# Knowledge, Practice and Psychological Symptoms Among the Nepalese Medical Laboratory Staff: An Online-Based Cross-Sectional Study During COVID-19 Pandemic

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Research

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# Abstract

### Introduction

The Coronavirus Disease 2019 (COVID-19) outbreak has spread globally causing a significant impact on the social and mental life of people across the world including frontline health care workers. The knowledge level, practice behaviour, and mental well-being of healthcare workers are the most important factors for tackling the COVID-19 pandemic. Nepal is a developing country lacking well-established health infrastructures and well-trained human resources to fight an outbreak. The continuous rise in the number of COVID-19 cases inside the country has left unanswered questions on the availability of health resources in Nepal. In this regard, we tried to assess the level of knowledge, practice and psychological symptoms among medical laboratory staff working in Nepal.

### Methods

An online survey using a pre-validated questionnaire was conducted in late January 2021 among medical laboratory staff across Nepal. A total of 301 completely filled responses were used to assess knowledge, practice, and psychological distress. Different statistical tests were used to evaluate differences among variables, and p-value less than 0.05 was considered statistically significant.

### Results

Of the total 301 respondents, 180 (59.8%) were male and 121 (40.2%) were female. The average score of knowledge obtained in this study was 32.4 ± 5.7 on a 56-point scale. Knowledge level was significantly different among age-groups (p value – 0.034). The average practice score obtained was 2.25 ± 0.91 on a 4-point scale. More than one psychological distress symptom was observed in nearly half (41.5%) of the participants enrolled in the study; mood change behavior being the most common symptom.

### Conclusion

We concluded that medical laboratory staff in Nepal has satisfactory levels of knowledge and practice and, larger number of them had psychological distress during the pandemic. The study recommends improvement in an effective information flow system, regular training social security and psychological support to the medical laboratory staff inside the country.


# Introduction

The emergence of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which causes Coronavirus Disease 2019 (COVID-19) has threatened millions of lives and plagued every industry of the world. The highly contagious SARS-CoV-2 was first detected in December 2019 in Wuhan, China as an outbreak of a pneumonia-like illness [1, 2]. SARS-CoV-2 is the third outbreak of Coronavirus in the 21st century after severe acute respiratory syndrome coronavirus (SARS-CoV) outbreak in Beijing, China from 2002–2003, and the Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in 2012 in Saudi Arabia [1, 3]. In response to this serious situation, the World Health Organization (WHO) declared COVID-19 as a public health emergency of international concern on January 30 and pandemic on 11 March 2020 [4]. Starting from Wuhan, China as an epicenter of the origin, the virus quickly spread to the different parts of China and to the globe afflicting 219 countries [5].

In Nepal, the first case of COVID-19 was reported on 23rd January 2020, in a 32-year old Nepali man who had returned from Wuhan, China. Two months after the first case, the second case was diagnosed through domestic testing on March 23rd, in a returnee from France [6, 7]. Since then, there had been a sharp rise in the number of COVID-19 positive cases till the middle of November 2020 [8]. In recent months the number of positive cases is gradually declining and has returned to around 200 per day at the time of preparing this manuscript [9]. To tackle this pandemic situation, Nepal Government had enforced a movement control order (MCO) as a preventive measure to control the spread of the disease from the very beginning. MCO includes restriction of most of the non-essential activities outside the home, travel restriction across the border of two countries and halted flights and other transportation inside the country [10, 11]. Despite these control measures, as of March 1, 2021, over 114 million of the population had been infected with COVID-19 among which around 2.5 million deaths have been reported globally [12]. Study suggests that a large number of people around the world has suffered from mental health problems besides death due to the pandemic [13]. In Nepal, the total number of COVID-19 infected cases are around 274 thousand and the total number of deaths due to the disease is around 3 thousand as of the Government record of March 7, 2021 [14]. The data seems relatively high in comparison to the total population of the country. This scenario has led us to concern over a very critical issue related to national capacity and health systems in the country to tackle the crisis like the COVID-19 pandemic. Nepal is a low-income country with insufficient health infrastructure. There were a very limited number of molecular laboratories for COVID-19 PCR testing inside the country before the outbreak of the pandemic. However, by now the government has been able to set up more than 80 PCR laboratories across the country with the help of public-private partnership. Setting up a molecular laboratory not only requires a well-managed infrastructure, but also well-trained and educated human resources. The information about COVID-19 comes from different sources, viz., governmental information, social media, and the internet, previous personal experiences, medical sources, training, conferences and hands out pamphlets. The accuracy of perception and practice of these beliefs may determine different behaviors about prevention and can vary among the laboratory staff too. In many cases, the lack of knowledge, lack of good clinical (and laboratory) practice may carry a potential risk to the staff and may result in laboratory reports of compromised quality [15].

