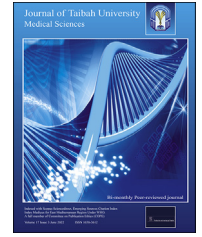




Taibah University

Journal of Taibah University Medical Sciences

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Original Article

Pattern of neurosurgical practice at a university hospital in KSA during COVID-19 pandemic

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Received 17 August 2021; revised 26 October 2021; accepted 28 October 2021; Available online 14 December 2021



المخلص

أهداف البحث: تأثرت الخدمات الطبية ودخول المستشفى الاختياري بجائحة فيروس كورونا. حاولت تخصصات متعددة دراسة تأثير الوباء على خدماتهم. تهدف إلى دراسة تأثير هذا الوباء على خدمة جراحة الأعصاب في مستشفى جامعة الملك عبد العزيز بجدة على مدى ثمانية أشهر.

طرق البحث: في هذه الدراسة الاستيعابية لسلسلة الحالات من مركز واحد، قمتنا بتضمين جميع مرضى جراحة الأعصاب الذين خضعوا لتدخل جراحي من 3 مارس 2020 إلى 3 نوفمبر 2020 لمدة 8 أشهر. تم جمع البيانات الديموغرافية للمرضى، والتشخيص، ونوع الجراحة، وفترة الأولوية، وبيانات الوفيات.

النتائج: خضعت 147 حالة لعملية جراحية خلال فترة الدراسة. كان متوسط العمر 30.8 سنة. كان 49% من مجتمع الدراسة من الرجال. كانت حالات الأورام وموه الرأس أعلى عدد من الحالات بنسبة 31.3% و 23.8% على التوالي. وكان أكثر من نصف الحالات قضايا ذات الأولوية الأولى (عاجلة) وخلال 24 ساعة). وبلغ معدل الوفيات 4.1% بين الحالات التي تم إجراؤها.

الاستنتاجات: من خلال وصف هذه التجربة في جراحة الأعصاب المحلية أثناء جائحة كوفيد-19، نأمل في إظهار بعض الصعوبات التي واجهناها، وتحسين ما تعلمناه خلال الوباء الحالي.

الكلمات المفتاحية: جراحة الأعصاب؛ كوفيد-19؛ جائحة؛ السعودية؛ دراسة استيعابية؛ نمط الممارسة.

Abstract

Objective: The coronavirus disease 2019 (COVID-19) pandemic affected both medical services as well as hospital admissions. Scholars have attempted to study the effect of the pandemic on the services of multiple specialities. In this study, we aim to examine the pandemic's impact on the neurosurgical service provided at the King Abdulaziz University Hospital in Jeddah over an eight-month period.

Methods: In this retrospective, single-centre case series study, we included all the consecutive neurosurgical patients who underwent a surgical intervention in the 8-month period starting on 3rd March, 2020 and ending on 3rd November, 2020. The demographics, diagnosis, surgery type, priority category, and mortality data of the patients were collected.

Results: A total of 147 patients underwent surgery during the study period. The mean age was 30.8 years. Forty-nine percent of the study population were men. Oncology (31.3%) and hydrocephalus (23.8%) recorded the highest number of cases. More than half of the cases were Priority 1 (immediate and within 24 h). The mortality rate was 4.1% among all the performed cases.

Conclusion: By describing this local neurosurgical experience during the COVID-19 pandemic, we hope to bring out some of the difficulties we encountered and improve what we learned during the pandemic.

Keywords: COVID-19 pandemic; KSA; Neurosurgery; Practice pattern; Retrospective study

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Peer review under responsibility of Taibah University.



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Introduction

The novel coronavirus, reported first in the Wuhan region of China continued to spread to countries around the globe. By March 11th, 2020, the World Health Organization (WHO) declared COVID-19 as a global pandemic.¹ The symptoms of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) range from mild cold-like presentation to acute respiratory distress syndrome and respiratory failure.² The severity of the disease varies among the infected individuals depending on their age, comorbidities, and immune response.

