

# The Impact of COVID-19 pandemic on Spine Surgeons

*An Asia Pacific Spine Society (APSS) Survey*

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**Study Design.** Cross-sectional survey.

**Objective.** The aim of this study was to investigate the impact of COVID-19 pandemic on the clinical practices of spine surgeons within the Asia Pacific region.

**Summary of Background Data.** COVID-19 pandemic had changed spine surgeons' clinical practices and their concerns toward personal and family risk of infection.

**Methods.** This cross-sectional survey was carried out from May 4, 2020 to June 4, 2020. The questionnaire was administered using REDCAP. The online questionnaire includes four sections. First section includes surgeon's demographics, background, type of clinical practice, and status of pandemic in their country. Second section includes volume and the type of spine surgery practice before the COVID pandemic. Third section includes changes of clinical practice during the pandemic and the last section was regarding their concern on COVID transmission.

**Results.** Total of 222 respondents from 19 countries completed the questionnaire. During the pandemic, 92.3% of the respondents felt their clinical practice was affected. 58.5% respondents reported reduced outpatient clinic hours and 74.6% respondents reported reduced operation theatre hours due to the enforcement by the hospital administration. The mean reduction of clinic

volume for all countries was 48.1%. There was a significant reduction in the number of surgeries performed in Japan, Malaysia, India, Philippines, and South Korea. This was due to reduced patient load. More than 60% of respondents were worried being infected by COVID-19 virus and >68% were worried of transmission to their family members.

**Conclusion.** COVID-19 pandemic has significantly affected the clinical and surgical practice of spine surgeons in the Asia Pacific region. Clinics were closed or the practice hours reduced. Similarly, surgical theaters were closed, reduced, or limited to semi-emergency and emergency surgeries. Spine surgeons were moderately concerned of contracting COVID-19 during their clinical practice but were extremely concerned to transmit this disease to their family members.

**Key words:** APSS, Asia-Pacific, clinic, COVID-19, operation theater, surgery, ward.

**Level of Evidence:** 4

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COVID-19 is an infectious disease caused by the SARS-CoV-2 virus. It was first identified in December 2019. This infection caused symptoms that ranged from mild cough, sore throat, and fever to severe viral pneumonia with multiple organ failure. On March 11, 2020, the World Health Organization (WHO) declared the outbreak a pandemic.<sup>1</sup> With large numbers of patients affected in the Asia Pacific region such as China, Japan, Singapore, and India, most governments had imposed movement restriction measures in an attempt to break the transmission chain of this disease.<sup>2,3</sup>

The disease itself coupled with these measures had led to a profound worldwide social and economic impact.<sup>4,5</sup> In China, industrial output fell 13.5% in January and February, compared to the year 2019. Year-on-year, fixed asset investment fell 24.5%, whereas private sector investment fell 26.4%. Retail sales reduced to 20.5% and the unemployment rate rose to 6.2% in February, compared to 5.2% in December 2019.<sup>5</sup> According to International Monetary

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Fund organization, the current economic impact is expected to be as severe as that of the global financial crisis of 2009.<sup>6</sup>

For medical professionals, the large volume of patients threatens to overwhelm the resources available.<sup>7,8</sup> The strain on medical resources included the number of personnel required to screen and/or treat suspected COVID-19 patients, hospital inventories such as ventilators, and consumable products, in particular personal protective equipment (PPE) for health care workers.<sup>9,10</sup> Although most spine surgeons are not directly involved in the treatment of COVID-19 patients during this pandemic, the burden to institutional resources would influence their clinical practices. In other medical disciplines, numerous reports on the effect of this pandemic on their patients or their practices had been published in recent months.<sup>11–13</sup>

Therefore, the aim of this research was to investigate the impact of COVID-19 pandemic on the clinical practices of spine surgeons within the Asia Pacific region. Other objectives of this study were to understand their concerns toward personal and family safety when carrying out their daily clinical practices.