Medical Laboratory Staffs (MLS) face a substantially higher risk of infection and death due to excessive COVID-19 exposure at different stages from collection to the dispatch of reports. They deal with elective treatment, a medical emergency and the pandemic by producing quality reports [16, 17]. In the case of Health Care Workers (HCWs), it is estimated that the risk could account for 10–20% of all diagnoses [18]. Since HCWs have greater risk of increased exposure, they also have fear of infecting their loved ones and children. This imbalance between professionalism, altruism and fear give rise to psychological distress [19]. Given the high burden, there is a growing demand and focus on protecting HCWs across the world through the provision of personal protective equipment (PPE), training, addressing fatigue, and countering the psychosocial consequences [20]. The literature on the health consequences of HCWs providing care to COVID-19 patients is proliferating; however, limited study is available on knowledge, practice and physiological impact of COVID-19 among MLSs [21]. Knowledge, practice and physiological impact are the major cognitive keys in public health, and are indispensable for evaluating knowledge, communication and practical interventions on COVID-19. Furthermore, mental health is an important dimension that regulates working capacity of HCWs, which may be affected due to occupational injury and potential risk of infection [22]. Researches suggest that higher number of people including HCWs had the psychological symptoms of anxiety and depression due to COVID-19 pandemic [22, 23]. This has created an unprecedented challenge for healthcare systems of all countries. In the context of MLS front-line workers, their

knowledge involves a range of beliefs about methods for testing, samples handling, collection, transportation, storage, processing, testing and reporting [24, 25]. Proper practice involves working inside a laboratory following recommended guidelines for using personal protective equipment. Likewise, mental health refers to working in the laboratory without having any psychological symptoms such as; anxiety, stress, depression and so on. The lack of understanding of such beliefs, inappropriate practices and disturbed mental well-being may generate reports that can vary between the laboratories. Nepal has faced the similar situation during past months [26]. In this scenario, we designed this survey for medical laboratory staff working in Nepal with two central objectives; 1) to assess knowledge level and laboratory practice for diagnosis of COVID-19 cases and, 2) to find the level of psychological distress arising due to the COVID-19 pandemic.

# Methods

### Study design

We conducted a cross-sectional survey in the month of February of year 2021 among the registered medical laboratory staff working in different laboratories/hospitals in Nepal. A structured and self-reported survey questionnaire containing informed consent and other measures was published on the Google doc platform on 15$^{th}$ of February 2021 and data were collected using the same platform between 15th February, 2021 and 28th February, 2021.