On 2nd March, 2020, the first case of COVID-19 was diagnosed in KSA. In less than two weeks, the number of diagnosed cases locally surpassed 100. Since then, the Saudi government has taken many steps to combat the spread of the local virus and mitigate its effects on our population.³ The Saudi Patient Safety Center (SPSC) and Ministry of Health (MOH), in collaboration with various public and private sector stakeholders, cooperated to mitigate the effect of the pandemic on patient access and care. The Saudi Association of Neurological Surgery (SANS) formed a task force to produce a consensus statement for triaging surgical patients. This statement, drafted in collaboration with the local experts in the field from all the healthcare sectors, prioritised neurosurgical cases into four significant priorities, which were defined clearly for them to be intervened over a specific time period.⁴

Recorded as having one of the largest neurosurgical centres in the western province, King Abdulaziz University Hospital (KAUH) continued to provide neurosurgical services to the local population during the pandemic. As a result, our study aims to examine the neurosurgical practice at an academic institute in the western province of the Kingdom after implementing the SANS patient triaging plan.

Materials and Methods

Study design and setting

We conducted a retrospective, single-centre, case series study. Our study included all the consecutive neurosurgical patients who underwent a surgical intervention at KAUH, Jeddah. The study period was defined as 3 March 2020 to 3 November 2020. IRB No. 401-21 consent was obtained from all participants. We followed the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines when reporting this study.

Data source and variables

Data were collected retrospectively from the hospital operating room records by accessing all the cases performed by the neurosurgical service during the given time period. Once the cases were identified, the other parameters were retrospectively collected from the hospital's electronic medical records and patient chart reviews.

We identified the demographics (including age and sex), admission and discharge date, diagnosis, diagnosis category, surgical procedure performed on, priority category, and mortality of the patients. According to the SANS consensus statement, patient triaging priority is defined via the use of three colour-coded domains: red (Priority 1: within 24 h), orange (Priority 2: from 24 h to 1 week; and Priority 3: from 1 to 4 weeks), and yellow (Priority 4: intervention can be performed for more than four weeks).⁴

Statistical analysis

Descriptive data were analysed to assess the available data. Data were presented as mean (standard deviation [SD]) and frequency (percentage [%]). We utilised Stata 14 statistical software (StataCorp LLC, College Station, Texas, USA) for the descriptive data analysis.

Results

We assessed the 147 consecutive neurosurgical cases performed at the KAUH since the start of the pandemic in KSA. The mean age was 30.8 years (standard deviation is 23 years). Women constituted 51% of the study cohort. Oncological cases constituted one-third of the performed cases (Figure 1) during the pandemic durations, followed by cases of hydrocephalus, vascular, and spine (Table 1). While a total of 91 (61.9%) of the 147 cases were admitted through the emergency

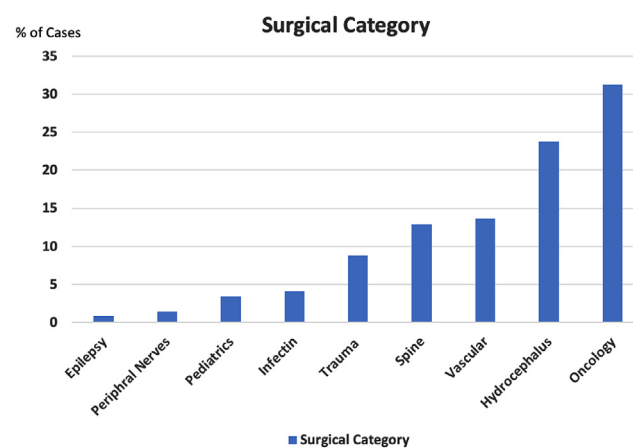


Figure 1: Percentage distribution of cases by surgical category.

Table 1: Demographics of the patients.

