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## Knowledge, attitude and perception of COVID-19 among Orthopaedic surgeons

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### Abstract

**Introduction:** COVID-19 has a long incubation period, is highly contagious but lacks definite cure. It has evolved into a pandemic resulting in global outcry. Preventive measures include hand washing or sanitization, maintaining social distance, face mask, quarantine etc. Orthopaedic surgeons are considered a high-risk group, due to the aerosol generating procedures (AGPs) they need to perform. A good knowledge and attitude are essential to prevent the contraction and spread of the virus.

**Method:** This is a cross-sectional descriptive study done in the form of online survey via e-mail among the registered Orthopaedic surgeons of Nepal. A four-point Likert scale was used for single option answer. Ethical approval was obtained. Descriptive analysis of data was performed by Microsoft Excel.

**Result:** Out of 123 responses, on the main issues regarding hand washing, social distancing and face masks, majority (>85%) of the Orthopaedicians had a good knowledge and attitude. Around 14% disagreed on Orthopaedic surgeries being AGPs. Majority (>90%) had a positive perception about implementation of preventive measures. More than 90% of the respondents believed that hospital meetings/teaching learning activities/presentations can be effectively conducted through virtual platforms.

**Conclusion:** Study found that most Orthopaedic surgeons have good knowledge and attitude regarding COVID-19. Importance of hand hygiene, social distancing, surgical mask, and well-ventilated rooms were well understood. Most perceived AGPs is a high risk procedure. Study found need of awareness on doffing of PPE. Online platforms were felt effective for most meetings and clinical consultations.

**Keywords:** aerosol generating procedures (AGPs), attitude knowledge perception, COVID-19, Orthopaedic surgeon, SARS-CoV-2

## Introduction

Corona Virus Disease-19 (COVID-19) was declared a pandemic of public health concern globally by WHO in February 2020.<sup>1</sup> Reasons for its rapid spread are attributable to highly contagious nature, asymptomatic carriers and inadequate precautionary measures.<sup>2</sup>

Orthopaedic surgeons are at high risk due to aerosol generating procedures (AGPs) during surgery, as was also shown by findings from Wuhan, China.<sup>2,3</sup>

This study will enable us to better understand the local perspective of Orthopaedicians while dealing with COVID-19. The data thus generated may identify the need of intervention, if any, and provide a basis for recommendation for managing Orthopaedic cases during current COVID-19 outbreak.

## Method

This cross-sectional survey among registered Orthopaedic surgeons in Nepal was conducted to find out the level of understanding of COVID-19. Ethical approval was obtained from Institutional Review Committee – Patan Academy of Health Sciences (IRC-PAHS). E-mail addresses of all Orthopaedic surgeons registered in Nepal Orthopaedic Association (NOA) till May 25, 2020 was obtained with the permission from the general secretary of NOA. The questionnaire regarding Knowledge, Attitude and Perception, in a four-point Likert scale, was circulated in google form via email. Reminder emails were sent on the fourth and seventh day. The survey was closed after 10 days. The participation was voluntary. A brief information on aim and objective of the study was included in the google form, and only those who agreed to participate could move further in the questionnaire. This was taken as consent for the study. The option in google form for limiting only one response per respondent was selected to eliminate the possibility of duplicate entry. The reply was saved in Microsoft Excel spreadsheet for analysis.

## Result

Out of over 400 emails sent out, over 50 email addresses were unreachable (undelivered). Total 123 completed the survey, a response rate of 35.14% (123/350).

Except for five (4.1%) respondents, all agreed that COVID-19 has a long incubation period. On the importance of hand hygiene 100 (81%) strongly agreed, and 23 (19%) agreed and none disagreed. On social distancing of two meters, 68 (55.3%) strongly agreed, 53 (43.1%) agreed, 2 (1.6%) disagreed.

Most (80-90%) agreed that reaming, drilling, burring, pulsatile lavage and use of electrocautery are AGPs, and are potential sources of transmission, Figure 1.

On the role of surgical mask in prevention of SARS-CoV-2 transmission, 28 (22.8%) strongly agreed, and 75 (61%) agreed. On Polymerase Chain Reaction (PCR), 84 (68.3%) strongly believed that positive cases are highly contagious. For rapid diagnostic test (RDT) 86 (69.9%) believed that positive cases can transmit the virus. On importance of Personal Protective Equipment (PPE) for PCR positive cases 111 (90.2%) strongly agreed. The possibility of transmission of the virus during the doffing process 64 (52%) strongly agreed, Table 1.