### Study participants, sample size and sampling

The study population consisted of all age-groups above 18 years and all educational levels of medical laboratory staff registered in Nepal Health Professional Council (NHPC). NHPC is an autonomous body regulating the human resource for laboratory and other allied-health practices in Nepal. According to the NHPC, the total MLS population of Nepal is around 30 thousand which is less than 1% of the total population of Nepal [27, 28]. Assuming 20% of the MLS population with satisfactory knowledge and practice behavior, the sample size was found to be 246 at 95% Confidence Interval and 5% margin of error [29]. We got a total of 350 responses during the data collection period of two weeks (February 15$^{th}$, 2021 to February 28$^{th}$, 2021). The total 350 responses included some duplicate responses from a single person, few incompletely filled responses and some responses filled by non-medical laboratory staffs that were excluded from the study. In total, we got 301 completely filled responses which we included in our analysis. Medical laboratory staff with internet access was only considered for this survey. The call for study participants was made via social media such as Facebook, Messenger, WhatsApp, Viber, WeChat and Emails to enroll in this study, and they were requested to fill the online questionnaire form based on their knowledge. The online-based survey was administered in the two official languages (Nepali and English) for a clear understanding of the questions. Participants from all the political and geographical divisions of Nepal were enrolled in this study.

### Study questionnaire and measures

After reviewing literature in this area and the number of questionnaire forms used for an online survey, a questionnaire was designed using Google form which was pre-validated by three independent reviewers. The questions were close-ended types that were divided into 4 different sections; a) Socio-demography of respondents, b) Knowledge about COVID-19 c) Psychological impact related to COVID-19 and d) Practice. Section A consisted of socio-demographic characteristics of respondents such as, age, gender, geographical location,

level of education, type of institution, and years of experience. To assess the knowledge about COVID-19, questions were asked on 11 different subheadings that include basic understanding of COVID-19, symptoms, transmission, fatality, sample collection, transportation, storage, and laboratory diagnosis of COVID-19. Likewise, 4 questions were asked to know whether medical laboratory staff follows good laboratory practice or not. The psychological impact of COVID-19 was measured using 12 Yes/No questions that were related to the prevalence of symptoms of mental illness or psychological distress. All questions and responses were based on the latest recommendations by the WHO [30-32].

The response to Knowledge and Practice related questions was measured via Yes/ No/ I am not sure format and, only the correct answers were provided with 1 point. The response of Psychology-related questions was measured in Yes/No format and each 'Yes' response was given 1 point. The questions for psychology were designed in such a way that the 'Yes' response suggests the altered psychology of a participant. Knowledge of COVID 19 was based on a 56-point scale, Practice on a 4-point scale and Psychology on a 12-point scale. For evaluation, the total score of each section was divided into tertile; the first tertile was considered as poor, the second as satisfactory and the third as good for knowledge and practice. Likewise, for evaluation of psychology, first, second and third tertile were considered as low, moderate and high psychological distress, respectively.

### Data analysis

Data was summarized using Microsoft Excel 2019 and analyzed utilizing the R language software version 4.0.3. Chi-square test and t-test were used to investigate the association between independent variables (demographics) and outcome variables (knowledge, practice and psychology) at a 95% confidence interval and, p-value less than 0.05 was considered statistically significant. Binary and multiple logistic regression analysis were also employed to find associations among variables of different categories.

## Results

### Socio-demographic characteristics of respondents

Of the total 301 respondents, 180 (59.8%) were male and 121 (40.2%) were female. The majority of the respondents 193 (64.1%) were from Bagmati province. The higher number of respondents who participated in this study had Bachelor degree (42.2%) followed by Diploma (Proficiency Certificate Level), Master or above, and Lab assistant degree. The majority had work experience of 1 – 5 years. (Table 1)

Table 1 Socio-demographic characteristics of medical laboratory respondents (N = 301)

