

Coronavirus disease 2019 pandemic as a challenge for pathology laboratories and pathologists in Egypt

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Received: 3 April 2022

Revised: 17 May 2022

Accepted: 5 June 2022

Published: 24 December 2022

Journal of The Arab Society for Medical Research 2022, 17:103–107

Severe acute respiratory syndrome-coronavirus 2 is a novel coronavirus that causes coronavirus disease 2019 (COVID-19) disease. The WHO announced the disease as pandemic in March 2020. The pandemic has caused a global collapse of the health system, and all nations started efforts and actions to confront the corona crisis. Egypt, although it is a middle resource country, started early its measures to control the spread of COVID-19 and on January 24, 2021 announced its vaccine rollout, with priority to health workers.

Health workers faced many difficulties and challenges during the pandemic with heavy workload and higher risk of coronavirus infection. Because of repeated exposures to potentially infectious patients and specimens, laboratory personnel, like other health-care physicians, are more susceptible to contract COVID-19.

The knowledge of pathological lesions in lung tissues and other different organs may provide a more accurate therapeutic management of symptoms and complications in affected severe acute respiratory syndrome-coronavirus 2 patients. Histopathological laboratories must follow strict biosafety guidelines to ensure that the laboratory personnel are protected. This article aims to highlight the challenges faced in histopathology laboratories during the COVID-19 pandemic and introduce some recommendations for the future laboratory work in Egypt.

Keywords:

challenges, coronavirus disease 2019 pandemic, Egypt, pathology laboratories

J Arab Soc Med Res 17:103–107

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1687-4293

Introduction

An outbreak of pneumonia appeared in Wuhan, China in December 2019. The causative agent of this severe acute respiratory syndrome known to be coronavirus 2 (SARS-CoV-2) virus has spread rapidly in many other countries and in March 2020, the WHO classified it as a pandemic [1]. The causative virus was first identified as novel coronavirus 2019, which was later renamed SARS-CoV-2, and the condition it produces is known as coronavirus disease 2019 (COVID-19) [2]. Since then, it has spread fast over the world, resulting in a public health disaster with clinical and psychological consequences, as well as the collapse of economy, which has impacted people in every country. Most of the health systems are affected, including histopathological services [3].

The WHO supplied countries with a strategy plan to fight the COVID-19 pandemic [4]. To cope with the rising number of COVID-19 patients, hospitals in many countries including Egypt focused their attention and financial resources on diagnosing and treating COVID-19 patients. And according to the preventive strategies, hospitals reduce nonessential hospital visits, as well as general outpatient procedures and surgeries and doctors reduced the number of real patient visits as much as possible by

using telemedicine (phone conversations and video consulting) [5].

Histopathology laboratories are concerned with the examination of tissue and cells to provide accurate diagnosis to develop the accurate plan of treatment. During the pandemic, histopathology labs in Egypt and across the globe faced numerous problems, including a significant drop in patient referrals for cancer and other pathological lesions. The greatest risk of SARS-CoV-2 laboratory infection is when the lab is receiving potentially infectious specimens for routine examination and diagnosis, especially in the absence of adequate control measures [6]. In resource-limited settings, laboratory personnel should receive up-to-date knowledge on how to protect themselves from this lethal virus [7].

Pathology labs, which handle human biological samples, must establish safeguards to protect laboratory workers from contracting COVID-19 while continuing to offer comprehensive pathology

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diagnostic services to all patients [8]. Previous studies have demonstrated that coronavirus was inactivated during routine formalin fixation and tissue processing of pathological specimens, but for antispread strategies during the COVID-19 pandemic, proper hand hygiene, use of disinfectant, and personal protective equipment (PPE) are the most important procedures [9]. The aim of this review is to provide information about problems and challenges facing pathology laboratories during the COVID-19 pandemic. It will focus on the policy and institutional responses to COVID-19 in Egypt as well as to the biosafety in pathology laboratory. At the end, it will introduce recommendations for the future work of pathology laboratories and pathologists in Egypt.

