Original Article

Orthopedic Surgeons' Knowledge, Attitude, and Practice in View of COVID-19 in Saudi Arabia: A Cross-Sectional Study

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Abstract

Objectives: The aim of this study is to evaluate the levels of knowledge, attitude, and practice among orthopedic surgeons toward COVID-19 in Saudi Arabia. **Methods:** This was an observational analytical, online-based survey. Data were collected in April 2020 using a structured validated self-administered questionnaire, which was composed of four sections: Sociodemographic, knowledge, attitude, and practice sections. It was distributed using the WhatsApp application. **Results:** The respondents to the questionnaire were 84 orthopedic surgeons, with a response rate of 64%, as 130 surgeons have been contacted, 4 participants were excluded as they were not fit to our inclusion criteria. The majority of the respondents (73; 91.3%), were male and 58 (72.5%) were from Riyadh. Regarding their level of expertise, nearly half of them (42.5%) were junior residents. The majority showed good knowledge about the symptoms and high-risk patients for COVID-19, 73 (91.2%) and 78 (97.5%), respectively. Regarding their attitudes, 40 (50%) declared that COVID-19 widespread has negatively affected their mental and emotional well-being. Moreover, 68 (85%) of them were feeling anxious about going home and infecting their family members after being in contact with patients and colleagues. **Conclusion:** Most of the participants showed good knowledge, attitude, and practice toward COVID-19. There is a relaxed attitude with some surgeons regarding wearing personal protective gear, despite the knowledge, awareness, and resources. More educational programs for orthopedic surgeons should be implemented to flatten the curve and take control of the outbreak.

Keywords: Attitude, COVD-19, educational health, knowledge, orthopedics, practice, Saudi Arabia, surgeons

Introduction

The widespread of lower respiratory tract infection by the novel coronavirus (CoV) exploded in December 2019.[1] Nidovirales are enveloped, single-strand-positive RNA viruses that can infect individuals and some creatures.[2] Novel CoV (COVID19), later known as severe acute respiratory syndrome CoV 2, was recognized in December 2019 as cases of pneumonia of unknown etiology in Wuhan City (China).[3-5] The World Health Organization (WHO) internationalized the name of the novel CoV into COVID-19.[6] In March, the WHO reported that COVID-19 is a pandemic.[7]

Physicians are among the highest risk groups for acquiring COVID-19 infection.[8] This is due to the hazardous nature of their job, which exposes them to infected patients with COVID-19, and many physicians have lost their lives getting infected in hospital settings.[9] Mortalities and morbidities among physicians due to COVID-19 endanger the systems of fighting this pandemic. Physicians can get infected from the hospital and the community, and thus unlike other population groups, they have double sources and chances of infection. In addition to the risk of infection that they are facing, physicians may act as a tool for spreading COVID-19 to patients, families, and communities.[10]

The WHO recommends the prevention of COVID-19 spread by protecting physicians and other health-care workers (HCWs).

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Primary preventive methods include regular hand hygiene, respiratory protection (covering the mouth and nose in case of sneezing or coughing), social distancing, and using personal protective equipment (PPE).[11]

The problem of the transmission of this virus among physicians is exaggerated by the contaminated environment, the shortage of isolation facilities, the long working hours, the psychological distress and fatigue that the physicians are facing during this pandemic.[12] Accepting rapid behavioral changes among orthopedic surgeons mainly relies on knowledge, practice and attitude toward this pandemic.[13] They need to adhere strictly to standard precautions that have been recently approved by health organizations for the sake of protection from being infectious with the COVID-19 pandemic.[14] Orthopedic surgeons have direct patient contact, especially in the operating room; strict compliance is of utmost importance to standard precautions to facilitate self-protection, performing safe procedures in the operating rooms, protecting other patients, and their families.[14]

Improving prevention practice and the knowledge of physicians is an important asset in the fight against COVID-19.[15] Incorrect attitudes and insufficient knowledge were directly associated with delayed diagnosis, the spread of the disease, poor infection control practices, patients overload, and surgical delay.[16] Moreover, learning the current levels of physicians' knowledge, and practices toward COVID-19 is a crucial step in preventing and controlling the spread of this virus. Several studies have investigated the awareness of HCWs regarding COVID-19.[17-19]

However, none have investigated the levels of knowledge, attitude, and practice among orthopedic surgeons working in Saudi Arabia. As per Al-Mohrej *et al*.,[20] the number of orthopedic surgeons in Saudi Arabia reaches up to 2179. Of them, only 411 work in Riyadh. The majority of 224 orthopedic surgeons working in Riyadh are Saudi, while the rest of 187 are non-Saudi.