Variable	n = 147
Age, year, mean (SD)	30.8 (23)
Gender	
Male, n (%)	72 (49)
Female, n (%)	75 (51)
Diagnosis category	
Trauma, n (%)	13 (8.8)
Oncology, n (%)	46 (31.3)
Spine, n (%)	19 (12.9)
Vascular, n (%)	20 (13.6)
Hydrocephalus, n (%)	35 (23.8)
Peripheral Nerve, n (%)	2 (1.4)
Infections, n (%)	6 (4.1)
Epilepsy, n (%)	1 (0.7)
Paediatrics, n (%)	5 (3.4)
Priority of the case	
Priority 1 (immediate), n (%)	80 (54.4)
Priority 2 (1–7 d), n (%)	16 (10.9)
Priority 3 (1–4 w), n (%)	33 (22.5)
Priority 4 (>4 w), n (%)	18 (12.2)
Complication	
General, n (%)	2 (1.4)
Craniospinal, n (%)	18 (12.2)
30-day mortality, n (%)	6 (4.1)

department, the rest were admitted through clinic visits. A majority of the cases, i.e., 80 (54.4%), were Priority 1 (immediate and within 24h) cases (Figure 2). Fifty-one percent of the patients who underwent surgery had a negative COVID-19 swab test, while 47.6% of the patients did not reach the MOH screening score threshold to undergo testing. Only one of the patients who tested positive for COVID-19 in our surgical series presented the case of cerebellar tumour requiring emergency craniotomy and resection under the COVID-19 intraoperative precautions (Figure 3). The median hospital length of stay was 9 days (IQR 5-24). Complications were divided into craniospinal and general complications. While 18 (12.2%) patients had craniospinal complications, 2 (1.4%) patients developed general complications. No COVID-19 related complications occurred among the patients. A 30-days mortality was reported in 6 (4.1%) of the 147 cases.

Priority of Cases in Accordance to the SANS Priority List

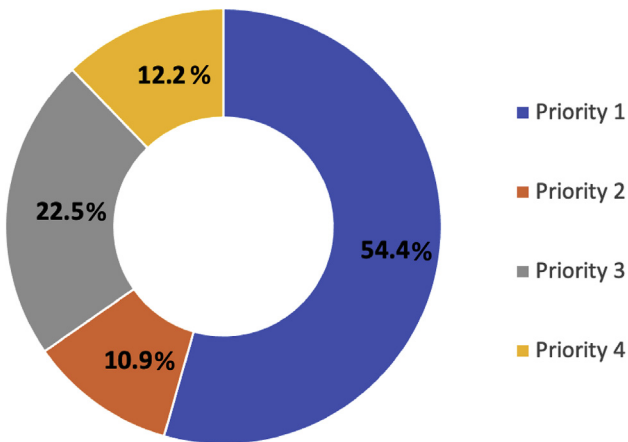


Figure 2: Priority of cases in accordance to the SANS priority list.



Figure 3: Intraoperative precautions and utilization of the personal protective equipment (PPE).

Discussion

The effect of the COVID-19 pandemic on our neurosurgical service was comparable to those reported in the literature locally and internationally.⁵⁻⁷ When examining our local neurosurgical practice at KAUH, there is no doubt that the COVID-19 pandemic caused a shift in our work and the number of daily cases we handled. As the pandemic spread throughout the world and region, our systems have adapted and managed their resources.

Right from the time the first case of COVID-19 was diagnosed in KSA, i.e., 2nd March, 2020, the government has continued to make every effort to flatten the disease curve and maintain a control over the spread of the pandemic. In less than two weeks, the number of cases reached 100, and by March 26th, 2020, the number of cases exceeded one thousand.⁸ Looking at how fast the illness spread, the Saudi government was one of the first to take drastic measures to deal with this unfolding crisis. During the current pandemic, it is evident that the preparedness for such an event was high as the Saudi government had built on its previous experiences with the Middle East respiratory syndrome coronavirus (MERS-CoV) that occurred in 2012.⁹

