Journal of Surgery
Al Rashed A, et al. J Surg 6: 1454
www.doi.org/10.29011/2575-9760.001454
www.gavinpublishers.com
Research Article

Perspectives on Return to Elective Surgeries in Kuwait and GCCC: A Cross-Sectional Survey

Balqees Alghanem[1], Muneera Ben Nakhi[2*], Asmaa Al Rashed[3]

[1]Department of ENT, Zain Center, Al-Sabah Medical Area, Kuwait City, Kuwait

[2]Plastic and Reconstructive Surgery Unit, Department of Surgery, Al Adan Hospital, State of Kuwait, Kuwait

[3]Department of Surgery, Al Amiri Hospital, Gulf Road, State of Kuwait, Kuwait

[*]**Corresponding author:** Muneera Ben Nakhi, Plastic and Reconstructive Surgery Unit, Department of Surgery, Al Adan Hospital, Hadiya block 5, Postal code 469691, State of Kuwait, Kuwait.

Citation: Alghanem B, Ben Nakhi M, Al Rashed A (2021) Perspectives on Return to Elective Surgeries in Kuwait and GCCC: A Cross-Sectional Survey. J Surg 6: 1454. DOI: 10.29011/2575-9760.001454

Received Date: 13 December, 2021; **Accepted Date:** 20 December, 2021; **Published Date:** 24 December, 2021

Abstract

Background: Covid-19 pandemic has affected hospital services worldwide including elective surgeries. This study provided perspectives on resuming elective surgeries in Kuwait and the Gulf Cooperation Council Countries (GCCC).

Methods: A cross-sectional study, anonymous survey, consists of 19 questions, using Google Forms was conducted. It was distributed via email and social media to healthcare professionals in Kuwait and the GCCC.

Results: 124 participants have completed the survey. Majority have developed a protocol for resuming back elective surgery (71%) and will consult local ministry of health or hospital guidelines for resuming the elective surgery (75%). More than half of the participants haven't started elective surgery in their hospital at the time of the study. For those who are planning for resuming elective surgery, 39% will start elective surgery with both cancer and non-cancer cases, while 27% have started elective surgery already. By the time of completing the survey, 34% have started elective surgery with both cancer and non-cancer cases, while 19% started with cancer cases only. One NP-PCR preoperatively was used by 44.4% and 48% tested patients 48-72 hours before surgery. Forty-six percent indicated that their protocol include testing of surgeons and medical staff for SARS-COV2 only when symptomatic. 40.7% used telemedicine for patient's consultation, triaging, post-operative follow-up, and team meetings.

Conclusion: Kuwait and the GCC face the same global challenges in resuming elective surgery. Great efforts are needed to overcome the long backlog of elective cases after the end of covid-19 crisis while accounting for resources, surgical condition, patient's complexity, and fair accessibility to surgery.

Keywords: Access to surgery; COVID-19; Elective surgery, Gulf Cooperation Council Countries; Kuwait; Pandemic

Introduction

Covid-19, which is caused by the newly discovered Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was classified as a global pandemic on March 11, 2020. Number of cases worldwide exceeded 202 million with more than four million deaths reported to the World Health Organization (WHO) [1]. In Kuwait, the first confirmed case was announced on February 24, 2020 [2]. To date, more than 403,000 confirmed cases and more than 2.300 deaths are caused by SARS-CoV-2 [3]. Greater than 2 million cases of Covid-19 and over 18.500 deaths were announced in the Gulf Cooperation Council Countries (GCCC) [4]. In order to limit viral transmission and preserve hospital resources as well as ICU capacity, the United States Surgeon General recommended stopping elective surgeries [5]. Globally, more than 28 million elective surgeries were estimated to be cancelled during the 12 weeks peak of Covid-19. Approximately 70% of elective cases were cancelled in Kuwait, Bahrain, Oman and Qatar and 72% in the United Arab Emirates and Kingdom of Saudi Arabia and the GCCC have to increase their capacity by 20% over 45 weeks to clear the backlog [6]. In Kuwait, elective surgery has been stopped since February 2020 [7].

