Factors associated to acceptance and willingness to pay for COVID vaccine in Nepal

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Introduction. Corona virus disease (COVID-19) remains pandemic globally. Vaccination is considered one of the best means to control both morbidity and mortality of COVID-19. The study aims to find out the people’s acceptance and willingness to pay for it.

Methods. The study used cross-sectional survey design. Data were collected using a survey questionnaire from 1072 respondents (age 20-60 years) from 14 districts of Nepal. Socio-demographic characteristics of the respondents were independent and acceptance of vaccine was the dependent variable.

Results. The study found that 84% of the respondents accepted the COVID vaccine. Only one out of six did not accept the COVID vaccine while 16% of the respondents stated that they would like to pay for the COVID vaccination. The average willingness to pay (WTP) for vaccination was NRs. 1053 (US$ 9) while median and mode remained the same NRs. 500. The middle age groups (30-49 years), respondents belonged to Madhesi, business people in terms of occupation and the respondents who had completed school level education had a higher acceptance rate than other categories. It was observed that place of residence in terms of provinces or districts, age group, caste/ethnicity, and educational level of the respondents were significantly associated with the acceptance of the COVID vaccine. Moreover, respondents residing from Lumbini Province, age group of 30-39 years, and having secondary or higher education were noticed more likely to accept the COVID vaccine than the respective compared groups.

Conclusion. Appropriate information, education and communication needs to disseminate to minimize the misinformation about the COVID and lack of trust in vaccine that may lead to low acceptance and poor WTP for vaccine. These findings could be considered while making COVID and the COVID vaccine-related interventions.
hygiene, wearing a facemask, avoiding crowded place, home quarantine and self-isolation through daily press meet and different mass media including radio and TV. People’s unwillingness or hesitation to get vaccinated against COVID-19 may be due to misinformation and contagious [5]. Therefore, it needs time to time intervention for adequate and accurate information. The facts only cannot motivate people it needs mass campaigns to change or acceptance. Though vaccination could not be as a bullet to fight the COVID however vaccination and healthy behaviours, contact tracing with other combined efforts could eventually shrink the transmission of COVID [6]. Despite various efforts of the GoN and civil societies to curb the transmission of coronavirus infection, the situation could not be controlled. The situation not only affected the health of the people rather it affected the national economy, education and all other sectors. To date, no medicine is available to cure the diseases so preventive measures are key weapons to fight the disease pandemic. Therefore, only vaccination against COVID-19 is considered as a permanent solution to overcome the situation. However, there is much misinformation are also being spread. The misleading information could lead to mistrust, hesitancy, confusion and even rejection toward vaccination [7]. The trend showed that the GoN has been allocating nearly two to three percent of the total national budget on average for the health sector in the recent decade. The budget may not be enough to buy the COVID vaccine for all Nepalese people. In such instances, people participation would be compensated for health financing for buying the vaccine. However, we could not find any study regarding people’s acceptance and willingness to pay for it in the context of Nepal. Therefore, the study aims to find out the people’s acceptance and willingness to pay for the COVID vaccine.

Methods

RESEARCH DESIGN
The study used cross-sectional survey design.

STUDY SETTING AND PERIOD
The study covered all seven provinces of Nepal. We choose purposively two districts from each province. Therefore 14 districts were covered in this study. Sunsari and Dhankuta from Province one; Saptari and Parsa from Province two; Kathmandu and Chitwan from Bagmati; Baglung and Kaski from Gandaki; Rupandehi and Banke from Lumbini; Surkhet and Dailekh from Karnali; and Kailali and Bhajhang from Suderpaschim Province were purposively selected (Fig. 1). These districts were selected because the risk of COVID-19 was slightly higher compared to other districts in respective provinces. Fieldwork was started on 1st March 2021 and stopped on 27th April due to lockdown imposed by the GoN and local authorities.

Study population
People aged between 20-60 years living in the selected districts was the study population.

Sampling unit
Individuals of the household were the sampling unit. The ward of Rural Municipality (Gaupalika) and Urban Municipality (Nagarpalika) were the primary sampling unit (PSU) for the study.

Sample size
The required sample size was calculated using the formula [8].

\[ n = \frac{Z^2(p.q)}{d^2} \times \text{Def} \]

Fig. 1. Sampling districts and sample size.
Where, $n$ = size required; $t$ = 95% confidence interval for cluster sampling (2.045) instead of ($z = 1.96$); $p$ = estimated proportion of the variables = 0.5; $q = 1 - p$, $d$ = the degree of accuracy ($d = 0.05$), and Def = design effect = 3. The total sample accounted for 1255. After adjusting the non-response rate of 10 percent, then the sample size accounted for 1394 for 14 districts (99.9~100 for each district), therefore, the required sample size reached $14 \times 100 = 1400$.