Our aim was to measure the expertise, stance, and procedures, in addition, to evaluate the levels of knowledge, attitude, and practice among orthopedic surgeons toward COVID-19 in Saudi Arabia.

Materials and Methods

Study settings and participants

This was an observational analytical, online-based survey conducted among orthopedic surgeons, who were practicing at the time in Riyadh, Saudi Arabia. This survey's inclusion criteria were a practicing Saudi orthopedic surgeon, from any position or subspecialty, who was working in a hospital in any region of Saudi Arabia, and who agreed to participate in this survey.

Due to the pandemic's situation and the difficulty of reaching the surgeons, a web-based method of questionnaire distribution was selected. The questionnaire was distributed via WhatsApp, and the 224 Saudi orthopedic surgeons in Riyadh were invited to fill the questionnaire.

Data collection methods

A structured self-administered questionnaire was used to collect the data. The questionnaire was composed of four sections. The first section was a sociodemographic section collecting information about the participants' residence, gender, position, specialty, years of practice after training, and hospital setting [Table 1]. The second section was the knowledge section and it contained questions about COVID-19 mode of transmission, symptoms, and prevention of the disease [Table 2]. The third section was the attitude section, and it was composed of questions regarding the beliefs of orthopedic surgeons toward COVID-19 [Table 2]. The fourth section included questions regarding the practice of surgeons in doing social distancing, and wearing PPE [Table 3].

Validation

The questionnaire was assessed for the vagueness of questions, mutually exclusive responses, and singularity of responses. Testing the content validity showed clarity of the questions asked, whereas face validity was conducted by a faculty member specialized in orthopedic surgery. The internal consistency of the sections was assessed using Cronbach'sα test with a total score of 0.72. Assessment of the questionnaire based on clarity expressed questions, shared single individual responses. The validity of the questionnaire showed direct and clear questions that have been asked. Face validity was managed by an orthopedic surgeon.

Statistical analysis

Data were managed using the Statistical Package for the Social Sciences (SPSS) software (Statistical Packaging for the Social Sciences software (IBM Corp. Released 2013. IBM SPSS Statistics for Mac, Version 22.0. Armonk, IBM Corp, NY, USA). Categorical data were presented as percentages and frequencies, while continuous data as means and standard deviation. Two-sample *t*-test and Chi-square tests were used to test for the association among the variables. The confidence interval was set at 95% and a $P < 0.05$ was considered statistically significant.

Results

The total number of participants to the questionnaire was 80 orthopedic surgeons, with a majority of the respondents (73; 91.3%), were male. In addition, most of the respondents (58; 72.5%) were from Riyadh city. Regarding their level of expertise, nearly half (42.5%) of them were junior residents. However, only 80 orthopedic surgeons answered the questionnaire with a response rate of 35%.

Most of the respondents were general orthopedic surgeons, however, the most commonly reported specialty was trauma 9 (11.25%). Respondents who were in training were 56 (70%), and only 4 (5%) had >15 years practicing as orthopedic surgeons. Moreover, nearly all participants (75; 93.8%) were practicing at governmental hospitals [Table 1].

Table 1: Demographic characteristics of the study participants

Characteristic	Frequency (%)
City of residence	
Riyadh	58 (72.5)
Dammam	9 (8.8)
Al-Hafouf	5 (3.8)
Abha	3 (3.8)
Makkah	2 (2.5)
Jeddah	1 (1.2)
Almadinah Almunawwarah	1 (1.2)
Al-Rass	1 (1.2)
Gender	
Male	73 (91.3)
Female	7 (8.7)
Position	
Junior resident	34 (42.5)
Senior resident	22 (27.5)
Fellow	4 (5)
Associate consultant	9 (11.2)
Consultant	11 (13.8)
Subspecialty	
General	56 (60)
Foot and ankle	2 (2.5)
Sports medicine	2 (2.5)
Trauma	5 (11.25)
Pediatric	2 (2.5)
Upper limb	0 (0)
Oncology	3 (3.75)
Spine	5 (8.75)
Arthroplasty	5 (8.75)
Years in practice postspecialty training (years)	
Still in training	56 (70)
<3	14 (17.5)
3-5	3 (3.75)
6-10	4 (5)
11-15	4 (5)
>15	4 (5)
Practice setting	
Government hospital	75 (93.8)
Academic hospital	5 (6.2)
Private hospital	0 (0)