| Characteristics | Categories | Number of respondents(n) | Percentage (%) |
|---|---|---|---|
| **Working province** | Province 1 | 22 | 7.3 |
| | Province 2 | 21 | 7 |
| | Bagmati | 193 | 64.1 |
| | Gandaki | 17 | 5.6 |
| | Lumbini | 26 | 8.6 |
| | Province 6 | 7 | 2.3 |
| | Far west | 15 | 4.5 |
| **Gender** | Female | 121 | 40.2 |
| | Male | 180 | 59.8 |
| **Age** | 18-30 | 201 | 66.8 |
| | 31-60 | 100 | 33.2 |
| **Education level** | Master and above | 47 | 15.6 |
| | Bachelor in Lab Technology | 127 | 42.2 |
| | PCL in Lab Technology | 102 | 33.9 |
| | Lab assistant | 25 | 8.3 |
| **Working place** | Government health care institution | 104 | 34.5 |
| | Private clinic/hospital/organization | 173 | 57.5 |
| | Unemployed | 24 | 8 |
| **Work experience** | < 1 year | 57 | 18.9 |
| | 1-5 years | 120 | 39.9 |
| | 5-10 years | 63 | 20.9 |
| | >10 years | 61 | 20.3 |

### Knowledge assessment

Of the total 56 questions in 11 specific subheadings asked to assess knowledge about COVID 19 to the participants, we got an average score of 32.4 ± 5.7. The average score lies in the second tertile of the 56-point scale which suggests that medical laboratory staff in Nepal have satisfactory knowledge about COVID-19. To find the difference in knowledge among different groups of demographic variables t-test was applied that revealed a significant difference in age-groups. Participants with age-group 31 – 60 years had higher level of knowledge than those of 18 – 30 years' age-group (p value – 0.034). Similarly, higher number of medical laboratory staff working in government institutions showed higher level of knowledge compared to those working in private institutions (p value – 0.07). (Table 2) In addition, mean knowledge score was calculated for every single participant and divided into tertiles categorizing them as poor, satisfactory and good accordingly. The data

shows a higher number of participants, 112 (37.2%) has good knowledge followed by satisfactory knowledge, 95 (31.6%) and poor knowledge, 94 (31.2%). Binary and multiple regression analysis among different knowledge categories and study variables did not show any significant association. (Supplementary table A)

Eleven subheadings of knowledge were further tested for differences among different variables using F/t-test. The data revealed significant differences in two subheadings: basic about COVID-19 and clinical symptoms. There was a significant difference in basic knowledge about COVID-19 among different age groups (p value - 0.004) and among participants of different education levels (p value - 0.044). Knowledge regarding clinical symptoms of COVID-19 was also found significantly different among different age groups (p-value 0.001), laboratory personnel working in different institutions (p value - 0.001), and among participants having different work experience (p-value 0.001). Respondents of age group 31 – 60 years, those possessing higher education, those working in government institutions, and those having more work experience were found to have higher knowledge. (Supplementary table B)

### Practice assessment

Laboratory practice towards COVID-19 was measured using 4 questions, each question having one point. The average practice score obtained in this study was 2.25 ± 0.91 that lies in the second tertile on a 4-point scale. This suggests that there is satisfactory laboratory practice among medical laboratory personnel in Nepal. The difference in practice among study variables was measured using a t-test and no significant difference was obtained between variables in this study. (Table 2)

Practice score when calculated for every participant shows that a higher number of medical laboratory staff has a good practice, 127 (42.2%) followed by satisfactory practice, 113 (37.5%) and poor practice, 61 (20.3%). (Supplementary table A)

