



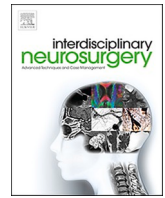
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# Interdisciplinary Neurosurgery: Advanced Techniques and Case Management

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Review Article

## Impact of COVID-19 on neurosurgical service: A one-year experience from a provincial countryside hospital in a rural area in north Egypt

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## ABSTRACT

**Background:** Globally, there is a shooting pandemic that affected many healthcare systems. Healthcare facilities had to set up strategies to avoid exhaustion while facing a catastrophic health problem. Vaccines or perfect therapies were not available over a long pandemic time and also no certified immunity against that disease is guaranteed. Therefore, it is probable that healthcare systems will face it for an exceptionally long period. That already had a grave effect on the strategy of daily practice of different specialties' services at healthcare centers. **Methods:** We tried simply to share a countryside hospital's expertise in managing neurosurgical cases amid a dreadful health crisis. Healthcare workers' safety and patient safety were typical priorities for neurosurgical service at Damietta Specialized Hospital. We expose the lines of management, triaging cases, the methods of handling confirmed and suspected neurosurgical patients, and strategies for discharging and following up patients. We identified hospital admission and discharge records starting from February 2020 till February 2021 to track the neurosurgical case burden, the state of service offered and the rate of infection among healthcare workers who participated in surgeries.

**Results:** At the peak time of the COVID-19 pandemic in Egypt starting from February 2020 till February 2021, we have admitted about 500 neurosurgical patients. About 400 (80%) of them did surgeries according to the triaging protocol of the hospital. About 150 (30%) of those who did surgeries were urgent and the rest were borderline or semi-urgent. About 20 (4%) were tested COVID-19 positive and six of them died due to acute respiratory distress syndrome. Only two mortality cases were reported due to post-operative complications and not related to SARS-CoV-2 infection. The rest of the cases (97.6%) were discharged for follow-up without complications. No neurosurgeons but three anesthesia staff were infected with SARS-CoV-2. A successful undisturbed neurosurgical care was available for patients during COVID-19 time.

**Conclusions:** Following the suggested strategies, a rural area-serving hospital managed to provide uninterrupted neurosurgical care amid COVID-19 pandemic in Egypt. Rural areas in developing countries are in need of strategies to deal with pandemics in the future without dismantling the normal health system, especially for life-saving cases in a critical specialty as neurosurgery.

### 1. Introduction

COVID-19 infection spread like a hurricane striking the medical system in both low- and high-income countries. In December 2019, an outbreak of a respiratory disease occurred in China, and later, it involved many countries [1]. The most common presenting symptoms are fever (87.9%), dry cough (67.7%), and fatigue (38.1%) [2]. COVID-19 infection clinically has an incubation period ranging from 1 to 14 days, which is a sufficient time to spread the infection even with

being asymptomatic. Governmental restrictions over travel, especially from high-risk countries like China and Italy, were imposed over the whole country. Lockdown, social distancing, and banning all social gatherings were the possible ways the Egyptian government used to minimize the spread which seemed to be inevitable, especially in Cairo, the epicenter of the pandemic in Egypt.

There is an urgent need to provide an update about different protocols that hospitals used during the pandemic. It was early March when the first case of COVID-19 was reported in Egypt, since then profound

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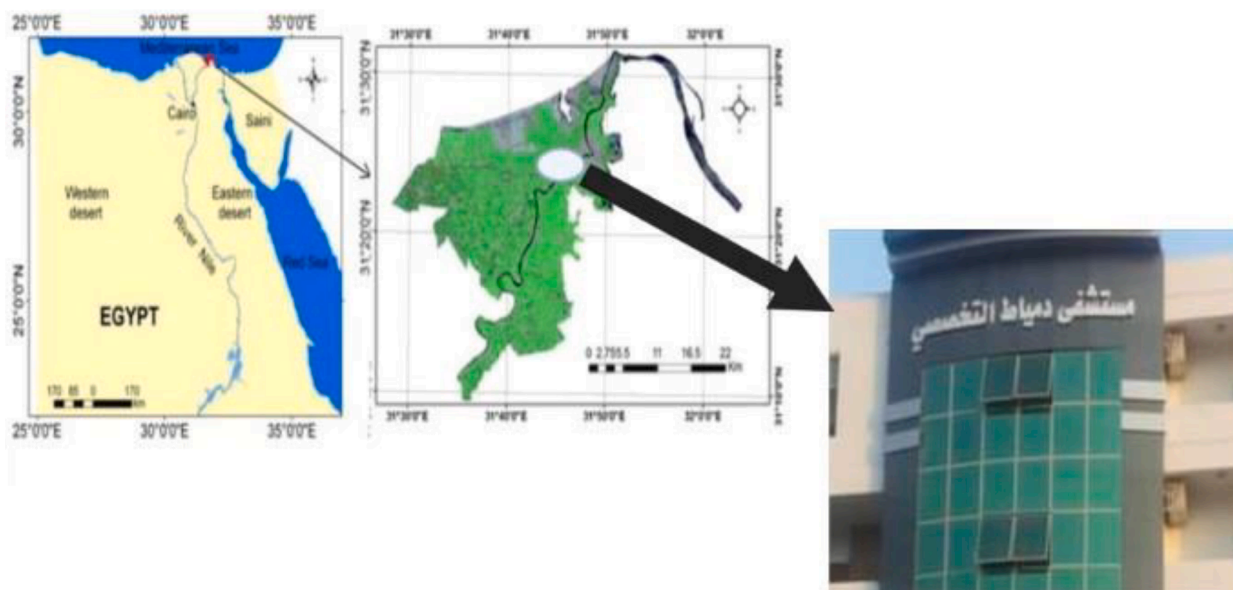