Regarding the participants' knowledge of COVID-19, the majority of the participants showed good knowledge about the symptoms and high-risk patients, 73 (91.2%) and 78 (97.5%), respectively [Table 2]. In addition, 78 (97.5%) said that washing their hands with soap and using alcohol rub regularly can reduce the chances of getting infected with COVID-19. Orthopedic surgeons who denied the need of wearing the N95 mask at work full time were 68 (80.0%). Nearly all of them (79; 98.8%) agreed that social distancing could reduce the chances of getting infected or infecting others with COVID-19. Furthermore, 69 (86.2%) of the respondents said that aerosol-generating procedures such as intubation, and extubating, electrocautery and power instruments increase the risk of COVID-19 infection to health-care providers. Moreover, 69 (86.2%) said that they were aware of preventive measures that were applied by the hospital to address the pandemic.

Regarding the attitudes of the participating orthopedic surgeons towards COVID-19, 50 (62.5%) participants thought that they should not test all patients for COVID-19 before performing surgery, whether they meet the case definition or not. In addition, half (40; 50%) of the participants declared that the COVID-19 pandemic has negatively affected their mental and emotional well-being. Moreover, 68 (85%) of them were feeling anxious about going home and possibly infecting their family members after being in contact with patients and colleagues at the hospital [Table 2]. Regarding their practice toward COVID-19, 65 (81.25%) of the participants stated that they have been practicing social distancing and avoiding going out unnecessarily. Moreover, 30 (37.5%) of them claimed that they had been fitted for an N95 mask [Table 3].

No statistically significant association has been found between the sociodemographic characteristics of the participating surgeons and their levels of knowledge, attitude, and practice. In addition, the majority of the participants showed good knowledge, attitude, and practice toward COVID-19.

Discussion

Over the last few months, the field of orthopedic surgery has been changed significantly during the COVID-19 pandemic. Two of the Saudi Board residents, Al-Mohrej and Aldakhil, shared their experience during the endemic via a letter to the editor of Clinical Orthopedics and Related Research®.[21] As well, Almarshad and Alghamdi shared orthopedic trainees' perspective on CoV disease 2019.[22] However, no previous studies on the awareness and perspective of the Saudi surgeons on COVID-19.

Thus, the results of this study provide a new insight into the awareness of orthopedic surgeons. Most surgeons responded that they do have good knowledge, attitude, and practice toward COVID-19. These results indicate that the measures taken to flatten the outbreak's curve have been accurately instilled in Saudi Arabia. It is important to note that this knowledge is not differentiated by the baseline characteristics of the region, gender, seniority level, type of hospital, or training level. Regardless of the characteristics, the level of knowledge remained valuably high.

Some results indicate worrying practice, as only about 40% of respondents have been fitted with an N95 mask, despite having sufficient knowledge of the risk. We have learned from the WHO rationale that we, especially when working in a hospital setting, must use PPE as the COVID-19 virus enters through the nose, mouth, and eyes. Wearing the N95 mask is paramount as the virus particles are so miniscule, typical throwaway masks will not suffice. We are also surprised to learn that our results indicated that about 30% of surgeons are unwilling to