The National Command and Control Center was established to follow up on the cases, establish updated measures based on the incoming daily data, limit the viral spread, and enhance the utilisation of the healthcare system to compete with this new disease.^{8,10} Multiple regulations and initiatives have been introduced throughout the pandemic across the country, such as the suspension of the Umrah pilgrimage and Almadinah Almunawwarah visitation, the temporary closure of the two holy mosques in Mecca and Almadinah Almunawwarah, the suspension of direct flights, and the introduction of a nationwide curfew. All these efforts helped flatten the pandemic curve and maintain low mortality in KSA in comparison to the other nations.⁹

King Abdulaziz University Hospital swift adapted to the situation in hand, similar to the other institutions. As one of the measures that had to be carried out by the administration

and due to hospital-wide rearrangement, the neurosurgical service operative room elective time was cut by 75% of the regular time allocated. As in-person clinics had been cancelled, most of the cases booked were through the emergency department, rather than clinics. Multiple organisations provided guidelines and consensus statements concerning the perioperative management of surgical patients during the COVID-19 pandemic, including the Latin American Federation of Neurosurgical Societies (FLANC), Congress of Neurological Surgeons (CNS), and the Saudi Association of Neurological Surgery (SANS).^{4,11,12} Perioperative care of patients during this pandemic dictated the importance of the proper use and conservation of personal protective equipment (PPE). During that time, our hospital administration and infectious disease department collaborated with KAUH Simulation and Clinical Skill Centre to provide dedicated teaching sessions on donning and doffing of PPE.

Additionally, the infectious disease team continued to provide support and updates regarding the guidelines and management options as the disease unfolded. During the pandemic, our service was divided into two teams; each team consisted of three consultants, three residents, and one hospital specialist staff. Each team covered the neurosurgical service for one whole week and endorsed patients electronically through teleconferencing to the incoming team. During that time, each team member was prohibited from interacting with the members of the other team to decrease the probability of cross-infection among our staff members. During this period, there was no case of COVID-19 infection among the neurosurgical team members.

During the pandemic, our hospital activated the online portal "Shifaa" to assist patients in activities such as booking of appointments, refilling of medications, and using of tele-clinics. As access to health care was restricted during the lockdown period for non-urgent cases, virtual clinics provided medical consultations. In addition, patients with urgent medical needs were encouraged to visit the emergency department for prompt assessments.

The continuous use of universal precautions during patient care is of utmost importance to decrease the possibility of spreading the disease. During the pandemic, our hospital utilized a COVID-19 specific patient care pathway, with specific intensive care units, floors, and corridors. All the non-COVID-19 cases were managed in different designated floors and in a separate intensive care unit. Alsafayan et al. conducted a national retrospective study assessing COVID-19 symptoms and demographics during the first month of the pandemic, and found 12.5% of the screened patients to be individuals who work in a health care facility. Among those tested positive, 17.4% were working in healthcare facilities. This echoes the importance of paying particular attention to universal precautions and patient separation to decrease the probability of cross-infection.¹³

Multiple steps have been introduced at our hospital since the start of the pandemic to limit the spread of COVID-19 infections during surgery, including (1) considering all the patients undergoing emergency procedures as COVID-19 positive until they are proven otherwise, (2) encouraging the utilisation of negative pressure operating rooms (OR),

was highly advocated especially during the aerosol-generating procedures, (3) limiting movement to and from ORs by decreasing the number of team members to the bare essential, (4) ensuring that all the members of the medical team wear the necessary and proper PPE, and are trained to dispose of all the PPEs and ORs appropriately. In line with the local guidelines published by the ministry and local authorities, face shields with goggles, caps, and N95 masks were used during surgical procedures, unless it was deemed necessary by the local infectious disease control service to utilise a higher-level PPE as powered air-purifying respirators (PAPRs).

In addition, one of the most crucial steps is to continue to provide transparent and up-to-date horizontal and vertical communication across all the levels of the organisation. Risk minimisation during an outbreak is encouraged and reiterated by the department chairs and hospital administrations.