Covid-19 can be asymptomatic or cause wide variety of symptoms in severity and complications such as acute respiratory distress syndrome, acute cardiac injury, secondary infections, and death [8]. The global pandemic has changed the surgical practice dramatically, surgeons who usually cover elective surgeries worked with emergency general surgery and trauma units. In Italy, surgeons joined Intensive Care Units (ICU) and emergency teams to overcome the extreme workload and health care personnel shortage. Surgeons used non-surgical alternative if applicable and utilized laparoscopic surgery with precautions to protect healthcare workers from possible risk of aerosolized virus contamination. Surgical patients were transferred to different hospital wards as the majority of the wards were used for isolating Covid-19 cases [9,10]. The decision of postponing elective surgeries placed surgeons in front of ethical dilemma as there is no clear definition for "elective Surgery" [11]. The American College Surgeons (ACS) recommended that resuming elective surgery can take a place after 14 days decline in Covid-19 daily cases. [12]. This recommendation can be vague as many countries were still reporting high number of daily cases and ACS did not specify the exact percentage of needed decline in cases to continue elective surgery.

It is known that cancellation of surgery under normal circumstances can lead to negative emotional as well as economic impact on patients and their families. Patients may suffer from disappointment, anger, frustration, and sadness in response to this cancellation [13]. In addition to the negative emotional effect, the delay in performing elective screening tests (e.g., colonoscopy) during this pandemic can lead to late diagnosis of various medical and surgical conditions and accordingly more advance diseases with negative outcome. For example, in Europe, 500,000 patients are being diagnosed with colorectal cancer yearly, with the current global circumstances there will be a delay in diagnosing 83,000 patients assuming that the crisis lasts for two months only [14]. The other issue that needs to be addressed is the negative effect of the pandemic on the training of surgical residents as their surgical exposure is compromised. The Royal College of Surgeons of England suggests that surgical trainees need to be freed from non-essential paper work with increasing operation theatre hours to face the delay in their training process [15].

The delay in delivering surgical care can lead to serious economic burden globally, taking in consideration that the exact date for resuming elective surgeries is still unknown. The objective of this survey is to assess views of surgeons and healthcare professions on return of elective surgery and to determine the challenges facing the return of elective surgery in Kuwait and the GCC countries.

Materials and Methods

Cross-sectional research study design using an anonymous survey that consists of 19 questions. The questionnaire was divided into five categories that addressed participants' demographic data, protocols and guidelines applied for resuming back elective surgery, disease triaging and COVID-19 testing and the use of telehealth and telemedicine. The survey was done using Google Forms that was distributed via email and WhatsApp to healthcare professionals in Kuwait and the GCC*. The Survey ran periods from 5th July to 5th August 2020. Consents were taken from all participants. Data analysis and statistical calculations were done using Microsoft Excel software version 16.54. *GCC countries: Gulf Cooperation Council Countries including Kuwait, United Arab Emirates, Kingdom of Saudi Arabia, Qatar, Oman, and Kingdom of Bahrain.

Results

Participants

A total of 124 participants have completed the survey. Participants' demographics such as age, gender, position, country of residence and specialty are shown in (Table 1). Mean age of participants was 38.5 years (standard deviation 12.69). Fifty three percent were males and 47% were females. The majority (53.2%) were surgeons in practice for more than 5 years,21.7% in post-graduate training,19.35% were medical students and 5.6% were surgeons practicing for less than 5 years. Sixty-two percent were from Kuwait, while 38% from other GCCC with 16.1% from Saudi Arabia. Most of the participants were working in a surgical specialty. 21.8% were general surgeons and 13.7% were working in obstetrics and gynecology, while the rest work in other specialties as follows: 5.7% in otolaryngology head & neck surgery, 4.8% in plastic surgery, 3.2% in bariatric surgery, 2.4% in orthopedics and urology, 1.6% in trauma surgery, breast surgery, colorectal surgery and surgical oncology. 0.8% were in ophthalmology, neurosurgery, cardiac surgery and vascular surgery. Non-surgical specialties were 4% in internal medicine, 6.4% in family medicine or general physicians, 0.8% in anesthesia, dermatology and hydrotherapy. Moreover, 14.5% of the participants were medical students and 6.5% were intern doctors.