On AGPs, 14 (11.4%) strongly agreed not to use power instruments, and 29 (23.6) strongly agreed not to use pulsatile lavage. On performing elective surgeries during the pandemic 49 (39.8%) strongly disagreed, and 31 (25.2%) strongly agreed for requirement of PCR prior to fracture fixation surgeries. To conduct OPD services 25 (20.3%) strongly agreed for need of proper mask by both the patients and the surgeons. Regular activities of conducting teaching learning activities, handover, morning conference, case discussion in the departmental room 4 (3.3%) strongly agreed. After returning from work, 41 (33.3%) would hang the jacket outside, 64 (52%) wash clothes, 86 (69.9%) shower and

change to fresh pair of clothes before meeting family members, Table 2.

Orthopaedic surgeons as a high-risk group was strongly agreed by 67 (54.5%), and 109 (88.6%) for need of COVID-19 related history. Seventy (56.9%) did not agree that Orthopaedic procedures can lead to virus transmission, and 18 (14.6%) strongly agreed to postpone surgery for up to 2 weeks till it is safer. Seventy-one (57.7%) strongly agreed that

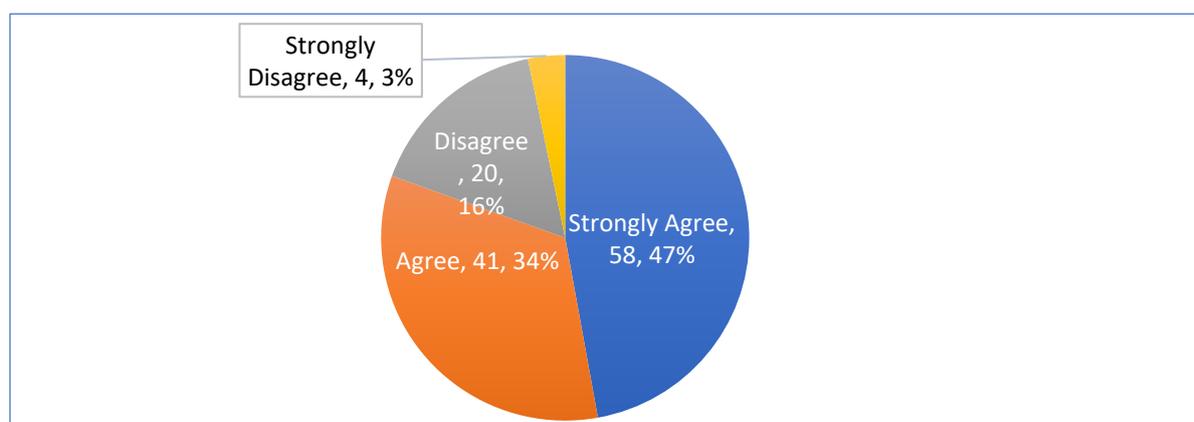
online meetings are safe during pandemic. Eighty (65%) strongly agreed on need of a well ventilated COVID-19 operation room and 91 (74%) on adequate disinfection of the instruments after use for COVID-19 patients, Table 3.

Twenty-two (17.9%) strongly agreed for need of antibacterial soap to wash hands, and 12 (9.8%) strongly disagreed, Figure 2.

**Table 1. Knowledge on COVID-19 amongst Orthopaedic surgeons (N=123)**

SN	Questions	1*	2*	3*	4*
K1	COVID-19 is characterized by long incubation period, easy transmission, and large number of asymptomatic carriers.	87	31	5	0
K2	Hand hygiene (hand washing/sanitizing) is one of the most important measures in preventing COVID-19 transmission.	100	23	0	0
K3	Social distancing of 2 meters (6 feet) helps prevent COVID-19 transmission.	68	53	2	0
K4	Orthopaedic procedures like drilling, reaming, burring, hammering are Aerosol Generating Procedures.	84	22	13	4
K5	Electrocautery produces aerosol.	51	50	18	4
K6	Pulsed irrigation can produce aerosol.	58	51	11	3
K7	Corona virus can be contracted via aerosol generated from blood and other body fluids.	58	41	20	4
K8	Surgical mask can protect COVID-19 from infection through airway.	28	75	15	5
K9	Ideally surgical mask should be changed every four hours and N95 mask should be changed every six hours to ensure protection from COVID infection.	24	77	21	1
K10	RDT positive cases can transmit COVID infection.	12	86	24	1
K11	PCR positive from samples taken within a week of infection is highly suggestive of possible source of transmission.	84	33	4	2
K12	For suspicious and PCR positive cases, it is mandatory to put on PPE during surgical procedures.	111	9	3	0
K13	During the doffing of PPE, COVID-19 pathogens can be transferred from the PPE to the bodies of healthcare workers (HCWs), putting HCWs and patients at risk of exposure and infection.	64	53	6	0