Policy and institutional responses to coronavirus disease 2019 in Egypt

Egypt is a lower-middle-income country in Northern Africa, with an estimated population of ~100 million [10]. In Egypt and many other countries, the health system was confronted with the necessity for massive growth to manage the crisis [10]. When COVID-19 struck, technology became very important in all live activities of people everywhere on the earth. Attempts by the Egyptian authorities to enter the digital world started earlier in 2017 by issuing the 'New Investment Law' empowering the use of new technology in the provision of services to investors. During the pandemic, Egyptian hospitals and laboratories have seen an increased demand for remote services and the crisis also pushed numerous Egyptian authorities to take additional steps to enforce and activate special systems for providing remote services to their clients [11].

In March 2020, as a response to the COVID-19 epidemic, Egypt government established the Higher Committee chaired by the prime minister to combat coronavirus and started a national lockdown and social distancing measures to combat the spread of COVID-19. The Ministry of Health and Population has the responsibility of coordinating the government's ongoing health measures across the country [12]. Under the supervision of the WHO, Egypt devised a unique care paradigm in which specific hospitals are designated as 'quarantine hospitals' for COVID-19 patients. Operational medical teams stay in the hospital for a total of 14 days. Following a negative SARS-CoV-2 test, health-care workers are discharged for additional 14 days of self-isolation at home. If any positive-swab doctors are found, they are admitted to the same quarantine hospital for medical treatment [13].

Since the beginning of the COVID-19 epidemic, the United Nations in Egypt has been actively assisting national efforts to address and mitigate the impact of the pandemic – both direct health and socioeconomic [14]. Moreover, various attempts to reduce the impact of COVID-19 on vulnerable groups have been declared; nonetheless, despite these efforts, COVID-19 continues to have a significant impact on people's lives.

The pandemic spurred global cooperation for vaccine research and distribution. Egypt first announced its vaccine rollout on January 24, 2021, with priority to health workers, the elderly, and those with preexisting risk factors. Egypt has engaged in a partnership with China for the development and distribution of two COVID-19 vaccine developments. Vaccinations with the third booster dose began in December 2021 in Egypt. As of March 19, 2022, the number of COVID-19 vaccine doses delivered per 100 persons in Egypt had increased to 72 [15]. Egypt is now one of the first six African countries to get the technology needed to manufacture mRNA vaccines.

Biosafety in pathology laboratory

Laboratory biosafety guidelines

According to the Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Coronavirus (COVID-19) [6], when handling any clinical specimens, all laboratories should conduct a site-specific and activity-specific risk assessment and implement standard precautions. Before beginning work in the laboratory, a proper and sufficient assessment of the hazards associated with handling samples that may contain SARS-CoV-2 must be completed [6].

Decontamination of the cryostat is crucial during tissue processing in the laboratory; it should be cleaned with 100% ethanol after each session, and all specimens should be processed first in an approved biological safety cabinet (BSC). These BSCs are closed cabinets used to provide a clean working environment and protect laboratory personnel against biohazardous or infectious agents, and finally help in protecting the environment by preventing cross-contamination. There are three classes of BSC varying from I to III [7].

During laboratory work, the rooms should be well and adequately ventilated by keeping the windows slightly open [7]. It is preferable to keep all doors open rather than opening and touching them constantly, and to clean and sanitize them if necessary [5]. It is advised to

sanitize all work surfaces in the laboratory numerous times each day and decontamination of computers, keyboards, phones, and frequently touched parts of microscopes is also needed [16].

Pathological specimen's biosafety

There are high chances of receiving potentially infectious specimens to the pathology laboratory for examination. According to the WHO, all specimens should be regarded as potentially infectious; there are some recommendations for sample collection and transportation to limit exposure to potentially infectious samples. All samples transported between laboratories should be placed in a secondary container to reduce the risk of breakage or leakage [5].