Fig. 1. Damietta is a rural government in the delta of north Egypt where Damietta Specialized Hospital serves a cohort of population in this area.

measures were sorted out to protect physicians and patients and to offer health facilities as much as we can to maintain proper health care for neurosurgery patients. Internationally, there was a common call to suspend elective neurosurgical procedures to reduce the transmission of the infection among healthcare workers [3]. Although some surgeries can be postponed, others cannot be delayed for the fear of disease progression. The neurosurgery field includes a myriad of borderline cases that are difficult to be classified as urgent or semi-urgent, for example, a non-ruptured aneurysm in a fully conscious patient or a fully conscious patient presenting with a large tumor with a pending herniation. Rural areas in a developing country like Egypt usually suffer from a deficiency in highly specialized surgical facilities as neurosurgery and plastic surgery. Damietta specialized hospital serves a great cohort of population located in the Egyptian Delta as in Fig. 1. Rural population suffers from a low grade of education which makes them more liable to transmissible infections as COVID-19. We tried in this article to show how the pandemic subsequently changed the practice in neurosurgery at a rural hospital in Damietta Government in North Egypt.

## 2. Workforce management

On the administrative level, human resources officials executed a strict order to prevent any unnecessary work leaves to exploit all the available workforce during the pandemic. Strict regulations were applied to stop gatherings and to apply social distancing with 2 m allowed between each person in the hospital. Communicating administrative rules between staff persons was done through electronic routes as e-mails, chatting, and messaging to avoid in-person contact. That reduced the need for meetings that may expose healthcare workers to infection. Documents involving academic and clinical updates were uploaded and collected electronically to be available later for documentation. COVID-19 team was a group of both medical and surgical staff personnel dedicated to tracking COVID cases in the hospital. Their role was to help infection control staff to categorize and sort out cases for COVID-19.

Surgical staff persons stood side by side to infection control staff persons on frontlines confronting COVID-19. For the daily neurosurgery care, the neurosurgery department divided staff into two “Groups A and B”. Group A provided neurosurgical service for cases for two weeks and Group B for the other two weeks alternatively to coopt to the principle of social distancing among physicians.

Table 1

Baseline characteristics of the admitted patients.

Patients	Numbers
<b>Total number of admitted patients</b>	<b>500</b>
<b>Patients with surgical management (%)</b>	<b>400 (80)</b>
Brain tumors	250 (62.5)
Cerebrovascular	124 (24.8)
Spine surgeries	26 (6.5)
<b>Urgent patients (%)</b>	<b>150 (30)</b>
<b>Borderline patients (%)</b>	<b>75 (15)</b>
<b>Discharged patients without complications (%)</b>	<b>488 (97.6)</b>

## 3. Total workload

Since the first case of COVID-19 was reported at our hospital, admissions to neurosurgery were triaged carefully. In the middle of March 2020, the American College of Surgeons has declared to suspend or cancel elective surgeries [4]. Accommodating the normal capacity of work that we used to have at our center will not be feasible amid the pandemic due to social distancing measures. Therefore, a strict plan was decided to postpone the elective cases. Sometimes, some cases seem to be borderline meaning that any delay in the intervention will lead to disease progression and a deleterious effect on the patient. It is the job of the senior attending physicians to determine the degree of urgency and to admit patients accordingly. The flow of patients to the emergency room remained constant despite the reduction of the working staff by 50%. Emergency cases that were admitted included large tumors causing disturbed conscious level, tumors causing acute hydrocephalus, spontaneous subarachnoid hemorrhage and surgical trauma. One of the clearest reasons to decrease elective workload was the major shifting of anesthesia staff to work in the ICU units that were stuffed with COVID cases. Therefore, the number of anesthesia staff assigned for the operating rooms decreased. Table 1 illustrates the numbers of admissions, surgeries done, and numbers of patients discharged amid the pandemic time from February 2020 to February 2021 at Damietta Specialized Hospital department of neurosurgery.