\*1: Strongly Agree; 2. Agree; 3. Disagree; 4. Strongly Disagree

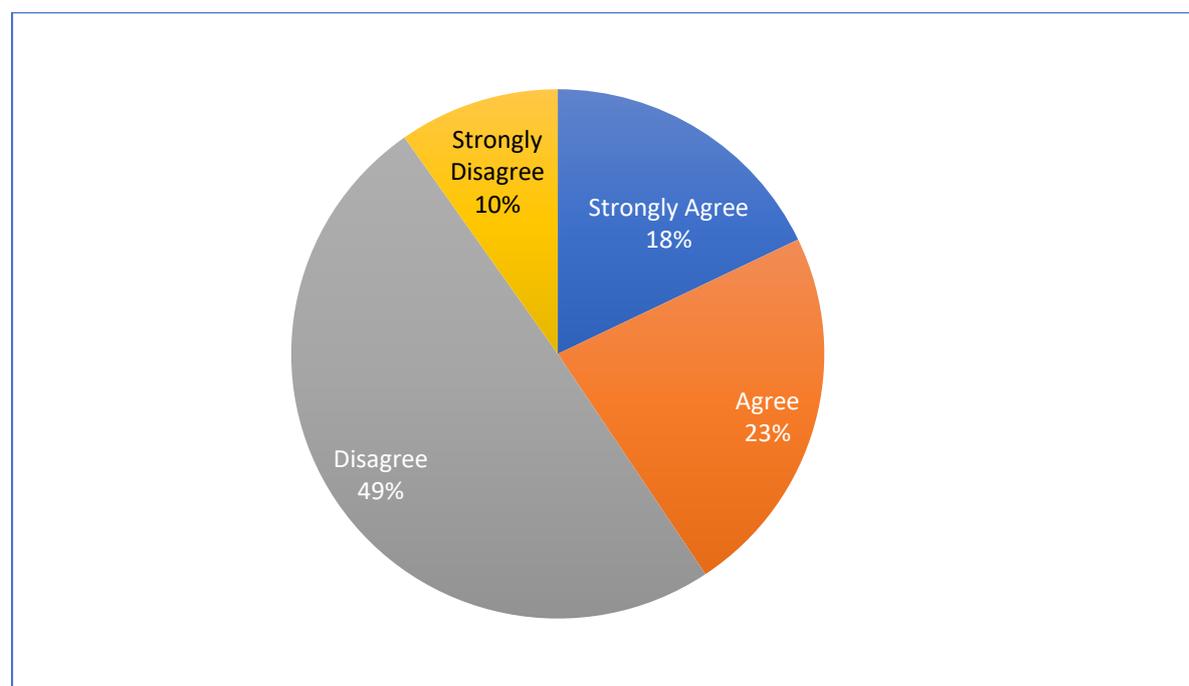


**Figure 1. Response of survey amongst Orthopaedic surgeons (N=123) on SARS-Cov-2 contraction via aerosol generating procedures (AGPs)**

**Table 2. Attitude on COVID-19 amongst Orthopaedic Surgeons (N=123)**

SN	Questions	1*	2*	3*	4*
A1	While applying an external fixator for open fracture in a COVID patient, I will operate normally in an emergency setup.	4	17	33	69
A2	While applying an external fixator for open fracture in a COVID patient, I will operate with full PPE in an emergency setup.	86	23	11	3
A3	I would perform high risk/positive cases in a dedicated Operation Room.	94	18	10	1
A4	For a COVID positive patient, I will NOT use power instruments.	14	71	34	4
A5	For a COVID positive patient, I will NOT use electrocautery whenever possible.	27	66	23	7
A6	For a COVID positive patient, I will NOT use pulsatile lavage/jet irrigation.	29	73	18	3
A7	During the current pandemic, I would perform elective Orthopaedic surgeries as usual.	3	12	59	49
A8	For a fracture fixation, I will request a PCR irrespective of his/her symptoms of COVID and travel/contact history.	31	25	62	5
A9	I feel safe to see a patient in Orthopaedic OPD with a surgical mask by both patient and myself.	25	83	12	3
A10	I feel safe to conduct teaching learning activities/handover/morning conference/case discussion in the departmental room in a regular fashion.	4	14	63	42
A11	I hang the outer coat or jacket outside the main door or window to reduce the chance of contamination to others.	41	67	15	0
A12	I wash all my clothes immediately upon arrival from the hospital.	64	38	21	0
A13	When I go back home from hospital, I routinely take a shower and change to fresh clothes before coming in contact with others.	86	34	3	0