Precautions should be taken when handling a specimen suspected or confirmed to be positive for COVID-19 virus. The specimens must be labeled clearly, further placed in a secondary container to minimize breakage or spill. The container then shall be put in a plastic box with biohazard label (COVID-19 virus). Only a designated personnel (wearing full PPE) should attend to the specimen when it arrives at the laboratory [17]. In the suspected COVID-19 samples, manual processing using plastic jars and beakers should be used instead of automatic tissue processing; complete formalin fixation will help in killing the virus. Paraffin bath produces sufficient heat to destroy the virus. So, formalin-fixed paraffin-embedded tissues are considered safe [5].

Frozen section and fine needle aspiration

Manipulating fresh tissue and body fluids from patients who may have COVID is very risky, this may occur during surgical pathology and cytology procedures as in frozen section and fine needle aspiration. In the surgical gross room, the risks are increased due to manual handling of the specimen and using the cryostat for preparation of frozen tissue sections. These procedures may lead to percutaneous exposures through punctures or cuts, droplet or aerosol exposures from blood and bodily fluid splashes, and surfaces contaminated with the virus [3].

As a result, it is safer to postpone frozen section procedures to prevent the spread of coronavirus, as it causes aerosol formation. In the duration of the pandemic, it is recommended to limit the fine needle aspiration procedure and perform fine needle aspirations only on a case-by-case basis [16]. The technique requires the use of PPE and should be carried out in Class II Biosafety Cabinets.

Like frozen sections, cytology specimens may contain viable viruses, and cytology specimen processing procedures may result in aerosol and or droplet formation. Alcohol-based fixatives (with an alcohol content of >70%) or formalin should be used to fix cytology samples and the fixatives used for the high-risk cases should be discarded daily [7].

Laboratory personnel

Laboratory staff are particularly vulnerable to contracting COVID-19 due to repeated exposures to potentially contaminated specimens. Histopathology laboratories must prepare to provide the greatest possible service to patients while safeguarding their technicians, trainees, and pathologists [18]. Sample handling, the use of PPE, and the appropriate biosafety level are all critical factors that influence the laboratory personnel's safety [17]. When using the PPE, they must be removed only at the time of finally leaving the laboratory and disposed in appropriate biomedical waste bins [8].

To control the risk, all laboratory personnel should have easy access to sanitary facilities, and when handling clinical specimens, standard precautions should be followed, most important is the hand hygiene and use of PPE such as gowns, gloves, eye protection, face shield, and disposable masks to protect the skin and mucous membranes of the eyes, nose, and mouth [5].

The laboratory team might not know the infectivity status of the patient's sample, as part of the risk assessment, the physician or surgeon should notify the pathologist each time before submitting a specimen of suspected or confirmed COVID-19 case with proper labelling of these samples. Absence of communication may cause exposure to COVID-19 infection among laboratory workers [3].

In COVID-19 crisis, it was useful to implement digital transformation in many aspects of our life, and it was a good opportunity to apply technology like telepathology and artificial intelligence in pathology laboratories. So, digital reporting is recommended [5]. Moreover, vaccinations against COVID-19 infection with a third booster dose for all laboratory staff and adhering to strict precautionary measures remain important for laboratory workers.

Personnel training

People are the most valuable resource in any institution; training programs in pathology laboratories will ensure that the personnel are

knowledgeable and adherent to all laboratory management requirements [19]. Training programs for COVID-19 include:

- (1) Instruction about sample collection, storage, and transport.
- (2) Knowledge about safe handling and processing of all pathology specimens during the pandemic.
- (3) Performing all tests properly and reporting the results.
- (4) Guidelines of risk assessments and emergency response procedures.
- (5) Proper handwashing practices, how to wear and dispose of PPE.
- (6) Guidelines of infection control to prevent the spread of many diseases, including COVID-19 [3].
- (7) Adequate training of sanitation workers for sanitization, how to collect biomedical waste, and measures to handle waste materials [20].

Training in health crisis as in COVID-19 can be challenging especially in middle income countries like Egypt because of the large number of workers who need to be trained appropriately in a short time.

Laboratory management should ensure that all laboratory staff who perform laboratory work receive proper training [19].

