Knowledge, practice and psychological symptoms among medical laboratory staff during COVID-19 pandemic in Nepal: An online based survey

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Abstract

Introduction: Despite several attempts to control COVID-19, there was a continuous rise in the number of cases, and this has left questions unanswered on the availability of health resources in Nepal. Here, we tried to assess the level of knowledge, practice and psychological symptoms among medical laboratory staff.

Methods: An online survey was conducted in February 2021. A total of 301 completely filled responses were used to assess knowledge, practice and psychological distress. R-language software was used for data analysis 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.

Conclusion: We conclude that medical laboratory staff in Nepal has satisfactory levels of knowledge and practice and, larger number of them has psychological distress. The study recommends further improvement in an effective information flow system, regular training, social security and psychological support.

Keywords
knowledge, practice, psychology, COVID-19, laboratory, healthcare, frontline

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1. **What do we already know about this topic?**

   Knowledge, Good laboratory practice and Psychological distress are important factors for healthcare workers in order to prevent themselves from getting infected and also to prevent its transmission.

2. **How does your research contribute to the field?**

   The article adds information about the level of knowledge, laboratory practice behaviours and psychological distress symptoms associated with medical laboratory staff during the COVID-19 pandemic.

3. **What are your research's implications towards theory, practice, or policy?**

   The finding of this research can be utilized to reform the policy in order to protect mental health and effective management of the future pandemic.

Introduction

The emergence of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has threatened millions of lives and plagued every industry in the world. The highly contagious SARS-CoV-2 was first detected in December 2019 in Wuhan, China.[1,2] SARS-CoV-2 is the third outbreak of Coronavirus in the 21st century after the outbreak of severe acute respiratory syndrome coronavirus (SARS-CoV) in China in 2002, and the Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in 2012 in Saudi Arabia.[1,3] In response to this difficult situation, the World Health Organization (WHO) declared COVID-19 as a public health emergency of international concern on 30th January and pandemic on 11th March 2020.[4] Originating from Wuhan, China, the virus quickly spread to the different parts of the globe afflicting more than 220 countries.[5] Several attempts have been made to control the pandemic situation but the virus continues to infect people around the world. As of February 3, 2022, over 385 million of the population had been infected with COVID-19, and around 5 million deaths have been reported globally.[6] In Nepal, more than 962,000 people have been infected with COVID-19 as of February 3, 2022.[7] This scenario has led us to concern over a very critical issue related to national capacity and health systems to tackle the crisis like the COVID-19 pandemic.

Laboratory plays a vital role in controlling the pandemic like COVID-19 as it helps in case identification and halts the process of virus transmission. There were a minimal number of molecular laboratories for COVID-19 Polymerase Chain Reaction (PCR) testing inside the country before the pandemic outbreak. However, by now, the government has set up more than 80 PCR laboratories across the country with the help of a public-private partnership.[6] Setting up a molecular laboratory not only requires a well-managed infrastructure but also well-trained and educated human resources. The quality of laboratory reports depends on knowledge possessed by a laboratory staff and their practice behaviour. Likewise, mental wellbeing of a medical laboratory staff (MLS) is also related to the good laboratory practice according to Wang et al.[8] In many cases, the lack of knowledge and good laboratory practice may potentially put the staff at risk and also compromise the quality of laboratory reports.[9]

Medical laboratory staff face a substantially high risk of infection and death due to excessive COVID-19 exposure at different stages of the laboratory procedure from collection of samples to the dispatch of reports.[10,11] In case of Health Care Workers (HCWs), it is estimated that the risk could account for 10–20% of all diagnoses.[12] Since HCWs have a greater chance of exposure, they also fear infecting their loved ones and children. This imbalance between professionalism, altruism and fear give rise to psychological distress.[13] Studies suggested that HCWs had the psychological symptoms of anxiety and depression due to the COVID-19 pandemic.[14–16] The literature on the health consequences of HCWs providing care to COVID-19 patients is increasing. However, the limited study is available on knowledge, practice and physiological impact of COVID-19 among MLSs.[8,17] In this scenario, we designed this survey for medical laboratory staff working in Nepal with two central objectives; (1) to assess the level of knowledge and laboratory practice for diagnosing COVID-19 cases and (2) to determine the level of psychological distress arising due to the pandemic.

