

Frontline healthcare workers' knowledge and perception of COVID-19 and willingness to work during the pandemic in Nepal: a nationwide cross-sectional web-based study

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Abstract

Background

The health sector's effectiveness during a pandemic primarily depends on the availability, knowledge, skills, perceptions, and motivations of frontline healthcare workers. In this study, we aimed to investigate the contextual factors associated with the knowledge, perceptions, and the willingness of frontline healthcare workers to work during the COVID-19 pandemic in Nepal.

Methods

A total of 1051 frontline health-workers from all seven Nepalese provinces were included in this web-based cross-sectional study, which was conducted in May 2020. Using a 5-point Likert scale questionnaire, we collected information on knowledge, perceptions, and the willingness of frontline healthcare workers to work during the COVID-19 pandemic. Multivariable logistic regression was applied to identify independent associations between predictors and outcome variables.

Results

Of the 1051 frontline health-workers, 17.2% were found to have inadequate knowledge on COVID-19, 63.6% reported unsatisfactory perceptions of government response, and 35.9% showed an unwillingness to work during the pandemic. Health workers at local health facilities (AOR: 0.35; 95% CI: 0.17-0.68) and those with chronic diseases were less likely to have adequate knowledge of COVID-19. Nurses (AOR: 2.10; 95% CI: 1.38-3.18), health-workers from Karnali Province (AOR: 2.62; 95% CI: 1.52-4.53), and those who had adequate knowledge of COVID-19 (AOR: 3.86; 95% CI: 2.51-6.16) were more likely to have satisfactory perception

towards government response to COVID-19. In addition, laboratory-workers, health workers from Karnali province, and those with adequate knowledge (AOR: 1.81; 95% CI: 1.27-2.58) were more likely to work during the COVID-19 pandemic.

Conclusions

We concluded that frontline healthcare workers have some gaps in knowledge-related to COVID-19; about two-thirds of them had a negative perception of government response, and nearly one-third of them were unwilling to work. These observations demonstrate that prompt actions are required to improve health-worker knowledge of COVID-19, address negative perceptions to government responses, and motivate them to provide healthcare services during the pandemic.

Keywords: COVID-19, Health-workers, Knowledge, Perception, Willingness

Introduction

In December 2019, an outbreak of a pneumonia-like illness was first detected in Wuhan, Hubei Province of China[1], and subsequently, faced with an escalating number beyond China, the World Health Organization (WHO) declared the outbreak a pandemic[2]. Based on available evidence, the disease is transmitted between individuals via nasopharyngeal droplets or saliva. Furthermore, no vaccine or effective treatment for COVID-19 is currently available[3]. Nepal is a small country in South Asia that shares a border with China and observed its first case of COVID-19 on January 25, 2020 [4]. In the first half of May 2020, Nepal experienced an explosive increase in cases; more than three-fourths of all cases recorded do date occurred during this period. As of May 24, 2020, Nepal reported 603 cases and three fatalities [5]. To tackle the COVID-19 pandemic, Nepal first sealed its border with China, and then suspended all international flights and, on March 23, implemented a country-wide comprehensive lock-down. On April 3, after encountering its first case of local transmission, Nepal began to utilize its resources more systematically [6].

Concern has been expressed that health systems in low-income countries like Nepal are not sufficiently resilient to tackle a crisis like that presented by COVID-19. Due to resource constraints and a weak health system structure, rapid diagnosis of suspected cases and contact tracing are challenging[6]. Studies have shown that knowledge of infectious diseases is greatest among doctors and nurses[7,8]. In addition, age, sex, educational status, and preexisting medical conditions have been shown to affect health worker (HW) knowledge of Middle East Respiratory Syndrome (MERS), and Severe Acute Respiratory Syndrome (SARS)[9,10]. The primary sources of information about COVID 19 are international health organizations such as the Center

for Disease Control (CDC), WHO and Ministry of Health, and social media. Moreover, the effectiveness of healthcare sectors during public health emergencies primarily depends on the availability, motivation and skills of frontline healthcare workers, and thus knowledge, their perceived willingness to work during uncertain times is essential [11], because appropriate perceptions and willingness to work during a pandemic are prerequisites of HW motivation to provide necessary treatment and to take the preventive actions required to reduce pandemic's impact. Studies have shown that factors such as perceived personal risks, availability of personal protective equipment, family care obligations, HW gender, type of employment, personal confidence, defined role, dissemination of timely information, appropriate training, and personal health problems, influence perceptions and willingness to work during pandemics [11–14]. In the present study, frontline Healthcare Workers were defined as doctors, nurses, paramedics, laboratory workers, pharmacists, pathologist, technical personnel, public health workers, and others directly involved in COVID-19 prevention and treatment that have direct contact with confirmed or suspected cases during patient intake, screening, inspection, testing, transport, treatment, nursing, specimen collection, or pathogen detection.