Table 2 Relationship of demographic characteristics with knowledge and practice

| Variable | Categories | Number of participants, n (%) | Knowledge | | | Practice | | |
|---|---|---|---|---|---|---|---|---|
| | | | Knowledge mean± SD | F-test/t-test | p-value | Practice score mean± SD | F-test/t-test | p-value |
| **Working province** | Province 1 | 22 (7.3) | 27±6.8 | 1.584 | 0.151 | 2.4±1.1 | 1.6 | 0.148 |
| | Province 2 | 21 (7) | 29.4±5 | | | 1.9±0.89 | | |
| | Bagmati | 193 (64.2) | 30.3±5 | | | 2.3±0.89 | | |
| | Gandaki | 17 (5.6) | 30.8±4.1 | | | 1.8±1.1 | | |
| | Lumbini | 26 (8.6) | 29±5.8 | | | 2.5±0.81 | | |
| | Province 6 | 7 (2.3) | 30.7±4.9 | | | 2.3±0.95 | | |
| | Far west | 15 (5) | 30.5±4.9 | | | 2.2±0.77 | | |
| **Gender** | Female | 121 (40.2) | 29.9±5.2 | 0.06 | 0.949 | 2.3±1 | 0.181 | 0.856 |
| | Male | 180 (59.8) | 29.9±5.2 | | | 2.2±0.84 | | |
| **Age (Years)** | 18-30 | 201 (66.8) | 29.5±5.4 | -2.14 | **0.034** | 2.2±0.88 | -1.812 | 0.071 |
| | 31-60 | 100 (33.2) | 30.8±4.7 | | | 2.4±0.95 | | |
| **Education level** | Master and/or above | 47 (15.6) | 30.8±5.3 | 0.993 | 0.396 | 2.4±1 | 0.529 | 0.662 |
| | Bachelor in Lab Technology | 127 (42.2) | 29.9±5 | | | 2.2±0.91 | | |
| | PCL in Lab Technology | 102 (33.9) | 29.7±5.5 | | | 2.2±0.86 | | |
| | Lab assistant | 25 (8.3) | 28.7±4.8 | | | 2.3±0.85 | | |
| **Working place** | Government institution | 104 (34.5) | 30.8±4.7 | 2.7 | 0.07 | 2.3±0.92 | 0.26 | 0.772 |
| | Private clinic/hospital | 173 (57.5) | 29.3±5.4 | | | 2.3±0.91 | | |
| | Unemployed | 24 (8) | 30±5 | | | 2.12±0.85 | | |
| **Work experience** | < 1 year | 57 (18.9) | 29.3±5.3 | 0.723 | 0.539 | 2.3±0.88 | 0.076 | 0.973 |
| | 1-5 years | 120 (39.9) | 29.8±5.6 | | | 2.2±0.89 | | |
| | 5-10 years | 63 (20.9) | 29.9±5.1 | | | 2.2±0.96 | | |
| | >10 years | 61 (20.3) | 30.7±4.2 | | | 2.3±0.94 | | |

## Psychology assessment

Of the total 12 questions asked regarding psychological distress, the mean score obtained by the participants was 2.2 ± 2 that lies in the second quartile suggesting a moderate level of psychological distress. Respondents having previous history of any mental illness were excluded from the data analysis, which was confirmed by asking 1 additional question. Nearly one-third of respondents (32.2%) did not have any type of psychological symptoms. More than one-fourth of participants (26.3%) had only one psychological distress symptom while higher number (41.5%) had more than one symptom of psychological distress. Mood change was observed in the highest number of participants while feeling of excessive anger or violence in the least number of medical laboratory staff. (Table 3)

In addition, to find the association of psychological distress with the demographic variables, t-test was applied that showed a significant difference in age groups and education levels. Psychological distress in medical laboratory staff aged 18-30 years differed significantly (p value - 0.032) from those aged 31-60 years. Also, the level of psychological distress was found different among MLS having different education levels (p-value < 0.001). (Table 4)

Table 3 Psychological distress among participants during COVID-19 outbreak (N = 301)