## 4. Surgical strategies for neurosurgical admissions amid COVID-19 era

Patients at our provincial hospital were categorized into : no-risk,

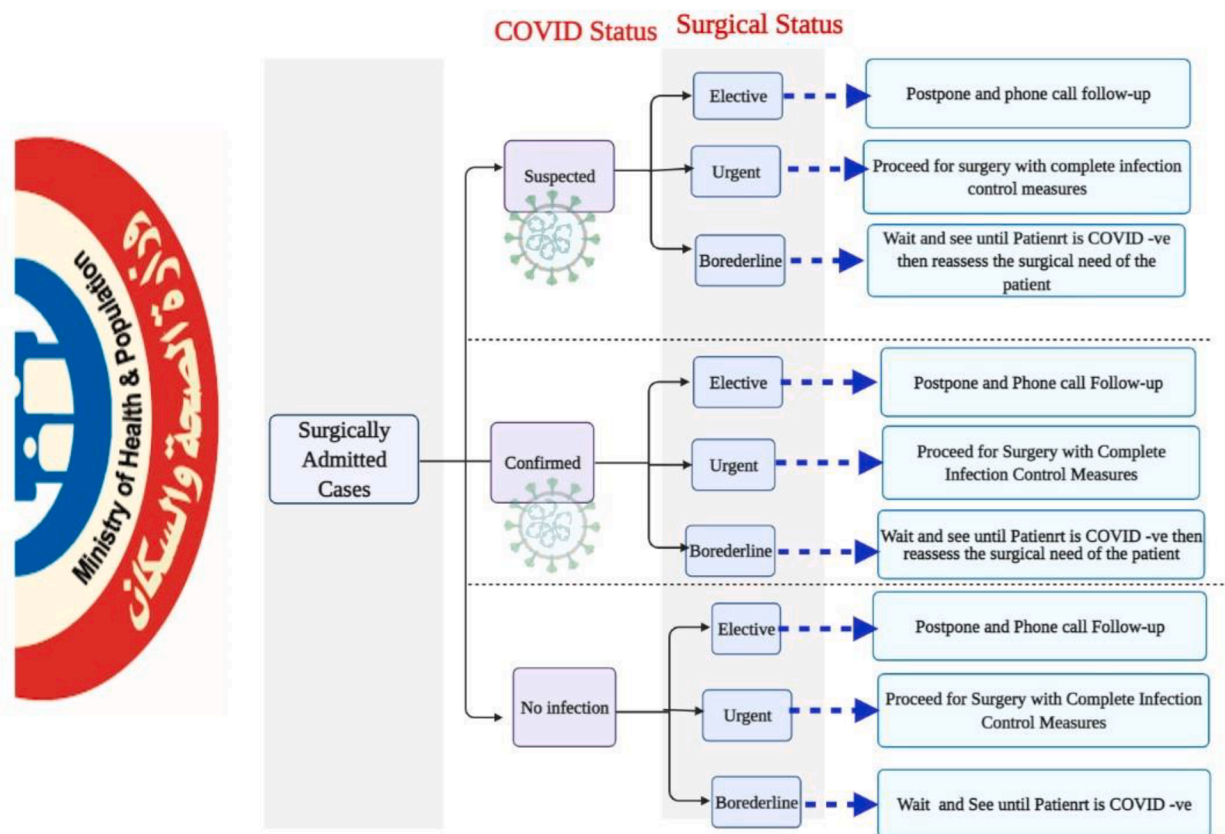


Fig. 2. Egyptian ministry of health strategy for management of surgically admitted cases amid COVID-19 pandemic with a stepwise filtering of the cases according to their surgical status into (elective, urgent, borderline) and according to the COVID status into (no infection, suspected and confirmed) based on clinical presentation and swab results.

suspected, and confirmed COVID-19 infected according to a triaging score set by the hospital. That triaging helped to filter the patients according to COVID-19 infection status as shown in the flowchart in Fig. 2. The current pandemic has raised a general consideration towards the wise consumption of medical resources. A vigorous effort was done to ensure a low risk of infection among healthcare workers. All the process starting from transferring the patient to the operating room to discharging the patient was carefully arranged to reduce the risk of transmitting the infection.