To provide healthcare services effectively, it is essential to assess and update HW' knowledge and improve motivation, and willingness, which depends on various factors at the individual, and to system levels. The present study describes the actual HW scenarios factors associated with their knowledge of COVID-19, their reactions to government interventions, and, most importantly, their perceived willingness to work during the pandemic. This study also provides valuable and actionable information to Nepal's policymakers to allow the judicious allocation of scarce resources in the short run. In the long term, this study guides for those developing policies and programs. That might be instrumental in ensuring preparedness to meet the challenges posed

by similar crises. Given this background, we aimed to investigate the contextual factors associated with the perceptions and willingness to work among Nepalese front-line healthcare workers during the COVID-19 pandemic to improve the prevention and management of future similar outbreaks.

Methods

Study participants and Sampling

We conducted a cross-sectional study using an online questionnaire from May 2020, among HWs in Nepal in accord with the Checklist for Reporting Results of Internet Surveys (CHERRIES) [15]. All participating HWs were aged 18 to 60 years old and ranged from high-level officials of the Ministry of Health and Population to paramedics working at the grassroots level in all seven provinces on Nepal. The research questionnaire was distributed to HWs using the health workers' network. As an initial step, we first appointed a doctor or public health professional in each of the seven provinces to act as a coordinator and co-investigator in the team. These seven coordinators then sent HWs known to them a link to our questionnaire and asked that these individuals send a Google link to other HWs they knew. Fischer's arctanh transformation as a power of 90% and a minimum correlation of 0.1[16], showed that the minimum sample size required was n=1046.

Survey Instrument and data collection

The online questionnaire included 33 questions on socioeconomic characteristics, HWs' knowledge of COVID-19, perception toward government response to COVID-19, and perceived willingness to work during the pandemic. The Responses were rated using a 5-point Likert Scale ("Strongly Agree," "Agree," "Neutral," "Disagree" to "Strongly Disagree").

The socio-demographic characteristics investigated included age, gender, ethnicity, and marital status. This section of the questionnaire also included questions about chronic diseases of HWs, their caretaking responsibilities for dependent family members, nature of the employment, and type of health facility at which they worked. Knowledge of COVID-19 was rated as "adequate" and "inadequate," perception of government response as "satisfactory" and "unsatisfactory" and willingness to work as "willing" and "unwilling." Knowledge of COVID-19 was assessed based on knowledge of the causative agent, mode of transmission, proper use of PPE, infection prevention measures, and public health impact of the pandemic. Reaction to government response was determined by assessing response effectiveness, timeliness of information provided, provision of supplies, support received from administrative staff, and elected representatives. Factors influencing willingness to work during the pandemic were risk of self infection, healthcare service rationing, the requirement to work overtime, working with untrained HWs, deployment to another duty station, family risk, and ability to choose whether to work or not during the pandemic.

The questionnaire was prepared based on national COVID-19 guidelines issued by the Ministry of Health and Population of Nepal[17] and World Health Organization resource center guidelines for HWs on COVID-19 [18]. A team of medical doctors, public health workers, and an academic

assessed the questionnaire for validity and relevance. Before conducting the survey, we conducted a pilot study on 30 participants to assess the reliability of the questionnaire items. The analysis revealed an overall Cronbach's alpha score of 0.77, indicating higher internal consistency[19]. The questionnaire was prepared as a Google Form, and Facebook Messenger was used to sending the Google form link to participants [20,21]. The questionnaire took approximately 10 minutes to complete. To maintain data confidentiality, only two research team members had access to the data repository, stored on a password-protected computer.

Data Management and Statistical Analysis

The data collected was downloaded in the form of a spreadsheet and checked for duplications and technical errors. After confirming the completeness, we exported the data to R Studio Software for full analysis [22]. Socio-demographic characteristics were subjected to descriptive analysis using the table 1package in R software, and results are presented as frequencies, percentages, or as means and standard deviations [23].

Univariate logistic regression analysis was used to assess factors associated with adequate knowledge, satisfaction with the government response, and willingness to work using the *finalfit* package in R [24]. Parsimonious multivariate models were created for each dependent variable and included independent variables found to be significant (p-value <0.05) by univariate analysis. Coefficients in the regression models were transformed into odds ratios with 95 % confidence intervals. P-values of <0.05 were considered significant.

220

221 **Ethics statement**

222 Ethical approval for the study was obtained from the Nepal Health Research Council (approval
223 no: 329/2020 P). The first page of the questionnaire detailed the study objective, benefits, and
224 harm. HWs provided e-consent prior to participating in the study. Participants were informed
225 that they could leave the study at any time. Participation was voluntary and anonymous.

