

The effect of disruption due to COVID-19 on operating room utilization: Experience from a secondary care hospital in Riyadh, Saudi Arabia

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ABSTRACT

Introduction/Background: The disruption caused due to corona virus disease-2019 (Covid-19) has affected the overall health care delivery worldwide. The elective services were foremost to face the restrictions and closure, subsequently they were resumed only after adoption on newer protocols. **Aims:** We aimed to estimate the effect of COVID-19 restrictions on operative room utilization. **Methodology:** This is a retrospective descriptive study. The surgical volume indicators were calculated and a comparison was made between pre-COVID-19 (April-June 2019) and COVID-19 phase (April-June, 2020). Pre-operative covid assessment through the RT-PCR test among the cases waiting for elective surgeries. **Results:** Overall surgical volume decreased by 53%, which included 87% decrease in elective procedures and 8% decrease in emergency procedures. The overall OR utilization reduced by 63%. Highest reduction in the surgical volume was noted in bariatric surgery (no surgeries conducted in the COVID-19 phase), ophthalmology (99% reduction), and Ear, Nose and Throat surgery (ENT) surgery (92% reduction). Six patients tested positive for pre-operative RT-PCR from the sample of 261 cases posted for elective surgery during resumption phase of elective services, thereby giving the positivity rate of about 2.2%. **Conclusion:** We found a high level of reduction in the operating room utilization in a secondary care public sector hospital. The pre-operative assessment has enabled to find out the COVID-19 cases and hence preventing the unwanted spread of infection during the surgical procedures.

Keywords: COVID-19 disruption, elective surgery cancellation, operating room utilization, RT-PCR, Saudi Arabia

Introduction/Background

Coronavirus disease 2019 (COVID-19) was first reported in December 2019 in Wuhan, Hubei Province in China,^[1] which spread far and wide, within a short duration of time, leading the World Health Organization (WHO) to declare it as public health

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How to cite this article: Althaqeel MF, Alshanwani MN, Alqahtani K, Khan MS, Zeidan ZA, Mohaideen NK, *et al.* The effect of disruption due to COVID-19 on operating room utilization: Experience from a secondary care hospital in Riyadh, Saudi Arabia. J Family Med Prim Care 2022;11:5226-30.

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Received: 25-08-2021

Revised: 08-12-2021

Accepted: 20-02-2022

Published: 14-10-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1707_21

emergency of international concern on January 30, 2020,^[2] which was soon announced as a ‘pandemic’ on March 11, 2020.^[3] The COVID-19 first announced to be recorded in Saudi Arabia on March 2, 2020; soon the Government put all the recommended measures in-place in order to contain the local spread. The effect on these measures was reflected on healthcare services in the form of suspension of all the routine services including the elective surgeries which were later on partially resumed with prioritization of the cases.^[4,5] Globally, the elective surgeries were cancelled in order to tackle the burden imposed by COVID-19.^[6] It has been estimated that globally about more than 28 million surgeries were cancelled owing to the disruption caused by COVID-19 during the peak three month’s duration, noting that about 81.7% of those surgeries were benign conditions.^[7] In United States alone about 6 million surgeries were estimated to be cancelled per week during the same time period.^[8] The modeling estimates about Saudi Arabia reflected about 9410 cancellation of surgical procedures per week.^[8]

Cancellation of elective surgeries in response to COVID-19 had serious consequences on health of individuals and economy of the countries. The association of worse surgical outcome and higher mortality with the delay in treatment has been well argued for a large range of disease conditions.^[9] Progression to advanced stages, in certain types of cancers has been known to take place in a time period as short as one to two months, which result in increased treatment cost.^[9] Considering these consequences urged many countries to resume surgical services as soon the first wave of COVID-19 started to decline by June 2020. The resumption of the elective surgeries was only begun following the adoption of new protocols and strategies with respect to overall Operating Room functioning as well those concerning different surgical specialties. The guidelines were issued from all of the surgical specialties in order to adapt into new realms of health care delivery. Most of these guidelines focused on the maintaining a balance between patient prioritization and containing the spread of COVID-19 spread.^[10] Moreover, other challenges such as shortage in health human resources, disturbances in supply chain and infrastructural (operating rooms, ICU, prioritizing non-emergency vs. emergency case) were also the deciding factors in resuming the elective services.^[11]

The Saudi Centre for Disease control issued specific guidelines for infection control measures for elective surgeries.^[12] According to these recommendations; the patient is to be evaluated through the checklist, 24–72 hours before the surgery and on the day of surgery. The RT–PCR swab test for COVID-19 should be tested negative within the duration of two weeks. For all high risk and positive cases, the surgery should be deferred for at least two weeks.^[12] As a result, some of these cases may pile up to the new waiting list to increase the surgical backlog.