**Sampling Technique**

The multistage sampling technique was used in the process of selecting sampling units. In the first stage, 14 districts from 7 provinces were purposively selected. In the second stage, one rural municipality and one municipality were selected purposively as applicable. In the third stage, two primary sampling units (two clusters/wards) were randomly selected from each of selected rural/municipalities. A list of the adult population [20-60 years] who were available at the cluster were listed. In the fourth stage, 25 households from each cluster/PSU were randomly selected.

**Criteria for sample selection**

Persons aged 20-60 years living in households of PSU were eligible for sample selection. Those persons who were willing to participate in the COVID survey were selected for the structured interview. Age less than 20 or more than 60, and an individual who did not want to participate and the guests who came from other than sample districts were excluded.

**Data collection toll**

The survey questionnaire was the tool for data collection.

**VALIDITY AND RELIABILITY OF THE TOOL**

The research tool was pretested in Kathmandu, Chitwan, Rupandehi, and Surkhet districts of Nepal. The final set of questionnaires was tested among 40 persons living in rural and urban areas which were not included in PSU. Cronbach’s alpha was calculated and found 0.754 which was eligible to administrate [9]. A webinar-based discussion was conducted to revise the study tool. After conducting the pre-testing, we also consulted with statisticians then some questions are removed as well as added as per the field experience.

**Data collection techniques**

After selecting the sample, filed enumerators stated about the objective of the study, voluntary participation, right to reject any time, data confidentiality and anonymity to the respondents. Consent was taken prior to the interview and then collected the data from the respondents at their home or the place where they felt comfort response such as field, workplace. Data were collected by using mobile technology through application software KoBo Toolbox. Though estimated the sample size was 1400 but the GoN imposed lockdown since 28th April 2021 in many districts. Then, we could not be able to collect the all