226

227 **Results**

228 **Socio-demographic characteristics**

229 A total of 1051 HWs participated in the study, 725 (68%) men and 326 (31%) women. The
230 response rate was 79%. Table 1 shows the socio-demographic characteristics of health care
231 workers who participated in the study. Nearly 49% of the participants were aged between 20 to
232 30 years. More than half (57.4%) of the HWs were Brahmin or Chhetri. The majority of the
233 participants were doctors (35.3 %) and nurses or midwives (16.5%). Highest percentage response
234 was from Bagmati Province (19.4%), which contains the capital city Kathmandu. Detailed
235 information about the provinces of Nepal is explained in Additional File. Nearly 60% of HWs
236 were permanent employees. More than 25% worked in local-level public health facilities, such as
237 health posts, primary health care centers, community health units, and urban health centers. More
238 than 50% worked in hospitals, public hospitals (22.8%) followed by teaching hospitals and
239 private hospitals. Nearly 20% of respondents used a health-related managerial agency at the

federal, provincial, or local levels. 13.5% of HWs reported having a chronic disease; the most common of which were diabetes, heart disease, and chronic respiratory disease and 64% of HWs had family members of less than five years or more than 60 years who needed their care and support. [Please insert Table 1 here].

Health Worker' Knowledge of COVID-19

More than 80% of HWs had adequate knowledge of COVID-19 (See Table 2), and the percentage of men with adequate knowledge was higher than that of women. No significant difference in knowledge was observed among ethnic groups. However, significant differences were observed among health professionals. More than 90% of public health workers had adequate knowledge, while only 61.5% of other health workers such as Ayurveda—an ancient medical system prevalent in Nepal [25] and pharmacists had adequate knowledge. No provincial differences in COVID-19 knowledge were observed. However, knowledge of COVID-10 differed among HWs employed at different health facility types. No difference in COVID-19 related knowledge was found between those with or without chronic diseases or caretaking responsibilities. Multivariate logistic regression analysis showed that gender, professional category, and type of healthcare facility were associated with adequate knowledge of COVID-19, as shown in Table 2. Males were more likely to have adequate knowledge (OR: 1.60; 95 % CI: 1.02-2.47) than females. HWs in“other” professional categories such as pharmacists, and Ayurveda—had less adequate knowledge than doctors (OR: 0.33; 95 % CI: 0.14-0.80). HWs working at local health facilities were more likely to have inadequate knowledge about COVID-

19 than those working at federal or provincial agencies (OR: 0.35; 95 % CI 0.17-0.68). [Please insert Table 2 here].

Health Workers' reactions to government response to COVID-19 Pandemic

More than 60% of HWs considered government response to COVID-19 Pandemic was unsatisfactory (Table 3). Gender and ethnicity were not found to influence perceptions of government response significantly. Nearly 74% of doctors reported government response to be unsatisfactory, while only 43 % of public health workers thought so. About 72 % of HWs from Bagmati Province and Province 2 were dissatisfied with the government response. Chronic disease and caretaking responsibility did not influence reactions to government response.

Multivariate logistic regression showed the reactions of HWs to government response were associated with a professional category, province, type of health facility, and adequacy of knowledge about COVID-19 (Table 3). Nurses were more likely to consider government response satisfactory than doctors (OR: 2.10; 95 % CI: 1.38-3.18). Similarly, public health professionals were more likely to consider government response to COVID-19 was satisfactory than doctors (OR: 1.83; CI 1.07 – 3.11). HWs from Province 6 (OR:2.62; 95 % CI: 1.52-4.53) and Province 7 (OR: 1.72; CI: 1.06-2.80) were more likely to consider government response satisfactory than those from Bagmati Province. Those working in public and teaching hospitals and local public health facilities were less likely to consider government response satisfactory than HW working from federal and provincial-level agencies. Interestingly, HWs with adequate

knowledge of COVID-19 were more likely to consider government response satisfactory (OR: 3.86; 95 % CI 2.51-6.16) [Please insert Table 3 here].

Health workers' willingness to work during the COVID-19

Pandemic

About 64 % of HWs reported a willingness to work under the challenging conditions created during the COVID-19 Pandemic (Table 4). No significant difference was observed between men and women with respect to willingness to work. About 74 % of laboratory workers were willing to work whereas, only 48.5 % of doctors were willing to do so. Furthermore, differences were observed between the seven provinces; $\approx$ 85 % of HWs in Karnali Province, but only 54.5 % of HWs from Province 2 were willing to work.