Table 2: Orthopedic surgeons' responses to knowledge and attitude questions

Questions	Yes (frequency), *n* (%)	No (frequency), *n* (%)
Knowledge questions		
Fever, dry cough, muscle pain, shortness of breath, and generalized fatigue are the most important clinical symptoms of the disease	73 (91.2)	7 (8.8)
Old age, people with low immunity and people with chronic illnesses are at increased risk of infection with severe diseases and complications	78 (97.5)	2 (2.5)
COVID-19 is transmitted by air droplets of an infected person	73 (91.2)	7 (8.8)
Can COVID-19 be transmitted to the surgeon/operating room staff through blood during surgery?	32 (40)	48 (60)
Washing my hands with soap and using alcohol rub regularly can decrease my chances of getting infected with COVID-19	78 (97.5)	2 (2.5)
No need to disclose any recent travel history reporting back to work if no symptoms	5 (6.2)	75 (93.8)
I cannot be a COVID-19 carrier if I do not have cough and fever	3 (3.8)	77 (96.2)
I need to use an N95 mask at work full time to avoid being infected with COVID-19	12 (20)	68 (80.0)
Social distancing (avoiding close physical contact with others, crowded places, family visits and shopping centers) can decrease my chances of being infected or infecting others with COVID-19	79 (98.8)	2 (1.2)
I need to stay at home, start quarantine and tell my supervisor if I have symptoms even if I did not get exposed to COVID-19 or history of recent travel	77 (96.2)	3 (3.8)
Isolate the suspected COVID-19 cases for 14 days can reduce the pandemic spread	76 (95.0)	4 (5)
I know the measures that were taken by my institution to address the COVID-19 pandemic	69 (86.2)	11 (13.8)
Aerosol-generating procedures such as intubation, extubation electrocautery and power instrument increase the risk of COVID-19 infection to healthcare providers	69 (86.2)	11 (13.8)
Attitude questions		
I think I should test all my patients for COVID-19 before performing surgery whether they meet the case definition or not	30 (37.5)	50 (62.5)
If needed, I will volunteer in taking care of COVID-19 patients in the intensive care unit settings if I am provided with personal protective equipment	49 (61.2)	31 (38.8)
I believe that my institution has taken everything necessary to protect healthcare employees and patients from being infected with COVID-19	53 (66.2)	27 (33.8)
COVID-19 pandemic has affected my mental and emotional wellbeing	40 (50.0)	40 (50)
COVID-19 pandemic has affected my family and social life	61 (76.2)	19 (23.8)
I feel anxious about going home and possibly infecting my family members after being in contact with patients and colleagues at the hospital	68 (85.0)	12 (15)
I think I have a responsibility to protect the public health by following the organization's recommendations to control the spread of COVID-19	75 (93.8)	5 (6.2)
I have been more serious regarding washing my hands	71 (88.8)	9 (11.2)
If clinically appropriate, I will consider nonoperative management for my patients until the COVID-19 pandemic is controlled	63 (78.8)	17 (21.2)

Table 3: Participants answers to practice questions

Questions	Answers	Frequency (%)
I strictly using social distancing and avoiding going out unnecessarily	Yes, all the time	65 (81.25)
	Yes, sometimes	13 (16.25)
	No	2 (2.5)
I got fitted for N95 mask	Yes	30 (37.5)
	No, I did not do the fitting test, or my hospital did not have N95 masks	8 (10)
	No, I did not want to	7 (8.8)
	No, I have a beard and did not want to shave it	26 (32.5)
I wear full personal protective equipment, including an N95 mask or PAPR, when performing an aerosol-generating procedure on suspected or confirmed COVID-19 patients	Yes	59 (73.75)
	No, I do not believe they are necessary for protection when performing surgery	4 (5.0)
	No, they are not available, or I do not have access to them	10 (12.5)
I obtain knowledge of the COVID-19 pandemic from	Newspapers or TV	30 (37.5)
	Websites of the WHO, MOH, or CDC etc.	69 (86.2)
	Hospital resources including emails, Internet, and posters	52 (65.0)
	Social media	42 (52.5)
	Friends and family	22 (27.5)

Responses were not mutually exclusive. WHO: World health organization, PAPR: Powered air purifying respirators, MOH: Ministry of health, CDC: The centers for disease control and prevention

shave their beards. This is important for any surgeon to do, especially when considering an N95 mask because this mask will not be able to do its function or provide an airtight seal around the nose and mouth with a beard in the way. We have also found that a staggering one-fourth of respondents do not wear full protective equipment when performing a procedure on a suspected or confirmed COVID-19 patients, even though only <10% do not have access to them.

A similar study was conducted among spine surgeons by Khattab *et al*. it was a multinational study involving 739 participants.[23] They stated that were an increased awareness about scientific research and its importance and the increased use of telemedicine among surgeons. In addition, 36.4% of their participants agreed that quarantine is one of the solutions to this epidemic, compared to 95.0% in this study. Moreover, 63.3% of the participants said that respiratory droplets are a transmission method of COVID-19 compared to 91.2% of the participants in this study. Social media was the most common source of information among their respondents, with a percentage of 73.2%. However, in this study, it was the third-most common source of information for the surgeons.[23]