Demographics	Number (%)
	124
Age	38.5 (20-65)
Gender	
Male	66(53%)
Female	58(47%)
Position	
Intern, Resident, Fellow (post-graduate training)	27(21.7%)
Junior surgeon in practice (<5 years)	7(5.6%)
Medical student	24(19.35%)
Senior surgeon in practice (>5 years)	66(53.2%)
Country of residence	
Bahrain	1(0.8%)
Canada	2(1.6%)
India	12(9.67%)
Kuwait	77(62%)
Oman	3(2.4%)
Qatar	4(3.2%)
Saudi Arabia	20(16.1%)
United Arab Emirates	5(4%)
Specialty	
Surgical specialty	
General surgery	27(21.8%)
Obstetrics and gynecology	17(13.7%)
ENT / Head & Neck surgery	7(5.7%)
Plastic surgery	6(4.8%)
Bariatric surgery	4(3.2%)
Orthopedics	3(2.4%)
Urology	3(2.4%)
Surgical oncology	2(1.6%)
Trauma surgery	2(1.6%)
Breast surgeon	2(1.6%)
Colorectal surgeon	2(1.6%)
Vascular surgery	1(0.8%)

Cardiac surgery	1(0.8%)
Neurosurgery	1(0.8%)
Ophthalmology	1(0.8%)
Non-Surgical Specialty	
Internal medicine	5(4%)
Family medicine	4(3.2%)
GP	4(3.2%)
Dentistry	3(2.4%)
Anesthesia	1(0.8%)
Dermatology	1(0.8%)
Hydrotherapy	1(0.8%)
Others	
Medical students	18(14.5%)
Intern	8(6.5%)

Table 1: Participant demographic data.

Protocols and Guidelines

As shown in (Table 2), 71% of the participants mentioned that developed protocols were available for resuming elective surgery and the majority (75%) will consult local Ministry of Health or local Hospital Guidelines and resources for resuming the elective surgery. More than half (58%) of the participants have not started elective surgery in their hospital by the time of taking the survey.

	Total of 124
In your hospital, have you developed a protocol for resuming back elective surgery?	
Yes	88(71%)
No	36(29%)
What guidelines or resources will you consult for resuming back elective surgery?	
Combination of MOH & LOCAL PROTOCOL	3(2.4%)
Department protocol	1(0.8%)
International surgical societies guidelines	13(10.5%)
Local ministry of health/ hospital guidelines	93(75%)
Local Society Guidelines	8(6.5%)
WHO/CDC	6(4.8%)

Table 2: Protocol Development & guidelines for resuming back elective surgery.

Disease Triaging

Just over one third of the participants (34%) mentioned that they have started both cancer and non-cancer cases, and 19% have only started cancer cases (Figure 1). Forty-seven participants (38.5%) out of 122 will start elective surgery with both cancer and non-cancer cases, while 27% have started elective surgery already (Table 3). For benign pathology cases, 49.2% will prioritize cases with poorly controlled symptoms and 46.7% were stopped from resuming elective surgery by ministry of health and government factors. As for the percentage of work resumed in comparison with pre-COVID usual hospital load, 39% started with less than or equal to 30% in comparison with 6% resumed only from 71 to 100% of the usual hospital load (Figure 2).

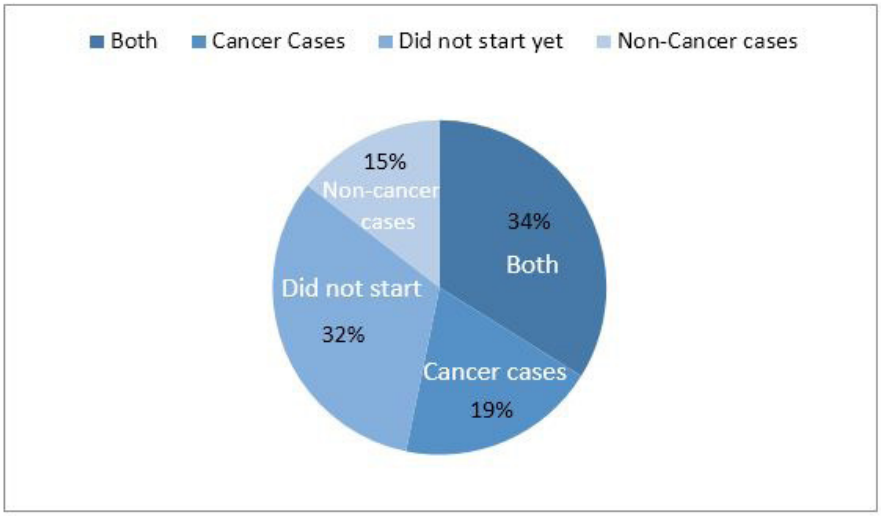

Figure 1: Type of elective surgery started.