## METHODOLOGY

This cross-sectional survey was carried out from May 4, 2020 to June 4, 2020. This survey was distributed to spine surgeons in the Asia Pacific region under the banner of *Asia Pacific Spine Society* but was not confined to members of this society. The membership of Asia Pacific Spine Society is open to active and practicing orthopedic spine surgeons who live in a country within the Asia Pacific region. Neurosurgical spine surgeons can join as affiliated member. To date, there are 19 chapters within this society. From our mail distribution records, 719 survey links were successfully delivered to surgeons. However, only 339 surgeons attempted to complete the questionnaire. A total of 224 surgeons completed the whole questionnaire, whereas 115 were incomplete surveys. From the 224 surgeons who completed the survey, 2 were from countries that were not within the Asia Pacific region and were excluded from the final analysis ( $n = 222$ ). The questionnaire was administered using REDCAP (Vanderbilt, Nashville, TN).

### Survey Respondents

A total of 222 surgeons from 19 countries completed the survey. The distribution of the number of surgeons according to their respective countries was illustrated in Figure 1. The highest number of respondents were from Japan. This comprised of 20.7% of the total number of respondents. This was followed by Malaysia with 38 respondents (17.1%) and India with 27 respondents (12.2%).

### Questionnaire

The online questionnaire was divided into four sections. The first section were questions on the surgeon's demographics, background, and the type of clinical practice they were involved in at the time the survey was administered. They were also asked on the status of the pandemic in their

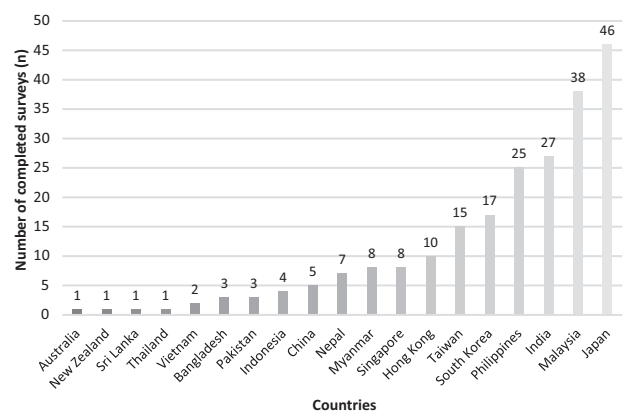


Figure 1. Distribution of survey respondents according to country.

respective countries and whether their hospital or they themselves were directly involved in the management of COVID-19 patients.

The second section included questions on the *volume* and the *type of spine surgery practice before the COVID pandemic*. Respondents were questioned on the number of patients they see at the outpatient clinic as well as the number of operations they carried out each week. They were also questioned on the type of surgeries they would normally perform; minimally invasive surgeries/ open surgeries as well as the type of conditions they treated; ranging from deformity surgery, surgery for degenerative conditions, trauma surgeries to pain intervention procedures.

The third section included questions on *the changes in their practice during the COVID pandemic*. Specifically, they were asked regarding their clinical practice during the month of April 2020. They were asked whether they were involved in elective, semi-emergency or only emergency spine surgery during the pandemic. We also documented the change in terms of the volume and the type of surgeries they performed. They were also asked on the impact of the pandemic on the volume of patients seen at their outpatient clinics. The various reasons that could have led to reduction in clinic and surgical volume were also investigated.

The fourth section in the questionnaire included the respondents' concern with *the risk of COVID-19 transmission* within their families and being infected by the virus themselves. The type of questions that were administered in the survey consisted of 3 types. The first type of question required the respondents to key in a response. The second type of question involved a stem with multiple choices whereby more than one answer could be chosen. The third type of question was a 5-point Likert scale-based question. The respondents were required to state their opinion regarding the statement provided, ranging from *strongly agree* to *strongly disagree*.

### Statistical Analysis

The data obtained from the survey were entered into and analyzed using IBM SPSS ver. 26.0 (IBM Corp, Armonk, NY). The distribution of categorical data was reported in

numbers and percentages. Continuous data were reported as mean with its standard deviation. Comparison between categorical data was performed using the  $\chi^2$  test. Fisher exact test was used when the value within the parameter was  $<5$ . Comparison between continuous data was carried out using independent sample *t* test. Statistical significance was set at *p* value  $< 0.05$ .