### Tab. I. Background characteristics of the respondents.

| Variables          | Category                  | %   | N   |
|--------------------|---------------------------|-----|-----|
| Province           |                           |     |     |
|                    | Province 1                | 17.3| 185 |
|                    | Province 2                | 15.0| 161 |
|                    | Bagmati                   | 16.6| 178 |
|                    | Gandaki                   | 10.9| 117 |
|                    | Lumbini                   | 17.5| 188 |
|                    | Karnali                   | 13.1| 140 |
|                    | Sudur Pashchim             | 9.6 | 103 |
|                    | Sunsari                   | 8.8 | 94  |
|                    | Dhankuta                  | 8.5 | 91  |
|                    | Saptari                   | 9.0 | 96  |
|                    | Parsa                     | 6.1 | 65  |
|                    | Kathmandu                 | 9.1 | 98  |
|                    | Chitwan                   | 7.5 | 80  |
|                    | Bajilung                  | 5.2 | 56  |
|                    | Kaski                     | 5.7 | 61  |
|                    | Rupandehi                 | 8.9 | 95  |
|                    | Banke                      | 8.7 | 95  |
|                    | Surkhet                    | 7.6 | 81  |
|                    | Dallekh                    | 5.5 | 59  |
|                    | Kailali                    | 5.8 | 62  |
|                    | Bajhang                    | 5.8 | 61  |
| District            |                           |     |     |
|                    | Sunsari                   | 8.8 | 94  |
|                    | Dhankuta                  | 8.5 | 91  |
|                    | Saptari                   | 9.0 | 96  |
|                    | Parsa                     | 6.1 | 65  |
|                    | Kathmandu                 | 9.1 | 98  |
|                    | Chitwan                   | 7.5 | 80  |
|                    | Bajilung                  | 5.2 | 56  |
|                    | Kaski                     | 5.7 | 61  |
|                    | Rupandehi                 | 8.9 | 95  |
|                    | Banke                      | 8.7 | 95  |
|                    | Surkhet                    | 7.6 | 81  |
|                    | Dallekh                    | 5.5 | 59  |
|                    | Kailali                    | 5.8 | 62  |
|                    | Bajhang                    | 5.8 | 61  |
| Place of residence |                           |     |     |
|                    | Urban/Town                 | 29.5| 316 |
|                    | Semi Urban/Small Town      | 26.3| 282 |
|                    | Rural Areas                | 44.2| 474 |
| Age group          |                           |     |     |
|                    | 20-29 yrs                  | 42.9| 460 |
|                    | 30-39 yrs                  | 25.5| 273 |
|                    | 40-49 yrs                  | 17.6| 189 |
|                    | 50 or more                 | 14.0| 150 |
| Sex                |                           |     |     |
|                    | Male                       | 47.9| 513 |
|                    | Female                     | 51.7| 554 |
|                    | Others                     | .5  | 5   |
| Caste/Ethnicity    |                           |     |     |
|                    | Brahman/Chhetri/Thakuri/Sanyasi | 44.3| 475 |
|                    | Advantaged Janajatis       | 6.3 | 68  |
|                    | Disadvantaged Janajatis    | 12.4| 135 |
|                    | Madhesi                    | 25.2| 249 |
|                    | Muslim                     | 5.1 | 55  |
|                    | Dalit                      | 10.2| 109 |
|                    | Others                     | .5  | 5   |
| Main occupation    |                           |     |     |
|                    | Subsistence Agriculture    | 25.3| 271 |
|                    | Cash crops/Farming         | 7.9 | 85  |
|                    | Business                   | 8.9 | 95  |
|                    | Service                    | 26.5| 284 |
|                    | Foreign Employment         | 5.2 | 54  |
|                    | Wage labour                | 8.5 | 91  |
|                    | Housewife                  | 10.9| 117 |
|                    | Other                      | 8.9 | 95  |
| Educational level  |                           |     |     |
|                    | No education               | 8.7 | 95  |
|                    | Basic education            | 15.2| 165 |
|                    | Secondary Education        | 40.4| 435 |
|                    | Higher education           | 35.7| 383 |
|                    | Up to 5 members            | 48.1| 516 |
|                    | 6 to 10 members            | 45.3| 486 |
|                    | 11 or more members         | 6.5 | 70  |
| Size of the family |                           |     |     |
|                    | Nuclear                    | 58.5| 627 |
|                    | Joint                      | 41.5| 445 |
|                    | Hindu                      | 84.7| 908 |
|                    | Buddhist                   | 6.2 | 66  |
|                    | Islam                      | 4.4 | 47  |
|                    | Christianity               | 2.5 | 27  |
|                    | Others                     | 2.2 | 24  |
| Type of family     |                           |     |     |
|                    | No                         | 77.1| 827 |
|                    | Yes                        | 22.9| 245 |
| Religion           |                           |     |     |
|                    | Chronic illness            |     |     |

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data as per the plan after the date. Altogether, responses from 1072 samples were recorded. So, the study yielded 77 (actual 85%: 1072/1255) percent of response rate due to lockdown and COVID-19 pandemic situation.

Variables and Measures
Socio-demographic characteristics of the respondents were independent, and acceptance and willingness to pay for the COVID vaccine were the dependent variables. Descriptive in terms of frequency and percentage, central tendency, and bivariate (chi-square test) analysis was performed to find out the association between the variables. For the statistical analysis, IBM SPSS statistics 20 was used.

Potential Biases
This was a quantitative survey, there might be selection bias of respondents and recall bias of information. There might be confirmation bias from the researcher side in order to favour particular assumptions. The field enumerators were oriented about these biases and the ways of minimizing these biases during the orientation and training. Moreover, they were oriented about probing techniques to minimize recall and other biases.

Ethical Consideration
The study proposal was reviewed and approved by Nepal Health Research Council (NHRC) on 26th January 2021 (# 649/2020). The study followed all research ethics guidelines made by NHRC.

Results
Characteristics of the Respondents
Though it was planned that a total of 200 respondents from each province. But due to the pandemic situation and the GoN and local authorities imposed lockdown we could not be able to collect the data after 28th April 2021. However, about 85 percent of the actual sample has been collected. Data were collected more than three-fourth of the total target sample. Of the total respondents, 44 percent were from rural areas and 30 percent from urban areas. The mean age of the respondent was 35 ± 11.29 years and 43 percent of the total samples were from 20 to 29 years of age. The majority (52%) of the respondents were female and 44 percent were from Brahmin, Chhetri, Dasnami and Thakuri. One-third of the respondents were involved in subsistence agriculture as the main occupation whereas 27 percent as in service. One out of ten (9%) of the respondents were illiterate but 36 percent had higher education degrees. Near to half (48%) of the respondents had up to five members in their family and 59 percent of the respondent were from nuclear families.
A vast majority (85%) of the respondent were Hindu and 23 percent of the respondents had some kind of chronic disease within family members.