Methods

Study design

We conducted a cross-sectional survey in 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 15th February 2021. 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). The total MLS population of Nepal is around thirty thousand, which is less than 1% of the total population of Nepal.[18,19] Assuming 20% of the MLS population with adequate knowledge and practice behaviour, the sample size was 246 at a 95% Confidence Interval and 5% margin of error.[20] Among the total 350 responses collected between the period of two weeks (15th February 2021 to 28th February 2021), some duplicate responses, incompletely filled responses and responses filled by non-medical laboratory staff was excluded from the study. In total, we got 301 completely filled responses which were included in our analysis. The call for study participants was made via social media such as Facebook, Messenger, WhatsApp, Viber, WeChat and Emails. To enroll in this study, the participants 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 better 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 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 and were divided into four 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 a basic understanding of COVID-19, symptoms, transmission, fatality, sample collection, transportation, storage and laboratory diagnosis of COVID-19. Likewise, four questions were asked to know whether medical laboratory staff follows good laboratory practice. Finally, the psychological impact of COVID-19 was measured using 12 Yes/No questions 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.[21–23]

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 so 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 the third tertile were considered low, moderate and high psychological distress.

Data analysis

Data were summarized using Microsoft Excel 2019 and analysed 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. A p-value less than 0.05 was considered statistically significant. In addition, binary and multiple logistic regression analyses 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 highest number of respondents who participated in this study had a Bachelor degree (42.2%) followed by Diploma (Proficiency Certificate Level), a Master or above, and Lab assistant degree. The majority had work experience of 1–5 years. (Table 1)

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. Participants in age-group 31–60 years had a higher level of knowledge than those of 18–30 years' age-group (p-value – 0.034). (Table 2) The mean knowledge score when calculated for every participant and divided into tertiles categorizing them as poor, satisfactory and good accordingly revealed a higher number of participants, 112 (37.2%), with good knowledge followed by satisfactory knowledge, 95 (31.6%), and poor knowledge, 94 (31.2%). Binary and multiple regression analyses among different knowledge categories and study variables did not show any significant association. (Supplementary Table A)

Among the eleven subheadings of knowledge asked to the participants, knowledge regarding the basics of COVID-19 and clinical symptoms were found significantly linked to some demographic variables. Basic knowledge about COVID-19 was significantly different among different age groups (p-value – 0.004) and education levels (p-value – 0.044).

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	5.7
	Lumbini	26	8.6
	Province 6	7	2.3
	Far west	15	5.0
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

Table 2. Relationship of demographic characteristics with knowledge and practice.

Variable	Categories	Number of participants, n (%)	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		

Similarly, knowledge regarding clinical symptoms of COVID-19 was significantly different among different age groups (p-value – 0.001), working institutions (p-value – 0.001) and work experiences (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 level of knowledge. (Supplementary Table B)

Practice assessment

Laboratory practice was measured using four questions, each carrying one point. The average practice score obtained in this study was 2.25 ± 0.91, which lies in the second tertile on a 4-point scale suggesting satisfactory laboratory practice. Practice score when compared between different variables in this study found no significant difference. (Table 2) In addition, practice score was also calculated for every participant that shows a good practice, 127 (42.2%) by a higher number of medical laboratory staff followed by satisfactory practice, 113 (37.5%) and poor practice, 61 (20.3%). (Supplementary Table A)

Psychology assessment

Of the 12 questions asked regarding psychological distress, the mean score obtained was 2.2 ± 2, which lies in the second quartile suggesting a moderate level of psychological distress. 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 a higher number (41.5%) had more than one symptom of psychological distress. Mood change was observed in the highest number of participants while feeling excessive anger or violence in the least number of medical laboratory staff. (Table 3) Psychological distress in medical laboratory staff was found significantly associated with age groups (p-value – 0.032) and education levels (p-value < 0.001) in this study. (Table 4)

Discussion

The SARS-CoV-2 emerged and spread throughout the globe with no bounds creating a pandemic situation. Within a very short period, the virus had devastating effects on the world population's health. Though the WHO and several other national and international agencies are trying to educate the people worldwide to fight against the pandemic by providing knowledge on several health topics related to COVID-19, they have not succeeded in ending the pandemic so far.[24,25] COVID-19 has been a challenge for everyone, including HCWs and medical laboratory personnel. MLS are among the frontline 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 has important roles in managing the pandemic as it helps to establish prevention beliefs, inculcating positive attitudes and behaviour to fight the pandemic.