Multivariate analysis showed a willingness to work was associated with the professional category, province, presence of chronic disease, caregiving responsibility, and knowledge of COVID-19. Laboratory staffs (OR: 3.54; 95 % CI: 1.77-7.61), paramedics (OR: 2.52; 95 % CI: 1.79 – 3.58), public health workers (OR: 2.40; 95 % CI: 1.47-4.01), and nurses/midwives (OR: 2.09; 95 % CI: 1.40-3.47), were more willing to work during the pandemic than doctors. HWs from Karnali Province (OR: 2.96; 95 % CI: 1.62-5.64), and Sudurpaschim Province (OR: 2.10; 95 % CI: 1.28- 3.48) were more likely to report willingness to work than those from Bagmati Province. HWs with responsibility for dependent family members were less willing to work than those without these responsibilities (OR: 0.72; 0.54-0.95). Finally, the HWs with adequate

knowledge of COVID-19 were more prepared to work than those with inadequate knowledge (OR: 1.81; 1.27- 2.55). [Please insert Table 4 here]

Discussion

This is the first nationwide study on knowledge and perception of COVID-19 among frontline healthcare workers and their willingness to work during the pandemic in Nepal. About two in ten frontline healthcare workers (17.2%) had inadequate knowledge of COVID-19, which is higher than that reported in a Chinese study, in which $\simeq 11\%$ demonstrated insufficient knowledge[26]. On the other hand, a study conducted by Bhagavathula S.A et al. reported that 61% of health workers had poor knowledge about COVID-19 transmission [27]. These differences between rates may have been due to variations in the level of knowledge accessed. Furthermore, the latter study was conducted in the first week of March 2020, and the Chinese study was conducted in the third week of May, when more information regarding COVID 19 was available and disseminated through different media. Knowledge is crucial for establishing perception and preventive behavior, which both affect coping interventions to some degree [28].

In addition, we found nearly two-thirds healthcare workers (63.6%) believed government response to COVID-19 was unsatisfactory. A slightly higher level of satisfaction with government response was reported in a survey conducted on the Nepalese general public in April 2020 (71.4 %) [29]. The present study also showed that most HWs (86%) experienced logistical shortcomings and reported inadequate supports from administrative (60%) and elected representatives (67.5%), which concurs with findings of a previous study[30]. Furthermore, our study shows that more than one in three HW (35.8%) were unwilling to work during the pandemic, which is

considerable issues because the health system's workload during the pandemic will be so high that all available health resources will be required to combat emergencies. In addition, the rate observed were higher than those reported in several other studies on willingness to work among health workers during public health emergencies[12–14,31,32]. In the present study, these high rates may have been due to inadequate knowledge (17%), preexisting chronic disease (13.5%), shortage of PPE (86%) and other factors [32,33]. The high rates of unwillingness to work during the pandemic revealed by our study demand the additional efforts be made to rectify the situation.

We also found that male health workers were more likely to report adequate knowledge; which is consistent with that found in another study conducted in Nepalese [34]. This finding may be due to greater interaction and socialization by men, and gendered norms, which means men are more likely to overestimate, and women are likely to underestimate personal knowledge [35–38]. The study also showed that pharmacists and Ayurveda had inadequate knowledge of COVID-19 rates as compared with doctors; finding is similar to a survey conducted in Nepal [34]. We also found that HWs in the local health facilities were less likely to have adequate knowledge than the HWs in federal or provincial agencies, which was possibly due to weaker implementation of COVID-19 related governmental interventions at the local level than that at provincial or federal levels. In addition, HWs with a chronic disease considered they had inadequate knowledge of COVID-19, perhaps because time limitations imposed by pre-existing conditions restricted studies about COVID-19.

This study shows that the professional category, province, type of health facility, and knowledge of COVID-19 were significantly associated with frontline health workers' satisfaction with

government response to the pandemic. Nurses were found to be more likely to be satisfied with government response than counterpart frontline doctors. This perception difference might have been due to the differences between levels of technical knowledge among doctors, nurses, and public health workers. Furthermore, health workers from Karnali and Sudurpaschim Provinces were more likely to be satisfied with government response than HWs from Bagmati province. However, the reasons responsible for these provincial variations were not determined. In addition, HWs from local public health facilities, teaching hospitals, and private hospitals had unsatisfactory perceptions than managerial level HWs at the ministry level, which we attribute to different work experiences, as HWs at health service outlets are directly exposed to risks and better understand the risks posed by logistical shortfalls than managerial level HWs. Interestingly, HWs with adequate knowledge of COVID-19 were more satisfied with government response than HWs with inadequate knowledge.