In Saudi Arabia, studies have been conducted on the impact of COVID-19 across the specialties;^[10,12-15] however, not much has been studied on the surgical volume affected overall in a secondary care hospital, which prompted us to undertake this study. The present study had been taken up in King Salman Hospital in First central health cluster, Ministry of Health, Riyadh, Saudi Arabia,

with following objectives: To assess the effect of COVID-19 on OR utilization during the pre-COVID-19 and COVID-19 phase.

Materials and Methods

Study design: Retrospective record-based study. A secondary data analysis was performed on the operating room (OR) data.

Study setting: King Salman Hospital in First Central Health Cluster, Ministry of Health, Riyadh, Saudi Arabia.

Study period: Following periods were considered for the data analysis –

1. **Pre-COVID-19 Phase:** Second Quarter of 2019, from April to June 2019
2. **COVID-19 Phase:** Second Quarter of 2020, from April to June 2020.

The surgical volume indicators were compared between these two phases, to quantify the effect of disruption.

Data Management: The Operating Room (OR) records were used as a primary source of data. The Surgical volume indicators were calculated and compared between the period of pre-COVID-19 and COVID-19 phase as defined in the previous section. Identical time period (second quarter) has been selected for the two subsequent years in order to maintain the comparability. After the resumption of the elective surgical services in July 2020, the efforts were made to clear the surgical backlog. The patient who had a booked appointment in elective surgical waiting list, were contacted to offer fresh appointments as per their sequence in the waiting list. Such patients were scheduled for elective surgery after getting clearance from the respective surgical specialty. Secondly they were subjected to screening through checklist for symptoms related to COVID-19 and RT-PCR test for SARS-corona virus. We collected the RT–PCR data for these scheduled cases and cross checked with their acceptance for the surgery on the scheduled date. The effect of result of RT–PCR on the elective surgery (surgeries conducted or delayed or postponed) was calculated and presented. The univariate data are presented as frequency and percentages. MS Excel was used for basic data processing and analysis.

Ethical consideration

The study was approved from Institutional Review Board, King Saud Medical city, Ministry of Health, Kingdom of Saudi Arabia. A formal permission for conducting the study was also taken from the King Salman Hospital administration.

Results

Impact on surgical volume

As shown in Figure 1, total 973 surgeries were performed in the second quarter of 2019, which went down to about 462 in the second quarter of 2020 indicating about 53% decrease between two phases. An overall decrease of about 84% was

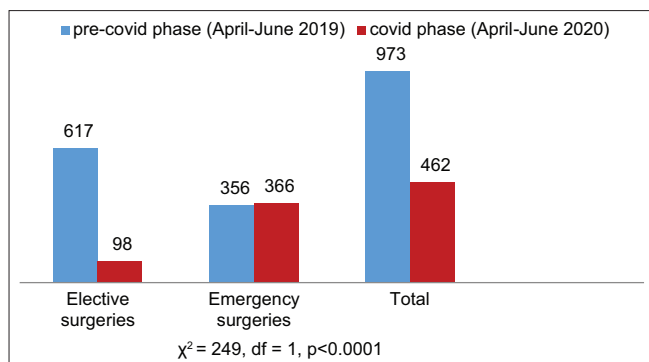


Figure 1: Surgical volume between pre-COVID and COVID disruption phases

noted in the elective surgeries between pre-COVID and COVID phase (617 vs. 98), while about 3% increase was observed in the emergency surgeries (356 vs. 366). Overall OR utilization went down to 24% in second quarter of 2019, as compared to 64% in second quarter of 2020.

The effect on the surgical volume in some of the major surgical departments is shown in Figure 2. Comparing with pre-COVID-19 phase, while most of the department had reduction in the overall number of surgeries conducted, some of the specialties (such as orthopedics and plastic surgery) had overall increase in number of surgeries in the COVID-19 phase, due to increase in the emergency surgeries. For instance, in orthopedic surgery, a surge (63%) was noted in the emergency surgeries, while the elective surgeries had a drop of 27%, thereby, an overall increase of 22% was observed.

Highest reduction in the surgical volume during COVID-19 phase as compared to pre-COVID-19 phase was noted in bariatric surgery (no surgeries conducted in the COVID-19 phase), ophthalmology (99% reduction), and ENT surgery (92% reduction). The specialties which had lowest reduction in the surgical volume during these two phases were; 'Obstetrics and gynecology' (39% reduction) and general surgery (41% reduction).