Resuming elective Surgery	N= 122
If still planning on resuming elective surgery, what cases will you start with? (triage)	
Both cancer and non-cancer cases	47(38.5%)
Cancer cases	21(17.2%)
Non cancer cases	21(17.2%)
We have started already	33(27%)
For benign pathology cases, how will you prioritize the cases? Have you or will you start with	
Cases with poorly controlled symptoms	60(49.2%)
harm vs benefit but definitely the cases that was postponed and deteriorated	1(0.8%)
Less complex cases (surgery lasting less than two hours)	27(22.1%)
Low risk patients	1(0.8%)
More urgent	1(0.8%)
Postponed or cancelled cases (Pre-COVID)	30(24.6%)
Semi-urgent cases	1(0.8%)
Should be postponed	1(0.8%)
What is the main factor stopping you from resuming elective surgery?	

Already started	1(0.8%)
Closed airports	1(0.8%)
COVID testing availability and turn-over	4(3.3%)
High mortality/morbidity rates published in the literature	1(0.8%)
Hospital facility capacity	3(2.5%)
Lack of access to ancillary services (e.g. Radiology, ICU, Anesthesia etc)	8(6.6%)
Local hospital administration	11(9%)
Ministry of health/ Government factors	57(46.7%)
Number of COVID-19 cases	22(18%)
PPE availability	3(2.5%)
Shortage of staff	7(5.7%)
Still a medical student	1(0.8%)
None	3 (2.5%)

Table 3: Resuming elective surgeries.

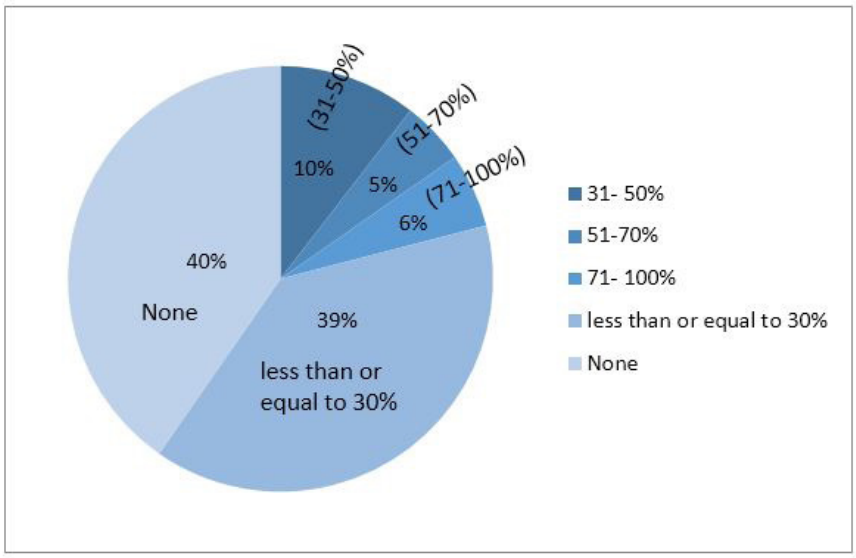

Figure 2: Percentage of elective cases in relation to usual load.

COVID19 Testing

In regard to testing patients for COVID-19 preoperatively as shown in (Table 4), approximately forty-four percent used one NP-PCR swab test and 48% tested patients 48-72 hours before surgery. Similarly, when testing surgeons and medical staff 46% indicated that their protocols test surgeons and medical staff for SARS-COV2 only when symptomatic, while 32.3% answered that their protocol is to test them when exposure to COVID-19 cases have occurred.

Testing protocol	Number (%)
What is your preoperative testing protocol in your hospital for SARS-COV2 for elective surgery?	
CT Chest only	4(3.2%)
Do not know	36(29%)
No routine testing, only if symptomatic	16(12.9%)
One NP-PCR only	55(44.4%)
One NP=PCR & CT chest	3(2.4%)
Two NP-PCR only	10(8.1%)
How often will you test patient preoperatively for SARS-COV2 for elective surgery?	
2 weeks and again 48-72 hours prior to surgery	7(5.6%)
24 hours prior to surgery	36(29%)
48-72 hours prior to surgery	60(48%)
Testing is not mandatory	21(16.9%)
How often will you test surgeon/medical staff for COVID-19?	
Every 2 weeks	17 (14%)
Every month	10 (8%)
Only when exposed to COVID-19 cases	40 (32%)
Only when symptomatic	57 (46%)

Table 4: Testing protocol and frequency for SARS-COV2 for elective surgery (n=124).