Interestingly, health workers professional category, province, presence of chronic disease, dependent family members, and knowledge about COVID 19 were associated with a willingness to work during the pandemic, and nurses, paramedics, public health workers, and laboratory staff were more willing to work than clinicians, which contradicts the results of a systematic review conducted by Aoyagi et al. [39]. HWs from Karnali and Sudurpaschim provinces were more willing to work than counterparts from Bagmati province. Similarly, it might be possible that due to virtually no cases of COVID-19 during the study, the HWs were willing to work in a humane way. Furthermore, HWs with adequate knowledge about COVID-19 were more willing to work, which concurs with a study performed on the 2007 influenza pandemic [40]. Our result shows that HWs with a chronic disease[41] and those that cared for family members[40] were less willing to work, which is also in line with previous studies [12,39]. It may be caring for family

members and that coping with personal chronic health problems diminishes willingness to work [41].

This study was conducted to identify predictors of the willingness of frontline healthcare workers to work during the COVID-19 pandemic. The findings of this study can be used to inform various stakeholders and policymakers involved in the drafting of future interventions to improve the effectiveness of the health sector during public health crises. However, despite our efforts, this study has several limitations. First, data was obtained using a questionnaire over the web and health care workers were recruited using their personal networks. Therefore, our results should not be extended to healthcare workers that do not use the internet. Second, the data used was self-reported, which makes the study prone to desirability bias and inaccuracies. Furthermore, participants were asked to consider their willingness to work under hypothetical conditions that did not exist when Nepal comparatively observed a lower number of cases and fatalities. We recommend studies of the impacts of HW knowledge, perception, and willingness to work on health sector efficiency in the context of public health emergencies be undertaken.

Conclusions

Health workers play an extremely critical role in the battle against pandemics. Therefore, their knowledge about the disease and their willingness to work are crucially required to prevent disease transmission and reduce morbidity and mortality. In view of the perceived knowledge gap of health workers about COVID-19, adequate training provides a means of addressing this shortcoming. The high-level dissatisfaction of HWs with logistical issues and shortages should also be at the focus of efforts to improving perceptions of government response. Health

managers should be fully aware of the impacts of factors and devise comprehensive approaches that ensure the safety of HWs and promote coordination to motivate the HWs to work efficiently and effectively in a sustainable manner throughout the COVID-19 pandemic.

List of Abbreviations:

COVID-19:	Coronavirus Disease 2019
CI:	Confidence Interval
HWs:	Health Workers
MoHP:	Ministry of Health and Population
OR:	Odds Ratio
SARS-CoV-2:	Severe Acute Respiratory Syndrome, Coronavirus 2
WHO:	World Health Organization

Declarations:

Ethics approval and consent to participate:

The study protocol was approved by the Institutional Review Board of the Nepal Health Research Council (ERB Protocol Registration No. 329/2020 P). Electronic consent was required

from all participants prior to completing the online questionnaire. A detailed description of the study was supplied on the first page of the online questionnaire.

Consent for publication:

Not applicable.

Competing Interests

The authors have no conflict of interest to declare.

Availability of data and materials:

Data will be made available upon reasonable request by email to the corresponding author.

Author Contributions

DPU, RP and MA conceptualized the study. DPU, RP, MA, AT, BC, and BB developed and pretested the questionnaire. BB, SB, RGY, RK, CNW, BKD, AT, MA, DRB, DPU, and RP supported data collection. DPU, MA, DJB, and RP performed the statistical analysis. DPU, MA and RP wrote the manuscript, and, DJB, KK, RP, KL, AS, JHP, SJY and DA edited, revised and finalized the manuscript. All authors contributed to the writing, editing, revision, and critical appraisal of the manuscript. All authors read and approved the final version of the manuscript.

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591 Tables

592 Table 1 Sociodemographic Characteristics of Health workers in Nepal

Socio-demographic Characteristics	Frequency (%) (n=1051)
Age, in years, Median (IQR)	31.0 (8)
Gender	
Female	326 (31.0)
Male	725 (68.0)
Ethnicity	
Brahmin/Chhetri	603 (57.4)
Madhesi/Muslim	209 (19.9)
Janajati	174 (16.6)
Dalit	34 (3.2)
Other	31 (2.9)
Marital Status	
Married	677 (64.4)
Unmarried	374 (35.6)
Professional Category	
Doctor	371 (35.3)
Paramedics	308 (29.3)
Nurse/Midwife	173 (16.5)
Public Health Workers	122 (11.6)
Lab Worker	51 (4.9)
Other	26 (2.5)
Province ^o	
Province 1	193 (18.4)
Province 2	156 (14.8)
Bagmati Province	204 (19.4)
Gandaki Province	69 (6.6)
Province 5	153 (14.6)
Karnali Province	111 (10.6)
Sudurpaschim Province	165 (15.7)
Type of Job	
Permanent	613 (58.3)
Temporary or Contract	438 (41.7)
Types of Health Facility	
Federal and Provincial managerial agencies ^o	134 (12.7)