Another study explored the attitudes of general surgeons toward COVID-19, nearly half of them expressed their fear for their life while treating COVID-19 patients. Around 90% of them were afraid of transmitting the disease and infecting their family members. In this study, the percentage was 76.2%. Moreover, 49% of them thought that power instruments are safe approach when operating on a COVID-19-positive patient.[24] A similar study was conducted in Egypt to assess the level of knowledge, and attitudes among HCWs, compared to this study, their level of knowledge was also good and they also had a positive attitude regarding COVID-19.[25]

Finally, the majority of around 60% of the participants would volunteer to take care of COVID-19 patients in the intensive care unit settings. This was discussed by Al-Mohrej and Aldakhil, as orthopedic trainees were being redeployed to work in specialties which they may be unfamiliar with such as intensive care unit.[21] In their view, this was a valuable lesson as the change is inevitable and the COVID-19 era is a time for orthopods to learn how to adapt to new surroundings, whatever they may be. The pandemic also taught us to adapt to change as many orthopedic residents worked in different teams and specialties.[22,26]

The limitations of our study include its cross-sectional design, which might limit the generalizability of the findings to larger populations. It is survey-based; thus, errors in the recall may affect reliability. Although online surveys allow respondents to maintain their anonymity, sending the survey via WhatsApp has its own disadvantages such as such as survey fraud, limited sampling, respondent and interviewer availability. Furthermore, the sample was small, which prevented us from comparing the groups. Further analysis with improved methods could be done to overcome these limitations. Further investigation is required to properly assess the issue and perhaps identify the risk factors that may participate in its development.

This survey and data collected have provided valuable insight into the mindsets of orthopedic surgeons. We have seen that with some surgeons, there is a relaxed attitude with wearing personal protective gears, despite the knowledge, awareness, and resources provided. Based on our results, we found that instilling concern and a sense of personal responsibility into our surgeons proves to be just as valuable as instilling knowledge, if not more. The only way we will truly flatten the curve, take control of the outbreak, and eventually end the pandemic is if everyone in Saudi Arabia, surgeons included, do their part and stay protected with the knowledge they have. At the end of our discussion, we could consider that some of the questions were not precise. However, it is necessary to note that there is an extremely rapid spread of the knowledge of the pandemic and this would be reflected in the health organizations as they keep updating the rules and the preventive measures daily with the evolution of the knowledge toward the COVD-19, despite this limitation, the finding of the current study had important information for evaluation and positive impact of the knowledge attitude and practice toward the pandemic. The current study, in addition, relies on a representative sample that was randomly selected through WhatsApp.

Conclusion

The majority of the participants showed good knowledge, attitude, and practice toward COVID-19. With some surgeons, there was a relaxed attitude with wearing personal protective gears, despite the knowledge, awareness, and resources provided. More educational programs for orthopedic surgeons ought to be implemented to flatten the curve and take control of the outbreak.

Recommendations

The authors recommend that health organizations introduce continuous and updated courses regarding the rapid revolution of the knowledge toward the COVD-19 pandemic regularly. In addition, the authors are encouraging orthopedic surgeons to actively participate in these courses to keep safe practice and improve the knowledge, attitude, and practice toward the COVD-19.

Ethical consideration

Ethical approval was obtained from the institutional review board at King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia. Additionally, informed consent for publication of the results was obtained from the participants before data collection. RAC # 2191 157 dated on the 30th of March, 2020.

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Conflict of interest

The authors declared that there is no conflict of interest.

Authors' contribution

AMR, TSH, AYM and OAM conceived and designed the study, conducted research, provided research materials, and collected and organized data. OHR and GBS analyzed and interpreted data. NOH and MSH wrote the initial and final draft of the article and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