This study suggests that medical laboratory staff in Nepal have an overall satisfactory level of knowledge and practice behaviour, and moderate psychological distress during the pandemic. The data revealed that MLS has satisfactory levels and similar knowledge by gender, province, education level and work experience similar to a study from Bangladesh.[26] However, a survey by Ejeh et al. reported the overall knowledge score as 7.1 out of 8 (88.75%), which is much higher as compared to this study.[27] Our analysis 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 than those belonging to the age group 18–30 years which may be due to maturity and development of consciousness with increasing age of participants. Likewise, a relatively greater number of medical laboratory personnel working in government institutions were found to have higher level of knowledge than those working in private institutions. This may be due to more opportunities for training and sufficient orientation in government institutions.

When calculated for every participant, Nepalese medical laboratory staff showed good knowledge in 37.2% and good practice behaviour in 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.[9] Likewise, other studies from Vietnam (88.4%) and Pakistan (56.56%) also reported sufficient knowledge in a higher number of HCWs.[27,28] 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 another reason for only the satisfactory level of knowledge and practice among MLS.

The survey also reported a higher number of medical laboratory personnel (67.8%) having one or more symptoms of psychological distress, which is comparable to the study by Kafle et al. in Nepal.[29] 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, which shows 49.9% of people have at least one symptom of psychological distress.[30] 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. and Almalki et al. that reported anxiety in 71.2% and 60.88% of health professionals, respectively.[16,31,32] The

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	223	74.09
Feeling 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 people	Yes	60	19.93
	No	241	80.06

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

Variable	Categories	n	Psychological distress			p-value
			Low (n = 97)	Moderate (n = 79)	High (n = 125)	
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)	

finding of this study is also in accordance to the study by Chen et al. that records 18.1% anxiety among paediatric medical staff members.[33] This study also accounts for 25.91% of depressive symptoms among MLS, similar to a study carried out in China.[14] The variation in data among different studies might be due to disparity in services and facilities available in different countries.

These data are important because policy makers may use it 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 the online-based platform to manage psychological symptoms.[34] This method may be an effective way to minimize the level of psychological distress among HCWs in the current situation where effort is being made to curb the spread of COVID-19 that may result from face-to-face contact.[13,34]

Limitations

The strength of the survey is that it is a nationwide study including MLS from all the provinces, which can be generalized throughout Nepal. However, as the study used an online-based Google Docs platform to collect the sample, there are some limitations too besides measuring practice through online questionnaire. First, 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 and Twitter, there is a possibility of bias as underprivileged populations may not have been able to participate in the study. Second, the survey was conducted only on medical laboratory staff from a medical background; however, some staff works from other non-medical fields in clinical laboratories, so the results may not be generalizable to other non-medical laboratory workers. In addition, the study used self-reported questionnaires to measure psychiatric symptoms without making a clinical diagnosis based on structured clinical interviews and functional neuroimaging.[35,36]

Conclusion and Recommendations

We concluded that medical laboratory staff in Nepal had an overall satisfactory level of knowledge and practice behaviour related to COVID-19. However, it is still showing a need for more information and good practice behaviour despite several attempts from Nepal Government. They had satisfactory knowledge on the basic information about COVID-19, its symptoms and transmission, and average knowledge on the topics related to the diagnosis of COVID-19 cases such as sample collection, handling, transportation, processing and storage. Their preparedness for producing quality report and adopting prevention practices to minimize the risk of infection was encouraging in some aspect. The medical laboratory staff also had moderate level of psychological distress that further indicates the need for improvement in prevention practice and social security policy inside the country.

The study recommends the policy makers in Nepal to 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 future outbreak. Furthermore, social security policy and psychological support seem important and need to be implemented among health care workers dealing with infectious diseases.

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.

Declaration of Conflicting Interests

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Author's Note

The datasets generated during and/or analyzed during the current study can be made available from the corresponding author on reasonable request

Ethical approval

Formal ethical approval was granted by the Ethical Review Committee of Nepal Health Research Council, (Ref: 1771) before carrying out this study.

Informed consent

Informed consent from participants was 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.

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Supplemental Material

Supplemental material for this article is available online.

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Appendix

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.