\*1: Strongly Agree; 2. Agree; 3. Disagree; 4. Strongly Disagree

**Figure 2. Response of survey of Orthopaedic surgeons' (N=123) perception about need of antibacterial soap**

**Table 3. Perception on COVID-19 amongst Orthopaedic surgeons (N=123)**

SN	Questions	1*	2*	3*	4*
P1	I feel that Orthopaedic surgeons are at risk during this COVID-19 pandemic.	67	54	1	1
P2	I feel that all patients undergoing Orthopaedic surgery procedures should be asked about their personal history over the past 14 days with regard to symptoms such as fever, cough, shortness of breath, respiratory disturbances, pneumonia of uncertain cause, and contact with a person positive for COVID-19 or person from endemic area.	109	14	0	0
P3	For patients with high-risk of COVID infection needing urgent surgery during COVID-19 pandemic, routine screening with a polymerase chain reaction (PCR) test is mandatory, within 24 hours before surgery.	79	19	20	5
P4	All elective Orthopaedic procedures should be delayed or rescheduled till the pandemic is more or less contained.	40	69	10	4
P5	I feel that COVID-19 is transmitted by touching an infected person/contaminated surface.	42	62	16	3
P6	I feel that COVID-19 cannot be transmitted by Orthopaedic procedure because it is a respiratory disease.	1	7	45	70
P7	I feel that by maintaining a social distancing measure of 2 meters, I feel safe to conduct ward rounds in general Orthopaedic ward and conduct regular OPD.	6	91	24	2
P8	I feel that teaching learning activities and/or case discussions/presentations of the hospital can be conducted effectively via webinars/virtual meetings.	65	52	5	1
P9	I feel that prevention of COVID infection we need antibacterial soap to wash our hands during ward rounds.	22	28	61	12
P10	Treatment of most fractures, which are not urgent, can be delayed for up to fourteen days to reduce the transmission of COVID-19 infection.	18	80	20	5
P11	Consultation via telemedicine is appropriate for most follow up cases during this pandemic.	71	46	5	1
P12	A well ventilated dedicated COVID operation theater is essential to decrease viral load of aerosol.	80	37	5	1
P13	All instruments and devices should be disinfected separately followed by proper labeling.	91	31	1	0

\*1: Strongly Agree; 2. Agree; 3. Disagree; 4. Strongly Disagree

## Discussion

The survey found that over 95% of Orthopedic surgeons surveyed agreed about long incubation period, easy transmission, and asymptomatic carriers of coronavirus. Common consensus for incubation period of COVID-19 is between 2 to 14 days.<sup>1</sup> There are evidences of initially asymptomatic PCR positive patients becoming symptomatic a week later.<sup>4</sup>

With 100% agreement, Orthopaedicians in Nepal reaffirms hand hygiene is one of the

important measures in prevention from self-contraction and in minimizing transmission. Studies have proven that hand washing with soap water for 20 seconds or use of alcohol based sanitizers can reduce the chances of virus transmission significantly.<sup>5</sup> Soap can achieve this goal via inactivation of the virus by its action on the lipid layer and cleansing action by lowering the surface tension of water. Anti-bacterial ingredients in a soap has no additional role against the virus.<sup>6</sup>

Several measures like social distancing, hand hygiene, disinfecting contaminated/

frequently touched surfaces and to cover mouth and nose while in contact with other people, have been advocated for minimizing contamination and spread of viral infection.<sup>7</sup> The strict disinfection protocol also holds true for equipment and instruments used for infected or suspected cases.