It was not that the pandemic affected education lesser than the other aspects of our daily medical lives. Because of the pandemic, all the teaching activities for students, interns, and residents were switched to online platforms. This is in line with the international trend of postgraduate teaching during the pandemic.¹⁴⁻¹⁶ Sabharwal et al. reiterated the importance of continuing to provide education to trainees while also maintaining all the safety measures to prevent infection. At our institute, we continued to provide distant didactic teaching to our trainees through online platforms locally and in collaboration with the webinar series of SANS Academy.¹⁶

At our institute, we adopted the Saudi Association of Neurological Surgery (SANS) patients' priority system to triage patients into four major categories to direct neurosurgical patient care. In our study, most of our patients (54.4%) were Priority 1 cases, showing a major observed shift in patient care to acute care cases. In a national multicentre study assessing the early impact of COVID-19, from March 5th, 2020 until May 2020, they showed Priority 1 cases to comprise of 37.6% of the cases performed. Our results were comparable when looking at the priority four cases where we had 12.2% of our patients compared to 15.6% in the early national study. In addition, our patients' median length of stay was 9 days (IQR 5-24), while the national median length of stay was 6 days (IQR 3-14).

When comparing the pandemic period to the period a year prior, a national multicentre study comparing the 11 weeks during COVID-19 to the period a year prior reported a 30-40% week-to-week drop in the number of cases during COVID-19 in comparison to the period a year prior.^{17,18} Several authors noted a change in the pattern and volume of cases during the pandemic, as has been reported by Fujimoto et al. and others.^{7,17,18} With this decline in the number of cases performed nationally during the first three months of the pandemic, most of which were Priority 4 cases, our experience is similar to that published in the early stages of the pandemic. Looking at that, we have to pay attention to the delayed cases that are not to be missed and formulate a plan to accommodate the anticipated waiting list that we all will be facing in the post-pandemic period. During the study period, our

mortality rate was 6/147 (4.1%), while 1.7% 30-day mortality was reported nationally among 474 neurosurgical patients.⁶ When we examined the mortality cases, none of them were related to COVID-19. This higher-than-average rate might be associated with the low number of cases in our current series and the high number of acute cases in our series.

There are multiple reasons that can explain why we noticed a decline in the surgical load, which may have been attributed to the lockdown effects at the beginning of the pandemic. As we move forward from the lockdown period, other reasons for the decline in numbers might be explored, such as fear of contracting COVID-19 during hospital visits, clinic closure, and PPE shortage. While these phenomena are beyond the scope of this study, it is important that they are pursued in future research.

Our study has several limitations. One of the limitations is that of the study having a retrospective design and reporting a single-centre experience. Another limitation is that of the study not assessing the effect of the pandemic period on the patient's waiting list, which is an important area that needs to be addressed by future research.

Conclusions

This study, which describes our local neurosurgical practice during COVID-19, continues to emphasise the continued demand for multiple neurosurgical subspecialties such as neurosurgical oncology, hydrocephalus, and vascular neurosurgery. Despite the pandemic, it is imperative to continue providing these essential services and a clear path of access to patients and their families.

Source of funding

This research did not receive any specific grant from any of the funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no conflict of interests to declare.

Ethical approval

This study was approved by the Unit of Biomedical Ethics Research Committee at King Abdulaziz University IRB No. 401-21 final approval on 10th August 2021.

Authors contributions

RS, KB, AS, SA, MA, and SB conceived and designed the study, conducted research, provided research materials, and collected and organised the data. RS, KB, and SB analysed and interpreted the data. RS, KB, and SB wrote the initial draft of the manuscript. RS, KB, AS, SA, MA, and SB critically revised the work. SB provided the logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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How to cite this article: Saeedi R, Bajunaid K, Sabbagh AJ, Alomar S, Alyousef M, Baeesa SS. Pattern of neurosurgical practice at a university hospital in KSA during COVID-19 pandemic. *J Taibah Univ Med Sc* 2022;17(3):448–453.