Laboratory waste management

All waste disposals plans must comply with national and international regulations. The surface of laboratory bench tops and containers used for waste storage should be disinfected properly with 1% sodium hypochlorite solution every day [5]. Decontamination of offices, equipment, and work surfaces should be done after processing of specimens [6]. Appropriate methods for decontamination of waste, such as disinfectants and autoclaves, must be available in the pathology laboratory [3]. Training of laboratory staff on updated emergency procedures is very important. Reviewing of these emergency procedures must be done according to risk assessments especially after spill of any dangerous material [6].

All infectious/suspected materials should be discarded in a yellow bag or a bin labeled with a biomedical hazard sticker and additionally written as COVID-19 so that extra care can be taken while handling. As a precaution, double-layered leak-proof bags should be used for the collection of waste from high-risk areas [7].

There should be dedicated sanitation workers for handling laboratory wastes. These workers should be provided with adequate PPE including gowns, gloves, and three-layer masks. They should be provided with adequate training for sanitization, collection of biomedical waste, and all safety measures to handle such waste [20].

Recommendations for the future

From our review we can recommend the following:

- (1) Framing of guidelines for all pathology laboratories in Egypt will ensure the uniformity in the working system and can ensure safe laboratory environment all over the nation.
- (2) All laboratories should reconsider standard operation procedures to ensure safe handling of laboratory samples and safety of the laboratory environment and laboratory personnel.
- (3) Typical biosafety level 2 cabinet is required in all pathology laboratories in Egypt to provide a clean working environment in the laboratory and to protect laboratory workers.
- (4) Establishment of a periodic review and audit for all laboratory activities is an important procedure for upgrading laboratory work.
- (5) Training of the laboratory personnel for good laboratory practice and appropriate use of PPE is very important.
- (6) Establishment of good, planned training programs and evaluation assessment systems that fulfil accreditation requirements.
- (7) Implantation of digital technology and whole slide imaging in pathological laboratory work can help in teaching trainees of pathology, in case reporting, in conference meetings, in sharing knowledge, and in maintaining communication between pathologists, clinicians, and other health-care professionals.

Conclusion

COVID-19 brought many global challenges to the pathology laboratory; to reduce danger, all pathology laboratories handling cell and tissue specimens must adhere to well-defined procedures and precautions. Pathologists must face pandemics and different health crisis by training on how to protect themselves, by having the recommended vaccines to ensure their safety and their families, and to be up to date with new technology of digital pathology. The presented recommendations are an attempt to assist Egyptian laboratory workers in maintaining safety and high-quality services in the future.