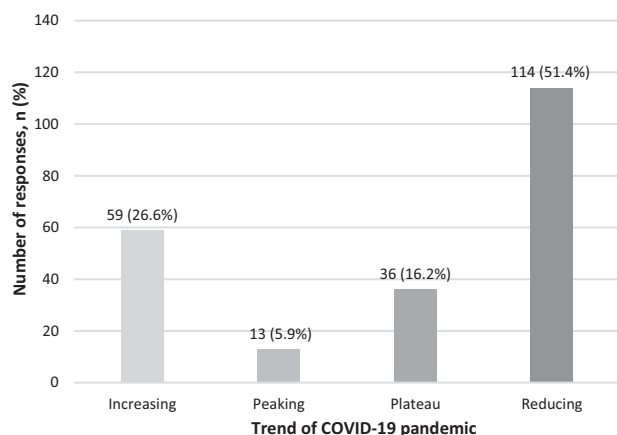
**RESULTS**

The mean age of the respondents was  $45.1 \pm 9.0$  years (Table 1). Majority of the respondents were males (96.8%). The average number of years in practice was  $13.1 \pm 14.7$ . 42.8% were practicing in spine surgery only, whereas 53.6% and 3.6% were also practicing orthopedic surgeons and neurosurgeons, respectively. 38.9% of respondents worked in academic institutions, 28.5% worked in private institutions, whereas 24.0% worked in government institutions. The number of patients seen at the outpatient clinic per week before the pandemic was  $>100$  cases among 23.0% of respondents. Most surgeons (38.7%) operated on 11 to 20 patients/month before the onset of the pandemic. Only 9.5% operated  $>30$  cases/month. Surgeries for degenerative conditions (40.3%) were the most commonly performed followed by surgeries for traumatic conditions (14.7%). Most of the respondents' hospital (67.1%) was involved in treating COVID-19 patients and 12.6% of respondents were directly involved in the treatment of COVID-19 patients in the medical ward.

The pandemic was peaking in 5.9% of the respondents' country (Figure 2). This was in comparison with 16.2% who felt the pandemic was plateauing and among 51.4% of respondents, they felt the number of cases were reducing. Movement restriction measures were undertaken in 85.1% of the respondents' country.

**Changes in Clinical Practice During the COVID-19 Pandemic (April 2020)**

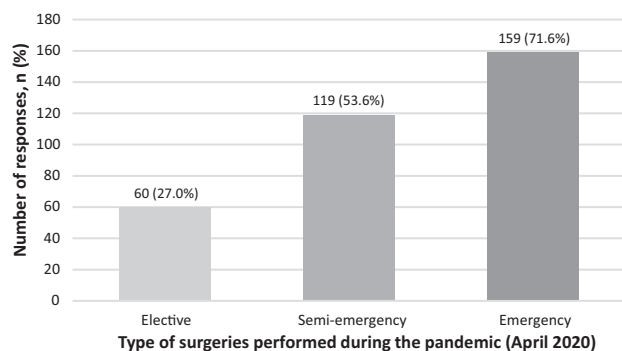
92.3% of them felt their clinical practice was affected by the pandemic. In 58.5% of respondents, the outpatient clinic operating hours were reduced by the hospital



**Figure 2.** Trend of COVID-19 pandemic in survey respondents' countries.

**TABLE 1. Demographic Data and Spine Surgery Practice Before COVID-19 Pandemic.**

Parameters	Mean ± SD/ n (%)
Age, y	45.1 ± 9.0
Sex	
Male	215 (96.8)
Female	7 (3.2)
Spine surgery experience, y	13.1 ± 14.7
Specialty	
Spine surgery	95 (42.8)
Orthopedic and spine surgery	119 (53.6)
Neurosurgery and spine surgery	8 (3.6)
Type of clinical institution	
University	86 (38.9)
Government	53 (24.0)
Private	63 (28.5)
University and government	3 (1.4)
Government and private	5 (2.3)
University and private	4 (1.8)
University, government, and private	7 (3.2)
Type of practice	
Individual	78 (35.3)
Group	140 (63.3)
Individual and group	3 (1.4)
No. of patients seen in outpatient clinic/wk	
0–20	23 (10.4)
21–40	40 (18.0)
41–60	48 (21.6)
61–80	31 (14.0)
81–100	29 (13.1)
>100	51 (23.0)
Number of surgeries/mo	
0–10	78 (35.1)
11–20	86 (38.7)
21–30	37 (16.7)
31–40	10 (4.5)
41–50	4 (1.8)
>50	7 (3.2)
Type of surgery (%)	
Minimal invasive local anesthesia surgeries	7.2 ± 12.4
Minimal invasive general anesthesia surgeries without instrumentation	13.3 ± 16.4
Minimal invasive general anesthesia surgeries with instrumentation	11.1 ± 13.5
Conventional open surgeries without instrumentation	21.0 ± 19.1
Conventional open surgeries with instrumentation	36.8 ± 23.7
Type of cases (%)	
Degenerative	40.3 ± 23.5
Deformity	13.8 ± 16.2
Trauma	14.7 ± 14.8
Oncology	6.7 ± 10.6
Infection	6.2 ± 6.1
Pain intervention	6.9 ± 11.8
Others	1.8 ± 4.0