Socio-demographic Characteristics	Frequency (%) (n=1051)
Teaching Hospital	191 (18.2)
Public Hospital	240 (22.8)
Private Hospital	132 (12.6)
Local public health facilities§	292 (27.8)
Local-level managerial agencies ⊗	62 (5.9)
Presence of Chronic Disease	
No	909 (86.5)
Yes	142 (13.5)
HWs with care-taking responsibility for children less than 5 years or elderly more than 60 years	
No	381 (36.2)
Yes	670 (63.7)

^⓪ Details about the provinces of Nepal are explained in Additional File 3.

^⓪ Consists of the Ministry of Health and Population, the Department of Health Services, the Ministry of Social Development at the province level, Provincial health directorate, and health offices.

§ Consists of health posts, primary health care centers, community health units, and urban health centers at the local level.

⊗ Consists of metropolitan, sub-metropolitan, municipalities, and rural municipalities

Table 2 Factors Associated with Knowledge of COVID-19

Knowledge about COVID-19	Inadequate Knowledge (n= 181)	Adequate Knowledge (n=870)	OR (univariable) (95% CI; p-value)	OR (multivariable) (95% CI; p-value) ϕ
Gender				
Female	72 (22.1)	254 (77.9)	-	-
Male	109 (15.0)	616 (85.0)	1.60 (1.15-2.23, p=0.005) **	1.60 (1.02-2.47, p=0.036) *
Professional Category				
Doctor	60 (16.2)	311 (83.8)	-	-
Paramedics	57 (18.5)	251 (81.5)	0.85 (0.57-1.27, p=0.423)	1.06 (0.65-1.75, p=0.809)
Nurse/Midwife	35 (20.2)	138 (79.8)	0.76 (0.48-1.22, p=0.246)	1.21 (0.67-2.18, p=0.537)
Public Health Workers	11 (9.0)	111 (91.0)	1.95 (1.02-4.03, p=0.054)	1.65 (0.78-3.72, p=0.203)
Lab Worker	8 (15.7)	43 (84.3)	1.04 (0.49-2.48, p=0.929)	0.92 (0.42-2.26, p=0.851)
Other	10 (38.5)	16 (61.5)	0.31 (0.14-0.73, p=0.006) **	0.33 (0.14-0.80, p=0.012) *
Type of Health Facility				
Federal and Provincial managerial agencies	12 (9.0)	122 (91.0)	-	-
Teaching Hospital	38 (19.9)	153 (80.1)	0.40 (0.19-0.77, p=0.009) **	0.51 (0.23-1.09, p=0.090)
Public Hospital	38 (15.8)	202 (84.2)	0.52 (0.25-1.01, p=0.064)	0.66 (0.30-1.37, p=0.284)
Private Hospital	15 (11.4)	117 (88.6)	0.77 (0.34-1.70, p=0.516)	0.95 (0.40-2.24, p=0.915)
Local public health facilities	72 (24.7)	220 (75.3)	0.30 (0.15-0.56, p<0.001) ***	0.35 (0.17-0.68, p=0.003) **
Local-level managerial agencies	6 (9.7)	56 (90.3)	0.92 (0.34-2.75, p=0.871)	0.96 (0.34-2.95, p=0.936)
Presence of Chronic Disease				
No	148 (16.3)	761 (83.7)	-	-
Yes	33 (23.2)	109 (76.8)	0.64 (0.42-1.00, p=0.042) *	0.58 (0.37-0.91, p=0.015) *

ϕ Odds Ratios were obtained by multivariate logistic regression adjusted for gender, professional categories, health facility types and presence of chronic disease

* p-value < 0.05 at the 5 % level of significance

** p-value < 0.01 at the 5 % level of significance

*** p-value < 0.001 at the 5 % level of significance

Table 3: Factors Associated with Self- reported Perception of Government Response to COVID-19 Pandemic