Utilization of Telehealth and Telemedicine

The role of telemedicine in the medical practice is summarized in (Table 5) as 81 out of 124 participants (40.7%) used telemedicine for patient's consultation, triaging and post-operative follow up and 81.5% think that it is a useful tool to use for their patients. As for team meeting, 40.7% of the participant are already using telemedicine for meetings.

The use of Telemedicine	
Did you use telemedicine for patient's consultation, triaging, and post- operative follow-up? (N=124)	
Yes	81(65.3%)
No	43(34.7%)
Do you think that telemedicine is a useful tool to use for your patients? (N=124)	
No	16(12.9%)
Yes	101(81.5%)
Do not know	7(5.6%)
Did you use telemedicine for team meetings? (N=123)	
No	33(26.8%)
Yes	90(73.1%)

Table 5: The uses of telemedicine in your center.

Discussion

Covid-19 pandemic caused a burden on the global health care system. With the high infectious rate of this virus, health systems put the major effort on taking care of the affected patients and controlling viral transmission. Elective surgeries were postponed in many countries with unclear strategy for their return and surgical patients waitlist accumulated in a way that require organized system with guidelines that can ensure healthcare workers and patients safety and equitable access to care. This survey aims to assess plans and current practices for return to surgery among those who practice in GCCC.

In a study that was conducted to estimate the number of cancelled operations in 190 countries during the 12 weeks peak of covid-19 cases, cancellation rates reached to 72.3%. The majority were benign cases (90.2%), 37.7% cancer cases and 25.4% elective cesarean sections. These rough estimates mean that surgical capacity needs to be increased by 20% for 45 weeks to overcome this disruption [5]. This study shows the effort that needs to be done by surgeons after the end of covid-19 crisis, however, it is limited by the lack of published surgical data in some countries and the unknown intensity of the pandemic.

Essential and clear strategies are needed to resume elective surgery in a safe and effective way. These strategies should include priority cases which have to be moved to the top of the waiting list as well as testing recommendations for patients who are planned for elective surgery. There are two main tests for Covid-19 according to CDC. The recommended test for diagnosing acute infection in symptomatic as well as asymptomatic cases is done through detecting the virus (SARS-CoV-2) nucleic acid or antigen in samples from the respiratory system (nasal and oral swabs or saliva). The other test is the antibody testing, which is not FDA approved yet and is not recommended by CDC [16]. Those that are scheduled for surgery should undergo nasopharyngeal swab to detect the viral antigen 24 hours prior to their surgery and isolated in their rooms with no visitations before any elective surgical intervention. Positive patients will have their operations postponed. This protocol needs to be followed regardless of patients' normal temperature and denial of respiratory symptoms [17]. According to a recent study that involved 96,454 patients from 114 countries, pre-operative isolation is no longer favorable as it increases the risk of pulmonary complications. Hence, we recommend vaccination and nasopharyngeal swab prior to elective surgery without isolating the patient [18]. We found that 44.4% of the participants used one NP-PCR preoperatively and 48% test patients 48-72 hours before surgery.

It is advised to give SARS-CoV-2 vaccination to the patients before undergoing any form of elective surgery. Multiple studies concluded that SARS-CoV-2 infection within thirty days of surgical intervention increases the rate of post-operative mortality, therefore preventing infection in surgical patients is necessary for their safety and protection [19]. Another study recommended waiting for 7 weeks after a positive COVID19 test to reduce the risk of mortality to control level [20]. One of the major causes of limiting surgical service to emergency operations during Covid-19 crisis is the fact that a lot of healthcare workers were affected by the virus and quarantined. The exact number of healthcare workers who tested positive for Covid-19 is still unknown and same global situation is present regionally, the number of healthcare workers with positive Covid-19 is increasing. According to BBC news, half of the accident and emergency consultants and nurses in Royal Gwent Hospital, Newport have tested positive for Covid-19 [21]. CDC recommends testing healthcare personnel in four situations: Presence of signs and symptoms consistent with Covid-19, asymptomatic healthcare profession with known or suspected exposure to the virus, asymptomatic healthcare profession without known exposure in special setting like nursing houses and healthcare professions who have been diagnosed with SARS-CoV-2 infection to determine that they are no longer infectious [22]. The four categories do not include testing healthcare personnel without known or suspected exposure to the virus in the usual hospital setting. Also, they do not solve the problem of silent viral transmission among asymptomatic healthcare workers and patients in hospitals. In a retrospective cohort study of 1096 patients done between 24th of February and 20th of April 2020 that included all patients who were diagnosed with Covid-19 in Kuwait and admitted to Jaber Al-Ahmad Hospital, it was found that 46.3% were asymptomatic on admission [23].

