warning signs of deterioration.[48] During this process, a family member is expected to gain more knowledge about the disease, its treatment options, and vaccination.

A major problem seen with COVID-19 is that at least during the early stage of the pandemic, many believed it was a simple problem that required not much attention.[49] This attitude had probably accelerated the pandemic progression in several parts of the world. In the present research, respondents who believed that the pandemic was severe had a significantly higher perception score. At the time of the study, with the pandemic causing significant global disruption, most were aware of its severity.

The limitation was that some of the nurses and paramedics who were involved in vaccination were trained by a government agency before commencing the vaccination, which might have influenced their choices for vaccination. Of the 385 calculated sample sizes, authors could only obtain the responses of 266 because the date of data collection coincided with the day of vaccination announced by the Nepal government.

Conclusion

Although a high number of healthcare workers considered themselves as a priority group for COVID-19 vaccination, one-third of them were not willing to be vaccinated mainly because of safety concerns. Healthcare workers not willing to take the vaccine had poor perception scores, which suggests the need to strengthen knowledge to improve vaccination.

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