**Figure 3.** Type of surgery performed during pandemic.

administration, whereas in 74.6% of respondents, a similar reduction in operating theater sessions was enforced. During the pandemic, only 27.0% still performed elective surgeries, whereas 53.6% of respondents would perform semi-emergency and 71.6% would perform emergency surgeries (Figure 3).

In 123 (55.4%) respondent's hospital, COVID screening was required for all patients who were listed for emergency surgery preoperatively (Table 2). 55.4% respondents would proceed with surgery for emergency indications even when the patient was diagnosed as COVID-19-positive. However, 30.2% respondents would not proceed with emergency surgery in COVID-19-positive patients. For semi-emergency surgeries, 60.4% respondent's hospital required screening and only 42.3% respondents would proceed with surgery for positive COVID patients. For elective surgical indications, 53.2% required preoperative screening. However, only 19.8% respondents would proceed with elective surgery in COVID-19 patients.

The mean reduction of clinic volume among all the countries in the Asia-Pacific region was 48.1% (Figure 4). In most of the countries, the clinic volume reduced by at least 30%. Taiwan experienced the lowest reduction in clinic volume (21.6%). This highest reduction in clinic volume was in New Zealand. However, there was only one respondent from this country.

There was significant reduction in the number of surgeries performed in Japan, Malaysia, India, Philippines, and South Korea for the month of April 2020 (Table 3). In Japan 29 of 41(70.7%) surgeons had 0 to 10 cases/ month during the pandemic. This was in comparison to their usual practices whereby most of them 22 of 46 (47.8%) had 11 to

20 surgeries/month. A similar trend was observed in Malaysia, India, Philippines, South Korea with most surgeons having only 0 to 10 surgeries during the month of April. The change in surgical volume did not reach statistical significance in Taiwan and Hong Kong.

The main reason for reduction in surgical volume was reduced patient load (Figure 5). 63.5% of surgeons agreed this was one of the reasons for reduced surgeries. 48.2% of surgeons also experienced reduction in their usual operation theatre time during the pandemic, whereas 29.7% of surgeons agreed that reduction in the number of available intensive care unit (ICU) beds could have affected their surgical volume. Inadequate blood products were only a significant factor among 18.9% of respondents.

There was a significant change in the type of cases that surgeons operated on during the pandemic (Figure 6). Before the pandemic, degenerative conditions constituted 39.6% of the respondents' surgeries. In contrast, trauma cases constituted 29.1% of operated cases during the pandemic, whereas 26.8% of operated cases were for degenerative conditions. Deformity cases constituted only 4% of surgeries during the pandemic. There was also a significant increase in proportion of operated cases for spinal oncology and infections.