| Questions | Category | Frequency (N) | Percentage (%) |
|---|---|---|---|
| **Change in sleep disorder** | Yes | 61 | 20.26 |
| | No | 240 | 79.73 |
| **Feeling sad or down or depressed** | Yes | 78 | 25.91 |
| | No | 233 | 77.40 |
| **Felling anxious** | Yes | 51 | 16.94 |
| | No | 250 | 83.05 |
| **Panic disorder** | Yes | 36 | 11.96 |
| | No | 265 | 88.03 |
| **Significant tiredness, low energy** | Yes | 61 | 20.26 |
| | No | 240 | 79.73 |
| **Mood changes** | Yes | 83 | 27.57 |
| | No | 218 | 72.42 |
| **Excessive anger, hostility or violence** | Yes | 27 | 8.97 |
| | No | 274 | 91.02 |
| **Excessive fears or worries, or extreme feelings of guilt** | Yes | 49 | 16.27 |
| | No | 252 | 83.72 |
| **Inability to cope with daily problems or stress** | Yes | 61 | 20.26 |
| | No | 240 | 79.73 |
| **Major changes in eating/drinking/smoking** | Yes | 30 | 9.96 |
| | No | 271 | 90.03 |
| **Confused thinking or reduced ability to concentrate** | Yes | 46 | 15.28 |
| | No | 255 | 84.71 |
| **Trouble understanding and relating to situations and to people** | Yes | 60 | 19.93 |
| | No | 241 | 80.06 |

Table 4 Association of psychological distress with socio-demographic characteristics of study participants

| Variable | Categories | Psychological distress | | | | |
|---|---|---|---|---|---|---|
| | | n | Low (n = 97) | Moderate (n = 79) | High (n = 125) | p-value |
| **Working province** | Province 1 | 22 (7.3) | 9 (40.9) | 6 (27.3) | 7 (31.8) | 0.508 |
| | Province 2 | 21 (7) | 5 (23.8) | 7 (33.3) | 9 (42.9) | |
| | Bagmati | 193 (64.2) | 57 (29.5) | 45 (23.3) | 91 (47.2) | |
| | Gandaki | 17 (5.6) | 8 (47.1) | 4 (23.5) | 5 (29.4) | |
| | Lumbini | 26 (8.6) | 10 (38.5) | 10 (38.5) | 6 (23) | |
| | Province 6 | 7 (2.3) | 3 (42.9) | 2 (28.6) | 2 (28.6) | |
| | Far west | 15 (5) | 5 (33.3) | 5 (33.3) | 5 (33.3) | |
| **Gender** | Female | 121 (40.2) | 33 (27.3) | 31 (25.6) | 57 (47.1) | 0.872 |
| | Male | 180 (59.8) | 64 (35.6) | 48 (26.7) | 68 (37.8) | |
| **Age (Years)** | 18-30 | 201 (66.8) | 56 (27.9) | 52 (25.9) | 93 (46.3) | **0.032** |
| | 31-60 | 100 (33.2) | 41 (41) | 27 (27) | 32 (32) | |
| **Education level** | Master and higher education | 47 (15.6) | 30 (63.8) | 10 (21.3) | 7 (14.9) | **<0.001** |
| | Bachelor in Lab Technology | 127 (42.2) | 33 (25.9) | 39 (30.7) | 55 (43.3) | |
| | PCL in Lab Technology | 102 (33.9) | 27 (26.5) | 21 (20.6) | 54 (52.9.) | |
| | Lab assistant | 25 (8.3) | 7 (28 ) | 9 (36) | 9 (36) | |
| **Working place** | Government institution | 104 (34.5) | 35 (33.6) | 23 (22.1) | 46 (44.2) | 0.115 |
| | Private clinic/hospital | 173 (57.5) | 54 (31.2) | 47 (27.2) | 72 (41.6) | |
| | Unemployed | 24 (8) | 8 (31.2) | 9 (27.2) | 7 (41.6) | |
| **Work experience** | < 1 year | 57 (18.9) | 14 (24.6) | 16 (28.1) | 27 (47.4) | 0.6 |
| | 1-5 years | 120 (39.9) | 39 (32.5) | 33 (27.5) | 48 (40) | |
| | 5-10 years | 63 (20.9) | 19 (30.2) | 15 (23.8) | 29 (46) | |
| | >10 years | 61 (20.3) | 25 (41) | 15 (24.6) | 21 | |