Study found that vast majority (98.4%) of respondents agreed on the importance of social distancing in prevention of COVID-19 transmission. Majority (83.8%) agree that infection can be prevented with the use of surgical mask. It is believed that when a person sneezes or coughs, droplets are released into the air which then adheres to the mouth and nose of people within 2 meters (6 feet). The person, if infected, can generate aerosol loaded with virus that can be transmitted if inhaled by people in the vicinity.<sup>8,9</sup> Reports have shown that social distancing is one of the major strategies which is highly effective in breaking the chain of transmission of SARS-CoV-2 virus.<sup>10</sup>

In the initial phase of the pandemic, the importance of face mask had been downplayed by WHO which was reflected in the guidelines of various countries.<sup>11</sup> With studies proving the effectiveness of surgical mask by the two parties involved in significantly reducing the virus transmission, it has been adopted by WHO in the later guidelines.<sup>12</sup> WHO has provided the specifications for both medical and non-medical masks and their uses for different occasions.<sup>12,13</sup> Surgical mask possesses the quality to prevent contraction of infection at a reasonable cost, while N95 respirator is better but not practical for all the occasions. WHO has recommended N95 respirators to be used for the frontline health care workers in high risk areas who are at risk of contracting the virus.<sup>12</sup>

As a general rule, a disposable mask needs to be changed when it is soiled or torn and between procedures. However, when it is being used as a preventive measure, it can be worn for a longer period. The aerosol generated by respiration and saliva account for soiling of the mask rendering them less

effective against viral transmission. It has been recommended that surgical mask (three ply) should be changed every four hours whereas N95 masks should be changed every six hours.<sup>12,14</sup>

Majority (85%) of the respondents in this survey did not feel safe conducting activities related to gathering of people in a confined space. A similar proportion of the respondents (>85%) felt safe if they can conduct ward rounds and outpatient service with the use of mask and social distancing. Over 95% of Orthopaedicians believe that teaching learning activities can be conducted effectively via virtual meetings, and teleconsultation as appropriate means for most of follow-up cases during the pandemic. There are ongoing controversies regarding the transmission of SARS-CoV-2 virus via expiratory particles, including the size of the particle, duration of the aerosol floating in the air, virulence etc.<sup>15</sup> It has now been well documented that in a well ventilated room, the generated aerosol disperses after half an hour, whereby in a confined space the droplets can remain and diffuse throughout the room for a much longer period of time.<sup>15,16</sup> It is hence advisable not to gather in large numbers for any academic or non-academic purposes. With correct platform, sincerity among the participants, a good internet connection, and following good clinical practice, virtual meeting has been found to be as effective as, if not better than conventional meetings.<sup>17</sup> On the flip side, eye contact, direct interaction, etc. are compromised which, at times, are vital especially in cases related to decision making. Ethical and documentation issues need to be addressed for legal purposes as well.<sup>18</sup>

This is an interesting finding whereby 13.9% of the Orthopaedic surgeons disagreed on Orthopaedic procedures as AGPs and that they will still be using the instruments associated with it. Reaming, burring, hammering, drilling, use of electrocautery and pulsatile lavage are procedures which produce high concentration of aerosol that can disperse in an area of up to 6 meters.<sup>3</sup> Furthermore, it has been proven that aerosol generated from body fluids

contain SARS-CoV-2 virus which can be transmitted via nose, mouth or eyes when it is significant in quantity.<sup>3</sup> Around 40% of respondents disagreed that they would use power instruments while doing surgery for COVID-19 patients. The discrepancy between knowledge regarding AGPs and reluctance to NOT use power instruments for surgery may be due to the reliance of Orthopaedic surgeons on power instruments for most surgeries, including majority of trauma cases.

Studies from Wuhan, China, have shown increased number of Orthopaedic surgeons getting infected with COVID-19.<sup>2</sup> With little known about the mode of transmission other than from aerosol generated through the nasopharyngeal route, a strong possibility of transmission through aerosol generated from body fluids still remain. Orthopaedic surgeons are among the high-risk groups and strong precautionary measures should be undertaken to minimize the risk of transmission among the surgical team. A proper PPE is advisable during AGPs, especially on suspected or PCR positive cases.