### Personal and Family Health During COVID-19 Pandemic

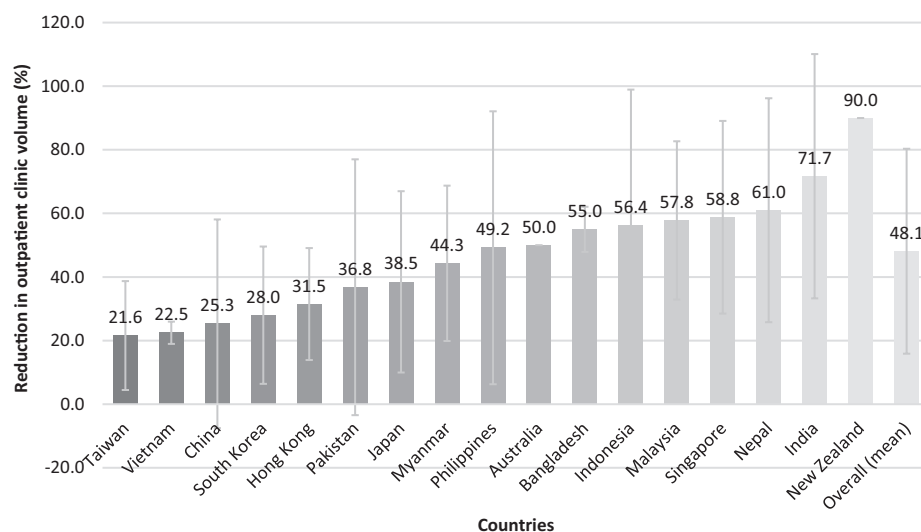
When we analyzed surgeon's concern regarding risk of being infected by COVID-19 virus during their clinical practice, 65.3%, 62.2%, and 62.2% of surgeons were at least moderately worried of this risk when conducting clinic, ward rounds, and surgery respectively (Figure 7). However, a bigger percentage of surgeons (30.6%) were extremely worried about this risk when performing surgery. In contrast, majority of surgeons were extremely concerned about transmission of COVID-19 virus to members of their family. 41.0% were extremely worried about the risk of transmission to family members due to conducting surgery on patients.

### DISCUSSION

To date, COVID-19 has infected >6 million patients worldwide. This outbreak had a case fatality rate ranging from 0 to 19.0%. In India, the number of infected cases was rising rapidly. As of May 31, 2020, the number of infected cases was 190,609 with 5408 recorded deaths. In Singapore, the

**TABLE 2.** Clinical Practice During Pandemic COVID-19 for the Month of April 2020

Clinical practice	Yes n (%)	No n (%)	I Am Not Doing Surgeries n (%)
Pre-operative COVID-19 screening for emergency surgeries	123 (55.4)	83 (37.4)	16 (7.2)
Emergency surgeries for COVID-19 +ve patients	123 (55.4)	67 (30.2)	22 (14.4)
Pre-operative COVID-19 screening for semi-emergency surgeries	134 (60.4)	65 (29.3)	23 (10.4)
Semi-emergency surgeries for COVID-19 +ve patients	94 (42.3)	103 (46.4)	25 (11.3)
Pre-operative COVID-19 screening for elective surgeries	118 (53.2)	67 (30.2)	37 (16.7)
Elective surgeries for COVID-19 +ve patients	44 (19.8)	144 (64.9)	34 (15.3)



**Figure 4.** Reduction in outpatient clinic volume in Asia Pacific countries.

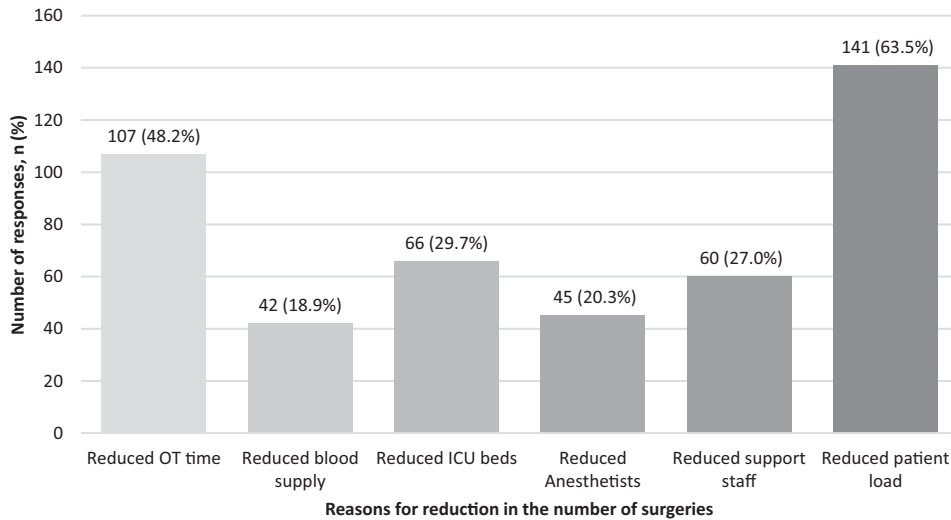
total number of cases were 34,884 with 23 deaths. Japan recorded 16,851 cases and 891 deaths. Malaysia recorded 7819 cases and 115 death.<sup>14</sup> As of mid-April, >50% of the global population was under lockdown.<sup>5</sup> However, by end of May the lockdown or movement control order had been eased in many countries including Japan, India, Singapore, and Malaysia.<sup>15–18</sup> In contrast, Hong Kong and South Korea showed a decreasing trend in the number of new infected cases despite not implementing lockdown.<sup>19</sup>