Acceptance of the COVID Vaccine
A majority (84%) of the respondent expressed that they would accept the COVID-19 vaccine. Nearly half (46%, n = 495) of the respondents indicated that they would accept vaccines if the vaccine was available at free of cost and only about 16 percent (n = 167) of the respondents stated that they would accept vaccines even if they have to pay. One fifth (21%, n = 228) of the respondents indicated that they will decide how much they want to pay after the vaccine is available.

Willingness to pay for COVID vaccine
Of the total respondents, only one out of six (16%) respondents wanted to pay for the COVID vaccine. The mean willingness to pay (WTP) for the COVID vaccine was Nepali Rupees (NRs.) 1053 (US$ 9), median and mode of the WTP for the COVID vaccine was NRs. 500 each where minimum NRs. 50 to maximum NRs. 10,000. The WTP of the respondents for COVID vaccine was asymmetry nature.

Association of socio-demographic characteristics and acceptance of COVID vaccine
Almost all (97%) of the respondents from Lumbini province expressed that they would accept the COVID vaccine followed by 90 percent from Province One, 88 percent from Province Two, and only 69 percent of the respondents from Bagmati province would accept the vaccine which was the lowest acceptance among all provinces (p < 0.001). In the same way, the cent percent of the respondents from Rupandehi district accepted the COVID vaccine what was the highest acceptance whereas 59 percent of the respondents from Dailekh district stated that they would accept the COVID vaccine which was the lowest acceptance among all provinces (p < 0.001). The acceptance rate of the vaccine was higher in the semi-urban areas (87%) compared to rural (85%) and urban (81%) areas. That means respondents from urban areas had a low acceptance rate for the COVID vaccine.
Interestingly middle age group (30-49 years) had more acceptance rate which accounted for 88 to 89 percent compared to other age groups (80-83%) (p < 0.01). In the same way, female respondents had a comparatively low acceptance rate (84%) compared to other (85%). The respondents who were Madhesi had a higher acceptance rate (91%) of COVID vaccine compared to other caste groups (p < 0.001). Only 82 percent of the respondents from Muslim expressed that they would accept the COVID vaccine. Similarly, the respondents who were involved in business had a higher acceptance rate for vaccines which accounted for 92 percent whereas the respondents who were housewives had a low acceptance rate (73%) (p < 0.01).
Ninety percent of the respondents who completed secondary level of education had a higher acceptance rate which accounted for 90 percent compared to the respondents who had no formal education (76%) and higher education (79%) (p < 0.001). Data showed that the
higher the number of family size higher the acceptance for the COVID vaccine. It was observed that there was no difference of the acceptance rate of vaccines between nuclear and joint families. In the same way, there were no significant differences for the COVID vaccine acceptance rate among the religious groups and the family of the respondents having the chronic disease(s) within the family member(s) or not.

### Multivariate Analysis on Socio-Demographic Characteristics and Acceptance of COVID Vaccine

Variables, that were found significant differences in bivariate analysis, were further analysed in the multivariate analysis except for districts. Before adjusting the variables in multivariate analysis some attributes were merged such as caste and occupation. In Model I, we presented the province and acceptance of the COVID vaccine, in Model II we adjusted age group and caste, and in Model III we adjusted occupation and education along with other variables. Nearly the same result was noticed in the tables but after adjusting the occupation and educational level of the respondent, the odds ratio of caste appeared in a fluctuated way.

It was noticed that the respondents from Bagmati province appeared 72% less likely to accept the COVID vaccine compared to the respondents from Province one (OR = 0.28, 95% CI: 0.15-0.52). In the same way, the respondents from Karnali Province noticed 59% less likely to accept the COVID vaccine compared to the respondents from Province one (OR = 0.41, 95% CI: 0.21-0.77). But, the respondents from Lumbini Province were observed almost 5.2 times more likely to accept the COVID vaccine compared to the respondents from Province one (OR = 5.20, 95% CI: 1.84-14.70). The middle age group (30-49 years and 40-49 years) appeared 1.8 to 2.0 times more likely to accept the COVID vaccine compared to the age group of 20-29 years respectively (OR = 2.03, 95% CI: 1.26-3.27, and OR = 1.84, 95% CI: 1.04-3.25). In the same way, the respondents having secondary and higher education were noticed as more likely to accept the COVID vaccine compared to the respondents who had no education respectively (OR = 3.64, 95% CI: 1.78-7.42, and OR = 2.34, 95% CI: 1.14-4.89).