| | |
|---|---|
| | (34.4) |

# Discussions

COVID-19 is relatively a new disease whose detailed pathogenesis is still to be known. The virus emerges and spreads throughout the globe with no bounds creating a pandemic situation. Within a very short period of time, the virus made devastating effects on the health of the world population. Though the WHO and several other national and international agencies are trying to educate the people around the world to fight against the pandemic by providing knowledge on several health topics related to COVID-19, they have not succeeded to end the pandemic so far [33, 34]. COVID-19 has been a challenge for all people including HCWs and medical laboratory personnel. MLS are among the front-line workers who deal directly with the infectious specimen putting their own health at risk to control the pandemic. The knowledge possessed by medical laboratory staff and their practices have important roles in the management of the pandemic as it helps in establishing prevention beliefs, forming positive attitude and behavior to fight the pandemic. Poor practice and poor knowledge among MLS can not only miss the infected cases but can make a failure of the entire health system of a nation in controlling the epidemic. In this regard, with this nationwide survey, we tried to assess the status of knowledge, practice and psychological behavior of medical laboratory personnel working in different laboratories of Nepal nearly after one year of COVID-19 outbreak. The study covers participants from all the geographical areas and administrative divisions of Nepal.

The data obtained in this study suggests that medical laboratory staff in Nepal have an overall satisfactory level of knowledge and practice behavior and moderate psychological distress during the pandemic. Our study revealed that MLS have satisfactory levels and similar knowledge by gender, province, education level, and work experience that is similar to a study from Bangladesh [35]. In contrast, a study by Ejeh et al reported the overall knowledge score as 7.1 out of 8 (88.75%) which is very much higher as compared to this study [36]. Our study also shows a significant difference in the level of knowledge among the different age-group (p value – 0.034). The medical laboratory staff belonging to the age-group 31–60 years had a higher level of knowledge in comparison to those belonging to the age-groups' 18–30 years. Likewise, a higher number of medical laboratory personnel working in government institutions were found to have higher knowledge than those working in private institutions. Maturity and development of consciousness with age groups may be the reason for higher level of knowledge in the 31–60 years' age group in our study. Similarly, more opportunities for training and sufficient orientation in government institutions might be the reason for higher levels of knowledge among medical laboratory staff working in government institutions.

Knowledge and practice score when calculated for every participant shows that the average number of medical laboratory staff in Nepal has good knowledge (37.2%) and practice behavior (42.2%). A study from China reflects sufficient knowledge in 89% and correct practices in 89.7% of HCWs, which is much higher than that from our study [15]. Likewise, other studies from Vietnam (88.4%) and Pakistan (56.56%) also reported sufficient knowledge in a higher number of HCWs [36, 37]. A comparatively lower proportion of medical laboratory staff showing good knowledge and practice in Nepal might be due to the weak information flow system in the country. Lack of sufficient orientation and regular training facilities to the laboratory professionals might be the other reason for only the satisfactory level of knowledge and practice among MLS.

This survey also reported that a higher number of medical laboratory personnel (67.8%) have one or more symptoms of psychological distress. The highest number of them, 83 (27.57%) showed mood change while the least of them, 27 (8.97%) showed feelings of excessive anger or violence. The data obtained in this study is a little higher than a similar study conducted in Nepal among general populations that shows 49.9% of people have at least one symptom of psychological distress [38]. Our study showed 16.94% of MLS have anxiety during the pandemic, which is similar to the findings of Chew et al who reported 15.7% anxiety among HCWs in a multinational study and, very much lower than the study by Giusti et al that reported anxiety in 71.2% of health professionals [39, 40]. The finding of this study is also in accordance with the study by Chen et al that records 18.1% anxiety among pediatric medical staff members [41]. This study also accounts for 25.91% of depressive symptoms among MLS that is similar to a study carried out in China [23]. A longitudinal study in China has further argued that there is no significant change in the level of psychological distress over the period of time during the pandemic [42]. The variation in data among different studies might be due to different level of services and facilities available in different countries. The data may be used by the policy makers to formulate psychological interventions for improvement in the mental health of HCWs during the COVID-19 epidemic. One way for psychological intervention among MLS can be the approach of Internet Cognitive Behavioral Therapy (I-CBT) that uses online based platform to manage psychological symptoms [43]. This method may be an effective way to minimize the level of psychological distress among HCWs in current situation where effort is being made to curb the spread of COVID-19 that may result from face-to-face contact [19, 43].