Healthcare workers' mental health has been affected in the ongoing pandemic as well. High proportion of them experienced anxiety, insomnia and depression. The most affected are the nurses according to a systemic review and meta-analysis of 13 cross sectional studies with a total of 33,062 participants [24]. In Kuwait, healthcare profession as well as students in health sciences faculties reported increased levels of anxiety and depression. Those who are in direct contact with COVID-19 patients had the higher prevalence of depression and anxiety as the majority reported experiencing concerns about being infected with SARS-CoV-2 or transmitting the infection to their families [25]. The learning experience for residents is affected by the pandemic as well especially in surgical specialties which require hands-on training. In a questionnaire based survey that included neurosurgical residents from the GCC to assess their awareness ,knowledge ,practice and safety measures about Covid-19, the majority of participating residents agreed that their training has been affected, 42% desired resuming elective surgery and none of the participants refused performing emergency surgery on Covid-19 positive patients [26]. Another survey included neurosurgery residents in Canada and the United States who reported reduction in patients flow and working hours as well

as responsibilities. Senior residents were the most concerned about their education [27].

At the time of conducting this study, it was found that 58% of the participants haven not started elective surgery in their hospital. However, 71% has already developed a protocol for resuming elective surgery and of those still planning 75% will consult local ministry of health or hospital guidelines for the guidance. From the centers who resumed elective surgeries, 38.7% started doing less than one third of the usual hospital load. Resuming elective surgery should start with preparation and planning followed by continuing elective surgery by 100% capacity and eventually increasing the capacity gradually to 140% to overcome the massive waiting list of surgical patients. It is also recommended to start performing elective surgery for healthier and younger patients during the current circumstances [28]. COVID-19 vaccination should be encouraged as well before undergoing elective surgery [17]. Moreover, as ICU capacity and healthcare resources improve, complex cases should take priority.

Telehealth is an important tool in Covid-19 outbreak response system. In a systemic review that was done to assess the role of telehealth in preventing, diagnosing and treating diseases; it was concluded that telehealth can preserve medical staff and equipment for the care of seriously ill Covid-19 cases, and can help in achieving social distancing by limiting congestion in the waiting rooms and HCW who are affected with covid-19 can work from a distance [29]. In our survey, 81.5% selected that it is a useful tool for patients and 40.7% used telemedicine for patient's consultation, triaging and post-operative follow up and for team meetings.

Conclusion

Kuwait and the GCCC face the same global challenges in the return of elective surgery and great efforts are needed to overcome the long backlog of elective cases after the end of Covid-19 crisis. Among the strategies that are recommended to help ending this crisis as well as protecting surgical patients are vaccination against SARS-CoV-2 infection and timely implementation dynamic national guidelines that address the rapidly changing variations in the number of cancelled elective cases, triaging and cases complexity, COVID-19 cases, deaths, ICU admissions along with healthcare workers availability, training, safety, mental health, and hospitals and operating room capacities.

Acknowledgment

The authors would like to thank Dr. Athari Alwael (Otolaryngology, Head and Neck Surgery Department in Al Jahra Hospital) and Dr. Maha Algilani (Otolaryngology, Head and Neck Surgery Department in Zain Hospital) for their contribution to the study concept and survey design and to acknowledge the role and efforts of the Women Surgeons of Kuwait Research Network (WSKRN), the Women Surgeons of the Gulf group for the dissemination of the research survey.