### Discussion

The study found that a vast majority of the respondents accepted the COVID vaccine. Only one out of six did not accept the COVID vaccine while the same percentage of the respondents would like to pay for COVID vaccination. The average WTP for vaccination was NRs. 1053 (US$ 9) and median and mode of WTP remained the same NRs. 500. However, the range of WTP was NRs. 50-10,000. A high acceptance rate was found in Lumbini and a low acceptance rate was observed in Bagmati province. In the same way, a high acceptance rate was recorded in Rupandehi and a low in Dailekh district. The middle age groups (30-49 years of age) had a higher acceptance rate of vaccination. Respondents who belonged to Madhesi and business people in terms of occupation had a higher acceptance rate than other related groups. The respondents who had completed school level education had a higher acceptance rate than others categories. The study revealed that place of residence in terms of provinces or districts, age group, caste/ethnicity, and educational level of the respondents were significantly associated with the acceptance of the COVID vaccine. Similarly, respondents from the Lumbini Province, the middle year of age 30-49 years, and secondary or higher education were noticed as more likely to accept the COVID vaccine compared to their respective attributes.

An e-survey conducted in Turkey showed that near to half (49.7%) of the respondents stated that they would be vaccinated [10] which was similar (42% acceptance rate) to the study from Russia [11]. Another study from France showed 77 percent of the respondents who were health workers would like to accept the COVID vaccination [12] which was lower than this study. The study further showed that gender, age and type of occupation were significantly associated with the acceptance of the COVID vaccine that was somehow similar result with the study [12]. In the initial days for the COVID vaccine, there was mistrust and hesitation to accept or be willing to participate in the vaccine trial. Nearly two-third (64-69%) of the respondents from China accepted for willingness for COVID vaccine trial [13,14] this paper aimed to describe the prevalence and correlates of willingness to participate in COVID-19 vaccine trials among university students in China. A cross-sectional survey with 1912 Chinese university students was conducted during March and April 2020. Bivariate and multivariate analyses were performed to identify variables associated with willingness to participate. The majority of participants (64.01%) similar to the study from Japan [15]. Nearly the same result was observed in the United States (US). Socio-demographic variables such as age, sex, ethnicity, education and income status were significantly associated with the intention to accept the COVID vaccine [16]. However, a systematic review showed that sex (female), age (younger), low social status (low economic and educational level), and caste (ethnic minority) were significantly associated with less likely to accept the CoViD vaccine [17].

The acceptance rate of the COVID vaccine was noticed to vary within a time interval. A longitudinal study conducted in the US showed that there was 71 percent vaccine acceptance rate was observed in April while it was declined to 54 percent in October 2020 [18]. So, the acceptance rate might be influenced not only by socio-demographic characteristics but also by the time interval. A prior study conducted in United Kingdoms showed that low socio-economic status, women and ethnic minorities appeared less likely to accept the COVID vaccine. Near to two-third (63.5%) of the respondents would like to accept the vaccine whereas about one fourth (22.5%) were unsure and 14 percent would like to reject...
the vaccine [19]. A similar observation was found in Philadelphia that showed acceptance rate was 74 percent. 26 percent were unsure and 10 percent did not plan to the vaccine [20]. The prior study from France supports that gender, age and low education level were associated with the acceptance of the COVID vaccine [21]. The majority (64%) of the respondents from China expressed they would accept vaccines however lower socio-economic status and females were more likely to accept the COVID vaccine [22] which was somehow different from this study.

Surprisingly, near to half (46%) of the respondents from Egypt had hesitancy towards the COVID vaccine. Moreover, six percent each form respondents would like to accept as well as a reject [23]. Two-third (66%) and 14 percent of the respondents from the US would like to accept and reject the COVID vaccine respectively [24] which was near to similar with the study. More than half (56%) had a vaccine acceptance rate whereas the upper-income category(richest) had a higher chance to accept and health workers were appeared less likely to accept vaccines in the Democratic Republic of Congo [25]. Acceptance of COVID vaccine varies in time and place overall vaccine hesitancy rate appeared 9 to 43 percent in France [26]. A systematic reviews showed that the acceptance rate was varied from 28 to 78 percent in 33 different countries [27].