The impact of COVID-19 pandemic toward surgical practice is evident. In general surgery, most outpatient clinics were suspended, elective non-urgent and non-cancer-related surgeries were stopped, and certain cancer-related surgeries were

delayed after risk stratification.<sup>11,20</sup> In orthopedic surgery, clinical work similarly had been scaled down and only patients who required urgent or early orthopedic care would be attended. Many centers had their electives and nonurgent surgeries postponed or cancelled, limiting only to emergency surgeries.<sup>21,22</sup> In spine surgery, clinical practice was mainly confined to emergency surgeries or surgeries prioritizing on minimally invasive and endoscopic procedures that generally has less blood loss and requires shorter hospital stay.<sup>23</sup>

In this survey, we found that among the factors that led to reduction of clinical practice were due to the directive of hospital administration. Outpatient clinic hours were reduced by the hospital administration in 58.5% of respondents.

Country	No. of Cases	Before COVID-19 (%)	During COVID-19 (%)	P
Japan	0–10	34.8	70.7	0.003
	11–20	47.8	17.0	
	>20	17.4	12.2	
Malaysia	0–10	28.9	92.1	<0.001
	11–20	52.6	7.9	
	>20	18.4	0.0	
India	0–10	18.5	96.2	<0.001
	11–20	37.0	0.0	
	>20	44.4	3.8	
Philippines	0–10	64.0	100.0	0.004
	11–20	28.0	0.0	
	>20	8.0	0.0	
South Korea	0–10	17.6	63.6	0.023
	11–20	52.9	36.4	
	>20	29.4	0.0	
Taiwan	0–10	46.7	69.2	0.248
	11–20	20.0	23.1	
	>20	33.3	7.7	
Hong Kong	0–10	60.0	90.0	0.121
	11–20	40.0	10.0	



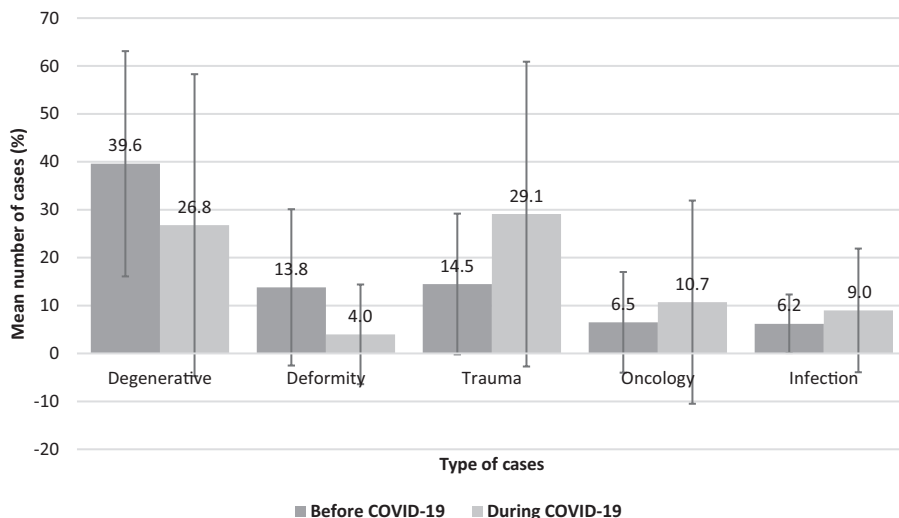
**Figure 5.** Reasons for reduction in surgical volume.

Operation theater hours were reduced by the hospital administration in 74.6% of respondents. Most of the respondents of every country had reported a reduction of outpatient clinic ranging from 21.6% to 90% with a mean of 48.1%. Among the top seven countries with the most respondents, five countries (Japan, Malaysia, India, Philippines, and South Korea) had significant reduction in the number of surgeries performed. Majority of surgeons would only perform emergency or semi-emergency surgeries during this period, thus increasing the percentage of trauma, oncologic and infection cases with the reduction in degenerative and deformity cases.