Impact of pre-operative RT-PCR screening on the elective OR services

Figure 3 is depicting the protocol adopted for clearing the backlog of waiting list for elective surgeries, following the resumption of elective surgeries in July 2020. All the patients in the waiting list were contacted to assess their status and willingness for the surgery. The patients who had already underwent the surgery; those who expressed non-willingness to get operated (due to general COVID-19 situation or other reasons) and those who could not be contacted despite three attempts on different occasions, were excluded from the main waiting list. Depending upon the number of appointment/slots for the duration of July 19 to December 16, 2020, a total of 291 patients were issued the appointment.

All of these 291 patients who were allotted appointments were instructed to get evaluated in the respective specialties for

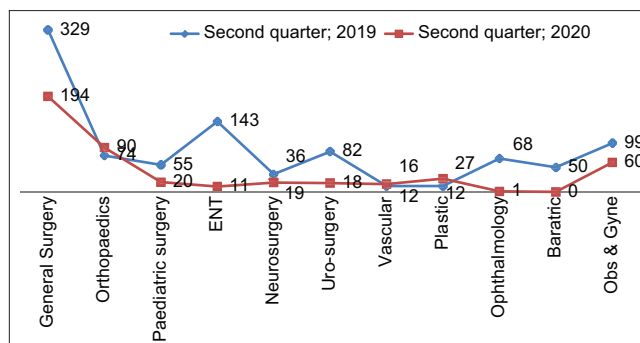


Figure 2: Comparison of surgical volume between pre-COVID and COVID phase in different specialties

pre-operative assessment. A total of 30 cases were removed from this list due to requirement of clinical re-evaluation and were referred to respective Outpatient department ($n = 10$), medical reasons ($n = 5$) and patient request ($n = 13$). So, a total of 261 patients were scheduled for the surgeries. Among these, six patients tested positive during pre-operative assessment through RT-PCR, thereby giving a positivity rate of about 2%. Other reason for the deferring of the scheduled surgery date included, probable COVID-19 ($n = 5$), sample rejection for RT-PCR ($n = 4$), non-availability of result ($n = 3$). So, about 7% surgeries were affected due to pre-operative COVID-19 assessment (20/261) which resulted in either delay or postponement in the surgery until a negative RT-PCR test.

Discussion

We have reported the impact of COVID-19 restriction on OR performance in a secondary care public hospital. Our hospital is one of the most important health care facilities in Riyadh, serving as referral center for about one million populations. The impact of COVID-19 has been previously reported in Saudi Arabia, while some of these studies^[13-15] have reported a generalized overview of the adaptive functioning in the context of COVID-19 in respective specialties, one study has reported impact on services.^[16]

While comparing the OR performance in pre-COVID-19 phase and COVID-19 phase, overall, 53% decrease was noted in the surgical volume in our hospital. A study conducted in an orthopedic hospital in Northern Italy, a total 57% decrease was reported in operative procedures.^[17] However, we had an overall increase in surgical volume in orthopedic surgery due to huge surge in emergency surgeries cases. In a systematic review, the orthopedic elective surgeries have been estimated to be decreased by 33.3% to 100%, while the decrease in trauma surgery has been estimated to be 37.7% to 74.2%.^[18] In the urological surgery, we found an overall decrease in 78% in the surgical volume. This finding is corroborated by a multi-site national study, whereby, overall urological services have faced more than 75% decrease in Saudi Arabia with 34% decrease in the elective procedures compared to first third of 2019.^[16] The highest reduction in the bariatric surgery and ophthalmic surgeries in our study can be explained by the fact that these cases are operated only as elective