Limitations
We selected the districts purposively as per the magnitude of the problem so there may be selection bias. Similarly, response and recall biases may persist since we collected the data from the respondents in a single and first visit. Moreover, the cross-sectional study might not show the cause and effect relationship among the variables. Therefore, a mixed or multi-methods approach with wider perspectives would be better to study for acceptance and WTP for the COVID vaccine in near future.

| Variable               | Category       | N   | %   |
|------------------------|----------------|-----|-----|
| Acceptance of vaccine  | No             | 169 | 15.8|
|                        | Yes            | 903 | 84.2|
| Accepted if (n = 905)  | Available at free of cost | 495 | 54.8|
|                        | Would pay if available | 167 | 18.5|
|                        | Will decide after vaccine available | 228 | 25.2|
|                        | Others         | 13  | 1.4 |

Conclusion
A vast majority (8 out of 10) of the respondents accepted the COVID vaccine however only one out of six will pay for vaccination. Of the respondents, 16 percent did not accept the vaccine. Moreover, the average willingness to pay for the COVID vaccine was NRs. 1053 (US$ 9). These findings show that people do not want to pay but they would like to be vaccinated free of cost. Since the vaccination is in the initial phase globally. People may have misinformation and a lack of trust in it. Generally, negative information can spread faster than a positive message. Socio-demographic characteristics such as place of residence in terms of province and districts, age group of people, caste/ethnicity, occupation, educational level are significantly associated with the acceptance of the COVID vaccine. But, residence setting (in terms of Province and districts), age group, and educational status of the respondents were significant predictors for the acceptance of the COVID vaccine. The policymakers and stakeholders should take these findings into account while making COVID vaccine-related planning and intervention. Proper dissemination is required to minimize the COVID related misinformation and lack of trust in the COVID vaccine that would lead to higher acceptance and WTP for the vaccine.

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Conflict of interest statement
The authors declare that they have no conflict of interest with this study.

Authors’ contribution
DA: Design of the study, analysis of data, interpretation of data, drafting and approved the final version of the manuscript. CBB: Conception of the study, interpretation of data, revised the manuscript critically, approved the final version of the manuscript. SPK: Design of the study, acquisition of data, revised the manuscript critically, and approved the final version.

Tab. II. Acceptance of Covid-19 vaccine.

| Variable                  | Category                      | N  | %  |
|---------------------------|-------------------------------|----|----|
| Acceptance of vaccine     | No                            | 169| 15.8|
|                           | Yes                           | 903| 84.2|
| Accepted if (n = 905)     | Available at free of cost     | 495| 54.8|
|                           | Would pay if available        | 167| 18.5|
|                           | Will decide after vaccine     | 228| 25.2|
|                           | Others                        | 13 | 1.4|

Tab. III. Willingness to pay for COVID vaccine.

| Amount in NRs. | N   | %  | Mean | Median | Mode | SD  | Minimum | Maximum | Range |
|----------------|-----|----|------|--------|------|-----|---------|---------|-------|
| Up to 500      | 105 | 63 | 1     | 1      | 1    | 0.5 | 1       | 1       | 0     |
| 501 to 1000    | 30  | 18 | 1053  | 500    | 1761 | 50  | 10000   | 50      | 9950  |
| More than 1000 | 32  | 19 | 1     | 1      | 1    | 0.5 | 1       | 1       | 0     |
| Total          | 167 | 100| 1     | 1      | 1761 | 50  | 10000   | 50      | 9950  |

NRs: Nepalese Rupee (NRs 117.04 = 1 US$).
### Tab. IV. Association of socio-demographic characteristics and acceptance of COVID vaccine.