Acknowledgements

Authorship contributions: Idea and concept: Wafaa E. Abdelaal. Literature review: Naglaa F. Abaas and Sonia L. El-Sharkawy. Writing – original draft: Wafaa E. Abdelaal. Critical review: Naglaa F. Abaas..References: Sonia L. El-Sharkawy.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 Ieni A, Tuccari G. The COVID-19 pandemic: pathologists support the clinical infectious diseases team. *Int J Infect Dis* 2021; 104:479–481.
- 2 Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, *et al.* China novel coronavirus investigating and research team. A novel coronavirus from patients with pneumonia in China, 2019. *Engl J Med* 2020; 382:727–733.
- 3 Amri MF, Azizan N, Hussain FA, Hayati F, Syed Abdul Rahim d SS, Azhar ZI. The challenges and risk of laboratory handling on a histology specimen during COVID-19 pandemic. *Ann Med Surg* 2021; 64:102242.
- 4 World Health Organization. Critical preparedness, readiness and response actions for COVID-19. N CoV/Community Actions / 2021. 1. WHO REFERENCE NUMBER: WHO/2019. Available at: <https://www.who.int/publications/i/item/critical-preparedness-readiness-and-response-actions-for-covid-19>. [Accessed March 27, 2022].
- 5 Sekaran A, Yandapally NR, Vanere VP. Laboratory biosafety measures in receiving, preparation and processing of pathology specimens in suspected and positive coronavirus infection. *Int J Res Med Sci* 2020; 8:3129–3134.
- 6 Guidance: COVID-19: guidance for sampling and for diagnostic laboratories information for clinical diagnostic laboratories regarding safety, sampling and packaging specimens associated with COVID-19. From: Public Health England Published: 15 January 2020 Last updated: 29 March 2021. Available at: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-guidance-for-clinical-diagnostic-laboratories>. [Accessed March 15, 2022].
- 7 Misra V, Agrawal R, Kumar H, Kar A, Kini U, Poojary A, *et al.* Guidelines for various laboratory sections in view of COVID-19: Recommendations from the Indian Association of Pathologists and Microbiologists. *Indian J Pathol Microbiol* 2022; 63:350–357.
- 8 Cedars-Sinai Staff. How COVID-19 has reshaped pathology. 2020. Available at: <https://www.cedars-sinai.org/blog/covid-19-reshaped-pathology.html>. [Accessed March 15, 2022].
- 9 Mohanty A, Mishra P, Dash K, Bhuyan L, Mahapatra N, Panda A. Rolling code on histopathology laboratories during Covid pandemic: a narrative review. *J Int Oral Health* 2021; 13:108.
- 10 Gaye YE, Agbajogu C, El Oakley R. COVID-19 on the Nile: review on the management and outcomes of the COVID-19 pandemic in the Arab Republic of Egypt from February to August 2020. *Int J Environ Res Public Health* 2021; 18:1588.
- 11 El Beshry H, Hamdy A. Digital transformation: a step forward amid the exceptional circumstances ordained by the spread of the global pandemic COVID-19. 2020. Available at: <https://www.tamimi.com/law-update-articles/digital-transformation-a-step-forward-amid-the-exceptional-circumstances-ordained-by-the-spread-of-the-global-pandemic-covid-19/>. [Accessed February 19, 2022].
- 12 Saied AA, Metwally AA, Madkhali NAB, Haque S, Dhama K. Egypt's COVID-19 recent happenings and perspectives: a mini-review. *Front Public Health* 2021; 9:1–14. Doi: 10.3389/fpubh.2021.696082
- 13 Youssef N, Mostafa A, Ezzat R, Yosef M, El Kassas M. Mental health status of health-care professionals working in quarantine and non-quarantine Egyptian hospitals during the COVID-19 pandemic. *East Mediterr Health J* 2020; 26:1155–1164.
- 14 United Nation, Egypt. COVID-19 Socio-economic response and recovery plan for Egypt. 2020. Available at: https://unsdg.un.org/sites/default/files/2020-08/EGY_Socioeconomic-Response-Plan_2020.pdf. [Accessed March 24, 2022].
- 15 Egypt Coronavirus COVID-19 Vaccination Rate. Available at: <https://tradingeconomics.com/egypt/coronavirus-vaccination-rate>. [Accessed March 23, 2022].
- 16 Odega K, Ehidiame Ibadin Ephraim. Safe laboratory practices in the light of covid-19 pandemic: way forward in a resource limited setting. 2020. DOI:10.20944/preprints202004.0103.v1
- 17 Hasan A, Nafie K, Abbadi O. Histopathology laboratory paperwork as a potential risk of COVID-19 transmission among laboratory personnel infection. *Prev Pract* 2020; 2:100081.
- 18 Pambuccian SE. The COVID-19 pandemic: implications for the cytology laboratory. *J Am Soc Cytopathol* 2020; 9:202–211.
- 19 Luann Ochs, Laboratory training and competence assessment in the era of COVID-19. May 19, 2021. Available at: <https://www.mlo-online.com/management/careers/article/21222674/laboratory-training-and-competence-assessment-in-the-era-of-covid19>. [Accessed February 2, 2022].
- 20 Guidelines for handling, treatment, and disposal of waste generated during treatment/diagnosis/quarantine of COVID-19 patients – Rev. 1. Available at: <https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/BMW-GUIDELINES-COVID.pdf>. [Accessed March 19, 2022].