Self-reported perception of government response [‡]	Unsatisfactory Government response (n=668)	Satisfactory Government response (n=383)	OR (univariable)	OR (multivariable) ^ϕ
Ethnicity				
Brahmin/Chhetri	367 (60.9)	236 (39.1)	-	-
Madhesi/Muslim	145 (69.4)	64 (30.6)	0.69 (0.49-0.96, p=0.028) *	1.15 (0.70-1.89, p=0.586)
Janajati	115 (66.1)	59 (33.9)	0.80 (0.56-1.13, p=0.211)	0.96 (0.65-1.42, p=0.846)
Dalit	24 (70.6)	10 (29.4)	0.65 (0.29-1.34, p=0.260)	0.67 (0.29-1.46, p=0.332)
Other	17 (54.8)	14 (45.2)	1.28 (0.61-2.64, p=0.504)	1.13 (0.50-2.49, p=0.770)
Professional Category				
Doctor	274 (73.9)	97 (26.1)	-	-
Paramedics	198 (64.3)	110 (35.7)	1.57 (1.13-2.18, p=0.007)	1.18 (0.78-1.79, p=0.439)
Nurse/Midwife	96 (55.5)	77 (44.5)	2.27 (1.55-3.31, p<0.001) ***	2.10 (1.38-3.18, p<0.001) ***
Public Health Workers	52 (42.6)	70 (57.4)	3.80 (2.49-5.85, p<0.001) ***	1.83 (1.07-3.11, p=0.027) *
Lab Worker	30 (58.8)	21 (41.2)	1.98 (1.07-3.60, p=0.027)	1.52 (0.79-2.90, p=0.207)
Other	18 (69.2)	8 (30.8)	1.26 (0.50-2.89, p=0.606)	1.37 (0.52-3.38, p=0.506)
Province				
Bagmati Province	147 (72.1)	57 (27.9)	-	-
Province 1	136 (70.5)	57 (29.5)	1.08 (0.70-1.67, p=0.726)	0.99 (0.62-1.59, p=0.976)
Province 2	113 (72.4)	43 (27.6)	0.98 (0.61-1.56, p=0.937)	0.88 (0.48-1.61, p=0.680)
Gandaki Province	42 (60.9)	27 (39.1)	1.66 (0.93-2.93, p=0.083)	1.69 (0.92-3.11, p=0.090)
Province 5	96 (62.7)	57 (37.3)	1.53 (0.98-2.40, p=0.062)	1.48 (0.92-2.40, p=0.105)
Karnali Province	46 (41.4)	65 (58.6)	3.64 (2.25-5.96, p<0.001) ***	2.62 (1.52-4.53, p=0.001) **
Sudurpaschim Province	88 (53.3)	77 (46.7)	2.26 (1.47-3.49, p<0.001) ***	1.72 (1.06-2.80, p=0.030) *

Self-reported perception of government response ‡	Unsatisfactory Government response (n=668)	Satisfactory Government response (n=383)	OR (univariable)	OR (multivariable) ^φ
Type of Health Facility				
Federal and Provincial managerial agencies	53 (39.6)	81 (60.4)	-	-
Teaching Hospitals	135 (70.7)	56 (29.3)	0.27 (0.17-0.43, p<0.001) ***	0.52 (0.29-0.93, p=0.027) *
Public Hospitals	168 (70.0)	72 (30.0)	0.28 (0.18-0.43, p<0.001) ***	0.41 (0.24-0.70, p=0.001) **
Private Hospitals	90 (68.2)	42 (31.8)	0.31 (0.18-0.50, p<0.001) ***	0.52 (0.28-0.94, p=0.032)
Local public health facilities	196 (67.1)	96 (32.9)	0.32 (0.21-0.49, p<0.001) ***	0.49 (0.30-0.81, p=0.005) **
Local-level managerial agencies	26 (41.9)	36 (58.1)	0.91 (0.49-1.68, p=0.752)	1.12 (0.58-2.20, p=0.742)
Knowledge about COVID-19 †				
Inadequate	154 (85.1)	27 (14.9)	-	-
Adequate	514 (59.1)	356 (40.9)	3.95 (2.61-6.20, p<0.001) ***	3.86 (2.51-6.16, p<0.001) ***

^φ Odds Ratios were obtained by multivariate logistic regression adjusted for Ethnicity, Professional category, Province, type of health facility, and health worker perceived knowledge of COVID-19

† Knowledge about COVID-19 was self-reported; a combined score above average was regarded as “Adequate” knowledge and a score below or equal to the average was considered “Inadequate”.