| Variables         | Category                  | Acceptance of COVID-19 vaccine | N  | %  | N  | %  | χ²  | p   |
|-------------------|---------------------------|-------------------------------|----|----|----|----|-----|-----|
| Province          |                           |                               |    |    |    |    |     |     |
|                   | Province 1                |                               | 19 | 10.3| 166| 89.7| 74.470| < 0.001|
|                   | Province 2                |                               | 20 | 12.4| 141| 87.6|       |     |
|                   | Bagmati                   |                               | 55 | 30.9| 123| 69.1|       |     |
|                   | Gandaki                   |                               | 17 | 14.5| 100| 85.5|       |     |
|                   | Lumbini                   |                               | 5  | 2.7 | 183| 97.3|       |     |
|                   | Karnali                   |                               | 58 | 27.1| 102| 72.9|       |     |
|                   | Sudur Pashchim             |                               | 15 | 14.6| 88 | 85.4|       |     |
|                   | sunsari                   |                               | 5  | 5.3 | 89 | 94.7| 107.339| < 0.001|
|                   | Dhankuta                  |                               | 14 | 15.4| 77 | 84.6|       |     |
|                   | Saptari                   |                               | 13 | 13.5| 83 | 86.5|       |     |
|                   | Parsa                     |                               | 7  | 10.8| 58 | 89.2|       |     |
|                   | Kathmandu                 |                               | 28 | 28.6| 70 | 71.4|       |     |
|                   | Chitwan                   |                               | 27 | 33.8| 55 | 66.3|       |     |
|                   | Baglung                   |                               | 1  | 1.8 | 55 | 98.2|       |     |
|                   | kaski                     |                               | 16 | 26.2| 45 | 73.8|       |     |
|                   | Rupandehi                 |                               |   95| 100.0|     |     |       |     |
|                   | Banka                     |                               | 5  | 5.4 | 88 | 94.6|       |     |
|                   | Surkhet                   |                               | 14 | 17.3| 67 | 82.7|       |     |
|                   | Dallekigh                 |                               | 24 | 40.7| 35 | 59.3|       |     |
|                   | Kailali                   |                               | 9  | 14.5| 53 | 85.5|       |     |
|                   | Bajhang                   |                               | 6  | 14.6| 35 | 85.4|       |     |
|                   | Urban/Town                |                               | 55 | 30.9| 123| 69.1|       |     |
|                   | Semi Urban/Small Town     |                               | 37 | 13.1| 245| 86.9|       |     |
|                   | Rural Areas               |                               | 71 | 15.0| 403| 85.0|       |     |
| District          |                           |                               |    |    |    |    |     |     |
|                   | 20-29 yrs                 |                               | 90 | 19.3| 370| 80.4| 11.699| 0.008|
|                   | 30-39 yrs                 |                               | 31 | 11.4| 242| 88.6|       |     |
|                   | 40-49 yrs                 |                               | 22 | 11.6| 167| 88.4|       |     |
|                   | 50 or more                |                               | 26 | 17.3| 124| 82.7|       |     |
| Place of residence|                           |                               |    |    |    |    |     |     |
|                   | Female                    |                               | 90 | 16.2| 464| 83.8| 0.199| 0.655|
|                   | Others                    |                               | 79 | 15.3| 459| 84.7|       |     |
| Age group         |                           |                               |    |    |    |    |     |     |
|                   | 20-29 yrs                 |                               | 90 | 19.3| 370| 80.4| 11.699| 0.008|
|                   | 30-39 yrs                 |                               | 31 | 11.4| 242| 88.6|       |     |
|                   | 40-49 yrs                 |                               | 22 | 11.6| 167| 88.4|       |     |
|                   | 50 or more                |                               | 26 | 17.3| 124| 82.7|       |     |
| Sex               |                           |                               |    |    |    |    |     |     |
|                   | Female                    |                               | 90 | 16.2| 464| 83.8| 0.199| 0.655|
|                   | Others                    |                               | 79 | 15.3| 459| 84.7|       |     |
| Caste             |                           |                               |    |    |    |    |     |     |
|                   | Brahman/Chhetri/Thakuri/Sanyasi|                         | 97 | 20.4| 378| 79.6| 21.799| 0.001|
|                   | Advantaged Janajatis      |                               | 10 | 14.7| 58 | 85.3|       |     |
|                   | Disadvantaged Janajatis   |                               | 13 | 9.8 | 120| 90.2|       |     |
|                   | Madhesi                   |                               | 23 | 9.2 | 226| 90.8|       |     |
|                   | Muslim                    |                               | 6  | 18.2| 27 | 81.8|       |     |
|                   | Dailit                    |                               | 18 | 16.5| 91 | 83.5|       |     |
|                   | Others                    |                               | 2  | 40.0| 3  | 60.0|       |     |
| Main occupation   |                           |                               |    |    |    |    |     |     |
|                   | Subsistence Agriculture   |                               | 43 | 15.9| 228| 84.1| 18.890| 0.009|
|                   | Cash crops/farming        |                               | 14 | 16.5| 71 | 85.5|       |     |
|                   | Business                  |                               | 8  | 8.4 | 87 | 91.6|       |     |
|                   | Service                   |                               | 56 | 12.7| 248| 87.3|       |     |
|                   | Foreign Employment        |                               | 7  | 20.6| 27 | 79.4|       |     |
|                   | Wage labour               |                               | 16 | 17.6| 75 | 82.4|       |     |
|                   | Housewife                 |                               | 52 | 27.4| 85 | 72.6|       |     |
|                   | Other                     |                               | 13 | 15.7| 82 | 84.3|       |     |
| Educational level |                           |                               |    |    |    |    |     |     |
|                   | No education              |                               | 22 | 23.7| 71 | 76.3| 21.972| < 0.001|
|                   | Basic education           |                               | 22 | 15.5| 141| 85.5|       |     |
|                   | Secondary Education       |                               | 45 | 10.4| 388| 89.6|       |     |
|                   | Higher education          |                               | 80 | 20.9| 303| 79.1|       |     |
| Size of the family|                           |                               |    |    |    |    |     |     |
|                   | Up to 5 members           |                               | 84 | 16.3| 432| 83.7| 0.554| 0.758|
|                   | 6 to 10 members           |                               | 76 | 15.6| 410| 84.4|       |     |
|                   | 11 or more members        |                               | 9  | 12.9| 61 | 87.1|       |     |
| Type of family    |                           |                               |    |    |    |    |     |     |
|                   | Nuclear                   |                               | 98 | 15.6| 529| 84.4| 0.021| 0.886|
|                   | Joint                     |                               | 71 | 16.0| 574| 84.0|       |     |
| Religion          |                           |                               |    |    |    |    |     |     |
|                   | Hindu                     |                               | 135| 14.9| 773| 85.1| 4.573| 0.334|
|                   | Buddhist                  |                               | 14 | 21.2| 52 | 78.8|       |     |
|                   | Islam                     |                               | 11 | 23.4| 36 | 76.6|       |     |
|                   | Christianity              |                               | 4  | 14.8| 23 | 85.2|       |     |
|                   | Others                    |                               | 5  | 20.8| 19 | 79.2|       |     |
| Chronic Illness   |                           |                               |    |    |    |    |     |     |
|                   | No                        |                               | 128| 15.5| 699| 84.5| 0.225| 0.635|
|                   | Yes                       |                               | 41 | 16.7| 204| 83.3|       |     |