### 5. Patient transfer

Patient transfer is a very critical step that may help in the spread of Infection unintentionally. The transfer was done as quickly as possible to limit exposure time at hospital corridors. Special elevators were designed for the transfer of suspected or confirmed COVID-19 infected patients. Transferring the surgical case occurred usually through pre-defined corridors away from main hospital ways. Nursing staff and workers involved in transfer wore all protective personal equipment as shown in Figure 2. Personnel involved in transfer should be well trained and highly equipped. All the elevators that were utilized to transfer the patient were sanitized afterward. Cleaning team members are working continuously to ensure a proper sanitization of lifts, and floors and are trained to protect themselves. Un-intubated patients should wear the disposable surgical mask, face shield, disposable gloves, and shoes cover while being transferred. Along the hospital pathways, containers for disposable protective equipment were designed to get rid of these materials whenever needed.

### 6. Operating area design to reduce COVID-19 infection spread

Limiting the number of persons in the operating room was the typical trend adopted at the neurosurgical department at Damietta Hospital to apply social distancing as much as possible. A special isolated operating room was designated for surgeries that involve COVID-19 patients whether suspected or confirmed. High air flow cycles would be effective in halting viral transmission [5]. Operating rooms usually have positive pressure air circulation. In the COVID-19 area, all the staff should wear all personal protective equipment as a mandatory precaution. Meticulous on-call staff was available at any time for urgent cases, and they were well trained to deal professionally with COVID-19 cases. Doors at the COVID-19 area in the operating room should be closed all the time. All instruments for surgery should be available on a case-to-case basis before beginning to avoid overcrowding at the COVID-19 operating area.

### 7. Anesthesia precautions

Surgical and anesthesia consenting was done through phone calls to avoid face contact. Intubation is a very hazardous procedure if one is not fully protected against COVID-19 transmission [6]. By the end of procedures, all the staff involved should remove all personal protective equipment in case of heavy involvement by secretions. A ventilator set specific for COVID-19 was assigned for those cases only to limit the risk of spread from confirmed to suspected patients. A chest tube should be done bedside in the intensive care unit before transferring patients to minimize time spent in the COVID-19 operating area. Anesthesia assistants should prepare everything while the patient is transferred to limit the time of contact with each patient.

## 8. Intraoperative precautions

The operating room door should be labeled and closed all the time to stop any inadvertent entry to the inside. The surgical team should prepare the instruments that will be needed in advance before starting. Persons in the operating room should not leave under any condition until the whole procedure is done. All the surgeons had to wear the Powered air-purifying respirator PAPR during surgery. It is unknown if there may be a viral load of COVID-19 in body fluids and brain tissues [3]. Therefore, surgical samples and biopsies should be handled cautiously as they may be a source of contamination after the surgery is over, all areas at risk of contamination should be disinfected. Surgeons were trained on how to take off their powered air-purifying respirators by the end of the procedures.

## 9. Postoperative management

The strategy we followed was the sooner as a possible discharge of the patient after the medical service has been fulfilled to minimize the risk for any patient to stay more at the hospital and get COVID-19 infection. No visitors were allowed at all. Communication with the patient family was done through the phone to reduce the social visits at the hospital. Outpatient appointments were scheduled through phone calls to follow up with patients who need service. Each patient is instructed to visit the emergency casualty only if there is an urgent problem.

## 10. Lessons learned from this experience

COVID-19 pandemic affected the management for neurosurgical patients in either outpatient or emergency wards. Preparations for similar scenarios in the future is necessary to avoid ad-hoc unpleasant events as what's facing the world at the moment.

## 11. Conclusions

Following the suggested strategies, a rural area-serving hospital managed to provide uninterrupted neurosurgical care amid the COVID-19 pandemic in Egypt. The rural areas in developing countries are in

need of strategies to deal with pandemics in the future without dismantling the normal health system, especially for life-saving cases in a critical specialty as neurosurgery. Continuing clinical services at that time is considered a big challenge. The protocol of the Egyptian Ministry of Health and Population is applied to all the Egyptian hospitals, but with different variance in each hospital according to several factors including, number of beds, number of cases, and geographical location.

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**Ethical approvals:** All necessary approvals have been obtained successfully.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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