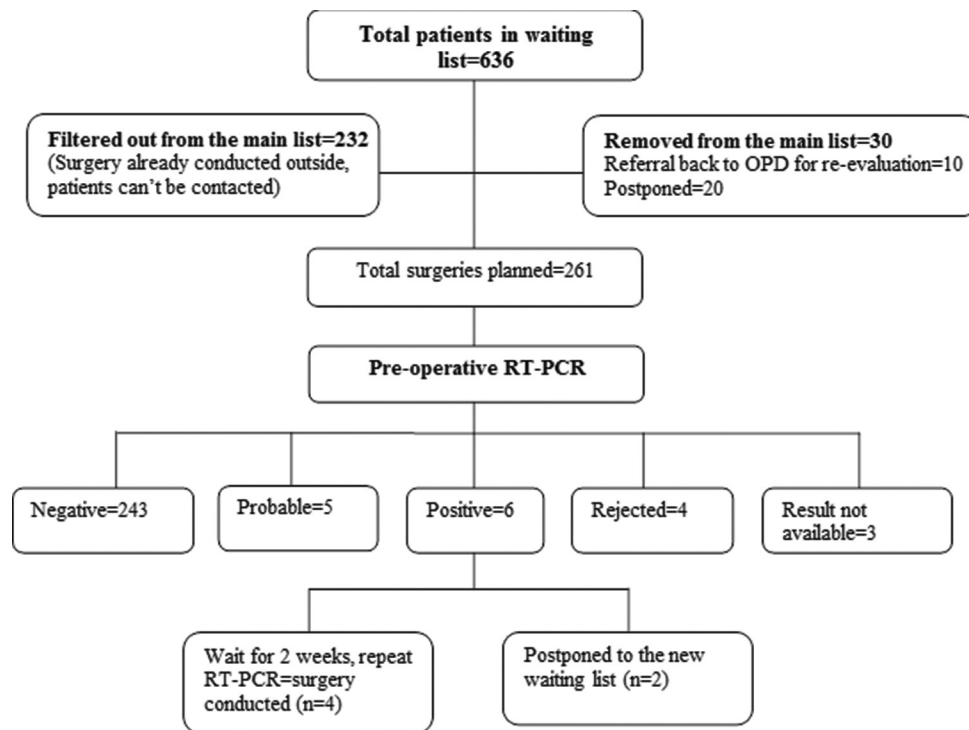


Figure 3: Protocol adopted for clearing the backlog of elective surgeries

surgery. Complete closure of ophthalmic surgeries is a matter of great concern for the overall health system. It has been estimated in United States that there would be 1.1 million to 1.6 million cataract cases as backlog by 2022.^[19]

In our study, less than 10% of the patients scheduled in the OR list were affected due to reasons including positive test, rejected samples, probable test. We found six patients got tested positive out of total 261 patients. These cases were rescheduled and surgeries were performed after a negative result. In a similar study conducted in a tertiary eye care center in South India, among the preoperative patients posted for elective or emergency ophthalmic surgery, who had no symptoms suggestive of COVID-19, 10 patients were found to be positive through RT-PCR among the total of 204 patients.^[20]

The RT-PCR has been adopted as an important tool for pre-operative screening of elective surgical patient along with the clinical evaluation. This was adopted in order to safeguard the patients and healthcare staff. However, there have been concerns expressed regarding relying on this protocol as it is insensitive in detecting the SARS-CoV-2 during the incubation phase. Other measures such as observing strict home quarantine for a period of two weeks have been argued to overcome this limitation of RT-PCR.^[21] Secondly, in post-operative period, there is high risk of contracting COVID-19 among the patients with co-morbidities. Therefore, stricter pre-operative screening with post-operative monitoring is highly recommended for such patients.^[22]

All the included cases in this were free from any COVID-19-related symptoms as recorded during their clinical evaluation on the day

of surgery, so the result corroborate with the screening in an asymptomatic community. In this study, we have only focused on pre-operative RT-PCR and it would have been more prudent to find out the proportion of patients contracting the COVID-19 during the immediate post-operative period.

Most of the secondary care hospital attendees in the Saudi Hospitals are referred through the well-established primary health care system. The disruption in the secondary care services ultimately affects the primary care services, leading to increased load. On other hand, the delay in the operative procedures create a pool of diagnosed patients, who, on experiencing breakthrough complaints present to the primary care. In the new model of health system in Saudi Arabia, the health care has been envisaged to be provided through accountable care organization (ACO) wherein the collaboration between different systems in deeply embedded, especially on the economic perspectives.^[23] Collaboration between primary and secondary care has been advocated to manage the overall care organizations.^[24]

Conclusion

We found a significant impact of the COVID-19 disruption on the OR utilization in our secondary care hospital setting. Since, this is the healthcare level just above primary healthcare services; this disruption represents a huge loss to the patients, immediate healthcare provider as well as the overall healthcare organization. The healthcare administration at the hospital level as well as the higher-up need to employ more innovative strategies to improve the OR performance affected by the COVID-19 disruption. RT-PCR has the distinct utility in the pre-operative screening

in elective surgeries, to prevent the spread of COVID-19 in the healthcare settings. However, alternative strategies need to be taken into account depending upon the clinical condition of the patient and the level of spread of COVID-19 in the local community. The positivity rate of pre-operative RT-PCR corroborate with case finding in asymptomatic subjects.

Acknowledgements

We are thankful to the OR administration, King Salman Hospital in data retrieval.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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