The strength of the survey is that it is a nation-wide study including MLS from all the provinces, the results of which can be generalized throughout Nepal. However, as the study used an online-based Google doc platform to collect the sample, there are some limitations. The study is prone to have selection bias and information bias on the respondent’s side. Since we used convenience sampling techniques through the networks of the researchers and disseminated through different social media platforms such as, WhatsApp, Facebook, Twitter, etc., there is a possibility of bias as underprivileged populations may not have been able to participate in the study. Biased may also be subjected to participants' honesty and recall ability as the questions are self-reported. The survey was conducted only on medical laboratory staff from a medical background; however, there are some staff working from other non-medical fields in clinical laboratories, so the results may not be generalizable to other non-medical laboratory workers. Finally, no standardized tool for pretest assessing knowledge, practice and psychological distress on COVID-19 has been previously validated. Also, the study used self-reported questionnaires to measure psychiatric symptoms and did not make clinical diagnosis. The gold standard for establishing psychiatric diagnosis involves structured clinical interview and functional neuroimaging diagnosis that the study has not adopted [44, 45].

# Conclusion And Recommendations

We concluded that medical laboratory staff in Nepal has an overall satisfactory level of knowledge and practice behavior and, moderate level of psychological distress related to COVID-19. They have satisfactory knowledge of the basic information about COVID-19, its symptoms and transmission. They also have average knowledge on the topics related to the diagnosis of COVID-19 cases such as, sample collection, handling, transportation, processing and storage. A higher number of them are competent to produce quality reports and adopt prevention practices to minimize the risk of infection. However, there are a lot more differences in the level of knowledge and practice among medical laboratory staff in Nepal when compared to those of foreign nation.

The study recommends that the government should further strengthen the information flow system among HCWs including medical laboratory staff and manage regular orientation and training for the new protocol for diagnosis and management of the disease. Furthermore, social security policy and psychological support seems important to be implemented by the government among health care workers dealing with infectious diseases.

# Abbreviations

***COVID-19:*** Coronavirus Disease - 2019

***MLS:*** Medical Laboratory Staff

***MCO:*** Movement Control Order

***HCW:*** Health Care Worker

***PPE:*** Personal Protective Equipment

***CI:*** Confidence Interval

***ERB:*** Ethical Review Board

***RDT:*** Rapid Diagnostic Test

***RT-PCR:*** Reverse Transcription – Polymerase Chain Reactions

# Declarations


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Not applicable

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We have not received any kinds of funding for completion of this study.


### Competing Interest

The authors declare that they have no competing interests.

### Ethical approval and Consent to participate

Formal ethical approval was granted by the Ethical Review Committee of Nepal Health Research Council, (Ref: 1771) before carrying out this study. Informed consents from participants were obtained online before participating in the survey after presenting them with the aims, nature, and purpose of the study. The study was conducted in accordance with the Declaration of Helsinki. Participants who gave their willingness to participate in this survey had to click ‘yes’ on the answer to the question “Do you want to participate in this survey?” after which only they were administered to a set of questions. Anonymity and confidentiality of the data were strictly maintained.

### Consent for Publication

Not applicable

### Availability of data and material

Data of this study will be made available to the concerned person upon request

### Code availability

Not applicable

### Authors' Contributions

All the authors made substantial contribution to this work. BBB and DS drafted the proposal. BBB, DS, RP, SK and SKM collected data. TBB and RP helped in statistical analysis of the data. BBB, RP and TBB wrote the manuscript that was guided by SKM and SK. All the authors finally read the manuscript and agreed for submission.

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