References

1. Rotzinger DC, Beigelman-Aubry C, von Garnier C, Qanadli SD. Pulmonary embolism in patients with COVID-19: Time to change the paradigm of computed tomography. Thromb Res 2020;190:58-9.
2. Fehr AR, Perlman S. Coronaviruses: An overview of their replication and pathogenesis. Methods Mol Biol 2015;1282:1-23.
3. Li X, Geng M, Peng Y, Meng L, Lu S. Molecular immune pathogenesis and diagnosis of COVID-19. J Pharm Anal 2020;10:102-8.
4. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese center for disease control and prevention. JAMA 2020;323:1239-42.
5. Gao Q, Hu Y, Dai Z, Xiao F, Wang J, Wu J. The epidemiological characteristics of 2019 novel coronavirus diseases (COVID-19) in Jingmen, Hubei, China. Medicine (Baltimore) 2020;99:e20605.
6. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, *et al*. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). Int J Surg2020;76:71-6.
7. Boelig RC, Saccone G, Bellussi F, Berghella V. MFM guidance for COVID-19. Am J Obstet Gynecol MFM 2020;2:100106.
8. Zhang R, Li Y, Zhang AL, Wang Y, Molina MJ. Identifying airborne transmission as the dominant route for the spread of COVID-19. Proc Natl Acad Sci U S A 2020;117:14857-63.
9. Wang J, Zhou M, Liu F. Reasons for healthcare workers becoming infected with novel coronavirus disease 2019 (COVID-19) in China. J Hosp Infect 2020;105:100-1.
10. Kumar J, Katto MS, Siddiqui AA, Sahito B, Jamil M, Rasheed N, *et al*. Knowledge, Attitude, and Practices of Healthcare Workers Regarding the Use of Face Mask to Limit the Spread of the New Coronavirus Disease (COVID-19). Cureus 2020;12:e7737.
11. World Health Organization. Infection prevention and control during health care when COVID-19 is suspected. *Interim Guid*. 2020;(19 March):1-5. Available from: https://apps.who.int/iris/rest/bitstreams/1272420/retrieve.
12. Gan WH, Lim JW, Koh D. Preventing Intra-hospital Infection and Transmission of Coronavirus Disease 2019 in Health-care Workers. Saf Health Work 2020;11:241-3.
13. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. PLoS One 2020;15:e0233668.
14. Askarian M, McLaws ML, Meylan M. Knowledge, attitude, and practices related to standard precautions of surgeons and physicians in university-affiliated hospitals of Shiraz, Iran. Int J Infect Dis 2007;11:213-9.
15. Hui DS. Epidemic and Emerging Coronaviruses (Severe Acute Respiratory Syndrome and Middle East Respiratory Syndrome). Clin Chest Med 2017;38:71-86.
16. McEachan R, Taylor N, Harrison R, Lawton R, Gardner P, Conner M. Meta-Analysis of the Reasoned Action Approach (RAA) to Understanding Health Behaviors. Ann Behav Med 2016;50:592-612.
17. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, *et al*. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. Int J Biol Sci 2020;16:1745-52.
18. Clements JM. Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: Cross-sectional online questionnaire. JMIR Public Health Surveill 2020;6:e19161.
19. Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. Knowledge and perceptions of COVID-19 among health care workers: Cross-sectional study. JMIR Public Health Surveill 2020;6:e19160.
20. Al-Mohrej OA, Elshaer AK, Al-Dakhil SS, Sayed AI, Aljohar S, AlFattani AA, *et al*. Work-related musculoskeletal disorders among Saudi orthopedic surgeons: a cross-sectional study. Bone Jt Open 2020;1:47-54.
21. Al-Mohrej OA, Aldakhil SS. Letter to Editor: Editorial: Postcards from War Zones–Personal Experiences during the COVID-19 Pandemic. Clin Orthop Relat Res 2020;478:1953-
22. Almarshad AY, Alghamdi AM. Orthopedic trainees' perspective on coronavirus disease 2019. J Musculoskelet Surg Res 2020;4:166.
23. Khattab MF, Kannan TMA, Morsi A, Al-Sabbagh Q, Hadidi F, Al-Sabbagh MQ, *et al*. The short-term impact of COVID-19 pandemic on spine surgeons: A cross-sectional global study. Eur Spine J 2020;29:1806-12.
24. Rymarowicz J, Stefura T, Major P, *et al*. General surgeons' attitudes towards COVID-19: A national survey during the SARS-CoV-2 virus outbreak. Eur Surg - Acta Chir Austriaca. 2021;53:5-10. doi:10.1007/s10353-020-00649-w.
25. Abdel Wahed WY, Hefzy EM, Ahmed MI, Hamed NS. Assessment of knowledge, attitudes, and perception of health care workers regarding COVID-19, A cross-sectional study from Egypt. J Community Health 2020;45:1242-51.
26. Jerome JTJ, Mercier F, Mudgal C, Arenas-Prat J, Vinagre G, Goorens CK, *et al*. Perspectives and Consensus among International Orthopaedic Surgeons during Initial and Mid-lockdown Phases of Coronavirus Disease. *J Hand Microsurg*. 2020;12:135-62. doi:10.1055/s-0040-1713964.