Among the respondents, 44.6% would request a PCR test prior to fracture fixation irrespective of symptoms and/or travel/contact history while 55.4% disagreed. As per the guidelines by WHO and Ministry of Health and Population, Nepal, people from high risk zone, having contact with COVID-19 positive or suspected of having COVID-19 and those who are symptomatic will need to be prioritized for testing.<sup>19,20</sup> Hence, not everyone is subjected to PCR testing before semi-urgent or urgent surgery. Nonetheless ongoing pandemic strongly suggests that be it asymptomatic or pre-symptomatic, COVID-19 is highly contagious and appropriate measures must be taken to prevent its spread. More research has unfolded the nature of spread from completely asymptomatic patients. Hence, it is not completely wrong if either we rule out COVID-19 with a negative PCR result, or fracture fixation, which is a semi-urgent surgery, be delayed for up to 2 weeks before definitive fixation, so that even the asymptomatic patients get past their incubation period.<sup>21</sup> The

positive attitude towards the importance of PPE and dedicated COVID-19 operation theatre has been well demonstrated in the response. The role of well-ventilated operation theater dedicated for COVID-19 cases cannot be over emphasized in reducing accumulation of the aerosol generated during the procedure.

About 80% felt that RDT positive cases can transmit SARS-CoV-2 virus whereas 95% feel that it is more so with RT-PCR positive cases. RDTs are antibody tests, which hint towards SARS-CoV-2 infection in the past. After initial contact with the virus, IgM and IgG antibodies start being detectable after 4-5 days. About 70% of symptomatic patients test positive for IgM antibodies by days 8-14 and 90% of total antibody tests positive by days 11-24. It usually takes several weeks for IgG to reach >98%, but duration of this antibody response is not yet known.<sup>22</sup> The combined test kits which test for IgM and IgG lack both specificity and sensitivity and may not show positive until the second week of infection. Poor specificity may result in false sense of security.<sup>23</sup>

The RT-PCR can detect the virus in real time and is the gold standard for detecting active infection of COVID-19.<sup>22-24</sup> However, it is still possible for undetected negative ones to be contagious. SARS-CoV-2 virus has an incubation period of 2-14 days, and although PCR is most sensitive within 2-7 days of contact, possibility of transmission remains via asymptomatic carriers. Moreover, poor sampling technique, improper handling of samples and several other factors contribute to lowering the sensitivity of RT-PCR. However, its high specificity renders it as a vital tool in accurate diagnosis of SARS-CoV-2 infection.<sup>22</sup>

In Orthopedic surgery, AGPs are the chief mode of transmission of SARS-CoV-2, apart from through direct contact. Hence, in the lack of proper PCR testing, fracture surgeries of potentially asymptomatic carriers maybe delayed for up to two weeks for active infectious stage to be over.<sup>3,21,25,26</sup> If possible, it is advisable to perform PCR before any of the AGPs. A full PPE is mandatory for dealing with suspected or PCR positive cases.<sup>3,21</sup>

Study found 117 (95.2%) were aware that improper doffing of PPE after a procedure of COVID-19 case may transmit the virus in the form of aerosol. An improperly doffed PPE produces enough virus containing aerosol that can contaminate others in the room. A standard donning and doffing protocol has been advocated by WHO and followed by many governing bodies.<sup>27</sup>

About 12% of the respondents disagreed that they need to hang the jackets outside and about 17% disagreed that they wash their clothes as soon as they get back home from the hospital during this pandemic. However, 98% respondents agreed to shower and change in to fresh clothes before meeting family members. SARS-CoV-2 virus not only survives but maintains its infectivity on different surfaces, which ranges from one hour to four days. The duration of its survival in room temperature, and moist surfaces of metals, porous fabrics and plastic surfaces, are well documented.<sup>28-30</sup> To minimize the transmission, one should ideally wash the jacket every time (if feasible) or at least leave it outside the house in dry condition for a few hours. Clothes should be washed, one should shower and change before meeting family members.<sup>29</sup>

One of the limitations of this study could be that the protocols and recommendations are changing with the emergence of the new information on COVID-19, and so this study reflects only the views during a specified period of time the survey was conducted. Besides, with a low response rate of 35%, these findings may not be generalized to reflect the views of entire Orthopaedic fraternity of Nepal.

## Conclusion

Majority of the Orthopaedic surgeons have a good knowledge and attitude regarding COVID-19. The important pillars of breaking the chain viz. hand hygiene, social distancing, surgical mask, and properly ventilated rooms

were well appreciated. Most perceived that Orthopaedic procedures are high risk but more need to be done regarding awareness of AGPs and proper doffing of PPE. Online platforms were felt effective for meetings and to prevent virus transmission.

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## Conflict of Interest

None

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None

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