‡ Self-reported perception of government response during COVID-19 pandemic was self-reported; a combined score above average was regarded as “Satisfactory perception” of knowledge and a score below or equal to the average was considered “Unsatisfactory perception”

* p-value < 0.05 at the 5% level of significance

** p-value < 0.01 at the 5% level of significance

*** p-value < 0.001 at the 5% level of significance

Table 4: Factors Associated with Self- reported Willingness to Work during the COVID-19 Pandemic

Perceived Willingness to work	Unwilling to work (n=377)	Willing to work (n=674)	OR (univariable) (95% CI, p-value)	OR (multivariable) (95% CI, p-value) [‡]
Ethnicity				
Brahmin/Chhetri	203 (33.7)	400 (66.3)	-	-
Madhesi/Muslim	89 (42.6)	120 (57.4)	0.68 (0.50-0.95, p=0.021) *	1.11 (0.69-1.80, p=0.659)
Janajati	69 (39.7)	105 (60.3)	0.77 (0.55-1.10, p=0.145)	0.90 (0.62-1.31, p=0.575)
Dalit	7 (20.6)	27 (79.4)	1.96 (0.88-4.95, p=0.121)	1.74 (0.76-4.53, p=0.215)
Other	9 (29.0)	22 (71.0)	1.24 (0.58-2.89, p=0.595)	0.97 (0.43-2.36, p=0.945)
Professional Category				
Doctor	191 (51.5)	180 (48.5)	-	-
Paramedics	83 (26.9)	225 (73.1)	2.88 (2.09-3.99, p<0.001) ***	2.52 (1.79-3.58, p<0.001) ***
Nurse/Midwife	52 (30.1)	121 (69.9)	2.47 (1.69-3.64, p<0.001) ***	2.09 (1.40-3.17, p<0.001) ***
Public Health Workers	28 (23.0)	94 (77.0)	3.56 (2.26-5.77, p<0.001) ***	2.40 (1.47-4.01, p=0.001) **
Lab Worker	11 (21.6)	40 (78.4)	3.86 (1.98-8.11, p<0.001) ***	3.54 (1.77-7.61, p=0.001) **
Other	12 (46.2)	14 (53.8)	1.24 (0.56-2.79, p=0.600)	1.24 (0.54-2.89, p=0.609)
Province				
Bagmati Province	90 (44.1)	114 (55.9)	-	-
Province 1	72 (37.3)	121 (62.7)	1.33 (0.89-1.99, p=0.168)	1.18 (0.77-1.81, p=0.446)
Province 2	71 (45.5)	85 (54.5)	0.95 (0.62-1.44, p=0.792)	0.83 (0.47-1.45, p=0.510)
Gandaki Province	29 (42.0)	40 (58.0)	1.09 (0.63-1.90, p=0.762)	1.24 (0.69-2.22, p=0.473)
Province 5	64 (41.8)	89 (58.2)	1.10 (0.72-1.68, p=0.666)	0.87 (0.56-1.37, p=0.554)
Karnali Province	17 (15.3)	94 (84.7)	4.37 (2.48-8.06, p<0.001) ***	2.96 (1.62-5.64, p=0.001) **
Sudurpaschim Province	34 (20.6)	131 (79.4)	3.04 (1.92-4.90, p<0.001) ***	2.10 (1.28-3.48, p=0.004) **
Presence of Chronic Disease				
No	313 (34.4)	596 (65.6)	-	-

Perceived Willingness to work	Unwilling to work (n=377)	Willing to work (n=674)	OR (univariable) (95% CI, p-value)	OR (multivariable) (95% CI, p-value) [‡]
Yes	64 (45.1)	78 (54.9)	0.64 (0.45-0.92, p=0.015) *	0.67 (0.46-0.99, p=0.043) *
HWs having family members who need care				
No	120 (31.5)	261 (68.5)	-	-
Yes	257 (38.4)	413 (61.6)	0.74 (0.57-0.96, p=0.026) *	0.72 (0.54-0.95, p=0.021) *
Perceived Knowledge about COVID-19[†]				
Inadequate	86 (47.5)	95 (52.5)	-	-
Adequate	291 (33.4)	579 (66.6)	1.80 (1.30-2.49, p<0.001) ****	1.81 (1.27-2.58, p=0.001) **
Perception of government response[‡]				
Unsatisfactory perception	264 (39.5)	404 (60.5)	-	-
Satisfactory Perception	113 (29.5)	270 (70.5)	1.56 (1.20-2.05, p=0.001) **	1.12 (0.83-1.51, p=0.448)

[‡] Odds Ratios were obtained by multivariate logistic regression adjusted for Ethnicity, Professional category, Province, Presence of Chronic Disease, health workers with family members requiring care, perceived knowledge of COVID-19, and perception of government response.

[†] Knowledge about COVID-19 was self-reported; a combined score above average was regarded as “Adequate” knowledge and a score below or equal to the average was considered “Inadequate”.

[‡] Perception of government response during COVID-19 pandemic was self-reported; a combined score above average was regarded as “Satisfactory perception” of knowledge and score below or equal to the average was considered “Unsatisfactory Perception”.

* p-value < 0.05 at the 5 % level of significance

** p-value < 0.01 at the 5 % level of significance

*** p-value < 0.001 at the 5 % level of significance