References

1. World Health Organization (WHO) Coronavirus Disease (COVID-19) Dashboard 2021.
2. "COVID 19 Updates" 2021.
3. World Health Organization (WHO) Coronavirus (covid-19) region-Kuwait 2021.
4. GCC Statistical Center - Coronavirus Pandemic Counts Map (COVID-19) for the Cooperation Council for The Arab Countries of the Gulf (GCC) 2021.
5. Stahel, Philip F (2020) How to risk-stratify elective surgery during the COVID-19 pandemic?." Patient safety in surgery 14.
6. COVIDSurg Collaborative (2020) "Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans." The British journal of surgery 107: 1440-1449.
7. Kuwait News Agency (KUNA) 2021.
8. Chaolin H, Wang Y, Li X, Ren L, Zhao J, et al. (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet (London, England) 395: 497-506.
9. Mallick, Odejinmi, Clark TJ (2020) Covid 19 pandemic and gynaecological laparoscopic surgery: knowns and unknowns." Facts, views & vision in ObGyn 12: 3-7.
10. Søreide K, J Hallet, J B Matthews, A A Schnitzbauer, P D Line, et al. (2020) Immediate and long-term impact of the COVID-19 pandemic on delivery of surgical services. The British journal of surgery 2020.
11. Verzaro, Roberto, Seigo Nishida (2020) The surgeon and the COVID-19 pandemic. International journal of surgery (London, England) 78: 160-161.
12. Wiseman SM, Crump RT, Sutherland JM (2020) Surgical wait list management in Canada during a pandemic: many challenges ahead. Can J Surg 63: E226-E228.
13. Herrod PJJ, Adiamah A, Boyd-Carson H, WES-Pi Study Group on behalf of the East Midlands Surgical Academic Network (EMSAN), et al. (2019) Winter cancellations of elective surgical procedures in the UK: a questionnaire survey of patients on the economic and psychological impact BMJ Open 2019.
14. Spinelli A, G Pellino (2020) COVID-19 pandemic: perspectives on an unfolding crisis. The British journal of surgery 7: 785-787.
15. "Action Plan for the Recovery of Surgical Services in England (May 2021)." The Royal College of Surgeons of England.
16. Centers of Disease Control and Prevention (CDC) website, Overview of Testing for SARS-CoV-2 (COVID-19).
17. Al-Muharraqi MA (2020) Testing recommendation for COVID-19 (SARS-CoV-2) in patients planned for surgery - continuing the service and 'suppressing' the pandemic. The British journal of oral & maxillofacial surgery 5: 503-505.

18. COVID Surg Collaborative, GlobalSurg Collaborative (2021) Effects of pre-operative isolation on postoperative pulmonary complications after elective surgery: an international prospective cohort study. Anaesthesia 76: 1454-1464.

19. COVIDSurg Collaborative, GlobalSurg Collaborative (2021) "SARS-CoV-2 vaccination modelling for safe surgery to save lives: data from an international prospective cohort study." The British journal of surgery 2021.

20. COVIDSurg Collaborative, GlobalSurg Collaborative (2021) Timing of surgery following SARS-CoV-2 infection: an international prospective cohort study. Anaesthesia 76: 748-758.

21. BBC, Coronavirus: 'half of A&E team' test positive 2020.

22. Centers of Disease Control and Prevention (CDC) website, Interim Guidance on Testing Healthcare Personnel for SARS-CoV-2 2020.

23. Almazeedi S, Al-Youha S, Jamal MH, Al-Haddad M, Al-Muhaini A, et al. (2020) Characteristics, risk factors and outcomes among the first consecutive 1096 patients diagnosed with COVID-19 in Kuwait. E Clinical Medicine 4: 100448.

24. Sofia P, Ntellac V, Giannakasc T, Giannakoulisc VG, Papoutsic E, et al. (2020) Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Brain, behavior, and immunity vol. 88: 901-907.

25. Alsairafi Z, Naser AY, Alsaleh FM, Awad A, Jalal Z (2021) Mental Health Status of Healthcare Professionals and Students of Health Sciences Faculties in Kuwait during the COVID-19 Pandemic. International Journal of Environmental Research and Public Health 18: 2203.

26. Alhaj, Ahmad & Al-Saadi, Tariq & Mohammad, Fadil & Alabri (2020) Neurosurgery Residents Perspective on the COVID-19: Knowledge, Readiness, and Impact of this Pandemic. World Neurosurgery 139.

27. Pelargos, Panayiotis & Chakraborty, Arpan & Yan, D. & Smith, Zachary & Dunn, Ian & Bauer, et al. (2020). An Evaluation of Neurosurgical Resident Education and Sentiment During the COVID-19 Pandemic: A North American Survey. World Neurosurgery 140.

28. "Kuwait Association of Surgeons" Return to elective surgery 2021.

29. Monaghesh, Elham & Hajizadeh, Alireza (2020) The role of telehealth during COVID-19 outbreak: A systematic review based on current evidence 2020.