Note: Bold face of p-value indicates statistically significant.
Tab. V. Multivariate analysis on socio-demographic characteristics and acceptance of COVID vaccine.

| Variables        | Category                             | Model I  |         | Model II |         | Model III |         |
|------------------|--------------------------------------|----------|---------|----------|---------|-----------|---------|
|                  |                                      | OR 95% CI|         | OR 95% CI|         | OR 95% CI|         |
|                  |                                      | Lower    | Upper   | Lower    | Upper   | Lower     | Upper   |
| Province         | Province 1 (Ref.)                    | 1.00     |         | 1.00     |         |           |         |
|                  | Province 2                           | .807     | .414    | 1.572    |         | .871      | .400    |
|                  | Bagmati                              | .256     | .145    | .453     |         | .280      | .151    |
|                  | Gandaki                              | .675     | .334    | 1.556    |         | .801      | .388    |
|                  | Lumbini                              | 4.189    | 1.530   | 11.470   |         | 5.195     | 1.835   |
|                  | Karnali                              | .307     | .168    | .562     |         | .405      | .214    |
|                  | Sudur Pashchim                        | .671     | .325    | 1.386    |         | .899      | .418    |
| Age group        | 20-29 yrs (Ref.)                     | 1.00     |         | 1.00     |         |           |         |
|                  | 30-39 yrs                             | 1.882    | 1.210   | 2.927    |         | 2.025     | 1.256   |
|                  | 40-49 yrs                             | 1.723    | 1.040   | 2.855    |         | 1.841     | 1.043   |
|                  | 50 or more                            | 1.059    | .650    | 1.726    |         | 1.283     | .686   |
| Caste            | Brahmin/Chhnetri/Thakuri/Dashanami (Ref.) | 1.00     |         | 1.00     |         |           |         |
|                  | Janajatis                             | 1.964    | 1.202   | 3.209    |         | 1.545     | .780    |
|                  | Others                                | 1.796    | 1.231   | 2.622    |         | 1.067     | .627   |
| Occupation       | Agriculture, business (Ref.)         | 1.00     |         | 1.00     |         |           |         |
|                  | Service, wage, foreign job           | .849     | .573    | 1.258    |         |           |         |
|                  | Others                                | 1.649    | .819    | 3.248    |         |           |         |
| Educational level| No education (Ref.)                  | 1.00     |         | 1.00     |         |           |         |
|                  | Basic education                       | 1.902    | .923    | 3.919    |         |           |         |
|                  | Secondary Education                  | 3.635    | 1.781   | 7.417    |         |           |         |
|                  | Higher education                      | 2.336    | 1.115   | 4.894    |         |           |         |

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