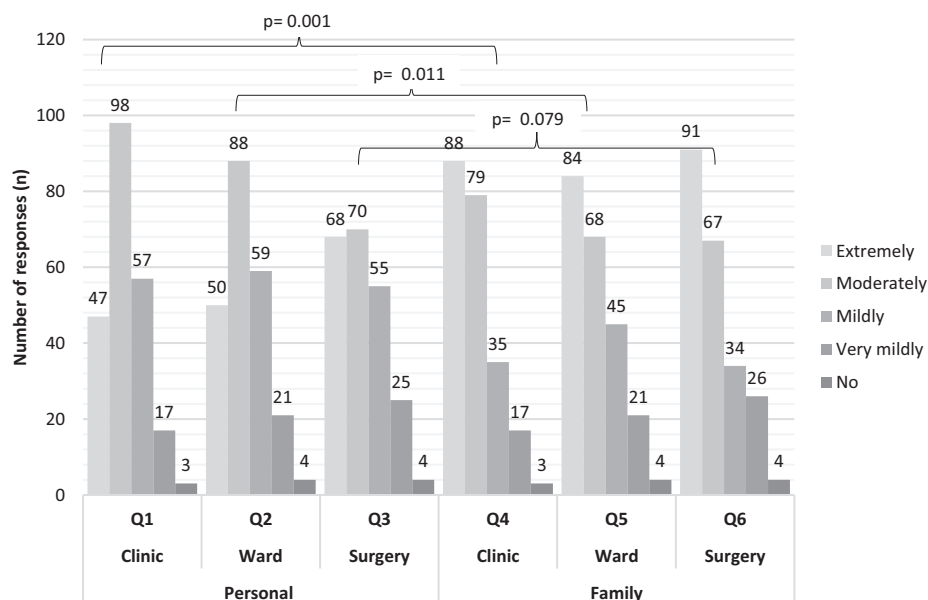
Health care workers are exposed to the risk of contracting this viral infection. Their risk factors increase if they work in high-risk departments, have longer duty hours, do not practice optimal hand hygiene, were not trained to handle PPE, were not wearing an N95 respirator, and had severe fatigue.<sup>24-26</sup> This had impacted the psychological well-being of health care workers who are still required

to continue providing their clinical services during this outbreak.<sup>27-29</sup> The fear of being infected with COVID-19 and potentially spreading it to their family members is clearly apparent. This survey found that spine surgeons were moderately worried of contracting the infection during their practice in the clinics, wards, and operation theater. However, they were extremely worried to transmit this infection to their family members.

The main limitation was the fact that this study was merely just a survey and the data acquired may be estimates given by the respondents. We do not think that this study had much bias as most of the questions were factual data acquired from respondents on what had occurred in their clinical practice. There were no questions that had ordinal preferences that may lead to bias. Another limitation was that there was lack of participation from some countries which led to underrepresentation of this study to be generalized to all countries in the Asia Pacific region.



**Figure 6.** Distribution of the type of surgical cases before and after the pandemic.



**Figure 7.** Personal and family concerns on the risk of being infected by COVID-19 infection.

## CONCLUSION

We can conclude that the COVID-19 pandemic had significantly affected the clinical and surgical practice of spine surgeons in the Asia Pacific region. Clinics were closed or the practice hours reduced. Similarly, surgical theaters were closed, reduced, or limited to semi-emergency and emergency surgeries. Spine surgeons were moderately concerned of contracting COVID-19 during their clinical practice but were extremely concerned to transmit this disease to their family members.

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the clinics, wards, and operation theater. However, they were extremely worried to transmit this infection to their family members.

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## Key Points

- 92.3% of the respondents felt their clinical practice was affected. 58.5% respondents reported reduced outpatient clinic hours and 74.6% respondents reported reduced operation theater hours due to the enforcement by the hospital administration.
- The mean reduction of clinic volume for all countries was 48.1%.
- There was a significant reduction in the number of surgeries performed in Japan, Malaysia, India, Philippines, and South Korea.
- Majority of surgeons would only perform emergency or semi-emergency surgeries during this period, thus increasing the percentage of trauma, oncologic, and infection cases with the reduction in degenerative and deformity cases.
- Spine surgeons were moderately worried of contracting the infection during their practice in

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