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Assessment of Infection Control and Staff risk of COVID 19 transmission at certain radiology department

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ABSTRACT

Background: Coronaviruses (COVs) are ribonucleic acid (RNA) viruses that cause upper respiratory system infections. The COVs have a spherical shape and a mean diameter of 120 nm. Human COVs were discovered in the 1960s. In response to COVs, all countries approved restricted measures to control the pandemic. These measures include Total or partial lockdown, canceled social events and football matches, closing schools and universities to reduce virus spread probability, social (physical) distancing (at least 1-meter distance), wearing a facemask, prohibiting crowds in addition to self-protection measures such as hands cleaning, disinfection of surfaces .**Objectives:** This study, conducted with meticulous attention to detail, aimed to assess the safety measures in the radiological departments and provide clinical data to enhance patient management. **Materials and Methods:** The study was carried out at five hospitals in the Riyadh region of Saudi Arabia, including four governmental hospitals and one private hospital. The questionnaire covered infection control and measures to reduce infection among radiographers. **Results:** The thorough analysis revealed that the Ministry of Health guidelines were rigorously followed at all levels, leading to effective COVID-19 infection control while maintaining departmental operations with minimal risk. **Conclusions:** The paperless system contributes significantly to the lack of virus transmission within our institution.

1. INTRODUCTION

The World Health Organisation (WHO) Situation Report states that COVID-19, also known as severe acute respiratory syndrome coronavirus (SARS-COV-2), was detected in Wuhan, Hubei, China, in December 2019 and continues to impact

humans worldwide (WHO, 2020). COVID-19 has lower mortality, a stronger occult character, and a more extensive transmission capability than Severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) (WHO, 2020). Like the other two, COVID-19 may be spread through the respiratory tract and touch and has human-human transmission. Another transmission pathway, fecal-oral, is unknown (Rahman et al., 2020; Khandaker et al., 2023; Rahma et al., 2024). The first confirmed case was on 3rd March 2020, for a Saudi national arriving from Iran. Immediately, the government limited entry to neighboring Gulf countries on the same day. In response to the first cause, the KSA suspended Umrah on 4th March to prevent the virus from spreading. On 8th March 2020, the government stopped all schools and universities, imposed quarantine in Qatif city, and suspended entry from neighboring countries. By 15th March 2020, the government had suspended international flights and shut down malls, restaurants, cinemas, and public events. On 16th March 2020, Riyadh was in complete lockdown with hefty fines for those who broke the regulations. On 17th March, the government suspends paring in mosques, domestic flights, and transportation to prevent the virus from spreading. Simultaneously, the movement announced that all COVID-19 patients would receive free medical treatment in governmental hospitals, demonstrating the government's care and support for its citizens. At the same time, the government issued a virus testing protocol. Financial and economic measures to support individuals and companies during the lockdown include the private sector of 61 billion USD and economic incentive measures. The practical steps resulted in a significant reduction in the virus transmission rate. On 28th May 2020, KSA implemented a plan to ease lockdown at three-stage. Infectious respiratory and vascular disease Because this disease was diagnosed in almost all human races on different continents at different rates, it is important to explore ethnicity variation and genetic background that may increase susceptibility to this viral, highly communicable disease (Abubakr et al., 2021; Zaccardi et al., 2023). SARS-COV-2 and SARS-COV share the same receptor of angiotensin-converting enzyme 2 (ACE2), which is more prevalent in Asian men, accumulates in lungs, especially type 2 alveolar cells (AT2), and is associated with abnormal genetic expression, suggesting increased susceptibility to the disease due to epigenetic dysregulation of ACE2 (Zhao et al., 2020) SARS-CoV-2 can kill respiratory patients. Immune-weakened people are more prone to severe illness (Sawalha et al., 2020; Cai, 2020). Computed tomography is used for initial screening to detect COVID-19 infection and for follow-up and show disease progression. (Pareek et al., 2020). Chinese researchers advocate CT imaging for COVID-19 diagnosis for these reasons. An American Society for Radiation Oncology academic advocated rapid development of a CT-based COVID-19 diagnostic technique and improved SARS-CoV-2 detection (Khunti et al., 2020). A clinically suspected COVID-19 patient with negative NAAT but positive imaging should be isolated and treated immediately. Because the 2019-nCoV spreads quickly via droplets and contact, infection prevention and control must be taken to the utmost degree to safeguard workers ((Abubakr et al., 2021). Radiographers and other radiological personnel face risks of both radiation exposure and infections due to the nature of their work close to the patients and radiation sources (Alkhorayef et al., 2020; Sulieman et al., 2011). Protections are divided into four levels: general, primary, and secondary. The general level includes work attire, disposable medical masks, work hats, and gloves (if needed). Primary protection is ideal for pre-examination and triage, fever clinic, and infectious illnesses clinic. Wear disposable work hats, medical masks (N95-type masks are advised for confirmed patients), work clothing, isolation gowns, disposable latex gloves (if needed), and careful hand cleanliness. Secondary protection is ideal for medical professionals who closely interact with suspected or confirmed patients. Wearing disposable work hats, anti-fog goggles or face shields, medical masks, protective gear or isolation gowns, latex gloves, shoe coverings, and hand hygiene. Finally, sputum aspirating, respiratory sampling, tracheal intubation, and tracheotomy, which may spray or splash respiratory secretions and body substances, are suitable for the third level of protection. Wear disposable work hats, medical protective masks, face shields (full-scale respirators or positive pressure headgear are advised), clothes, latex gloves, shoe coverings,

and rigorous hand hygiene. Due to their intimate patient contact, radiography technicians are among the most at-risk medical workers. Radiography is essential for COVID-19 radiodiagnosis. First-line chest imaging should be plain radiography, and chest CT should only be used for severely unwell patients with equivocal chest radiographs and clinical presentations. Literature reports many radiology department COVID-19 transmissions. Technologists are in intimate touch with respiratory-symptomatic patients in ventilation (Jorge et al., 2021). Technologists risk viral infection during imaging operations (Lewis & Mulla, 2021). Due to patient interaction, radiographers and other healthcare personnel were at risk of COVID-19 infection during the pandemic. Several studies have examined radiographer infection rates and risk factors. They were at risk of infection because they performed imaging procedures for suspected and confirmed COVID-19 patients as frontline workers. Factors Close contact with patients, aerosol-generating procedures, and PPE shortages increased radiographer infection risk. Additionally, Due to increased workload and infection concerns, many radiographers experienced stress, anxiety, and burnout during the pandemic. This study evaluates radiological department safety and provides clinical data to improve patient treatment and prevent staff infection.

2. MATERIALS AND METHODS

2.1 Study design and setting:

This study was conducted at five hospitals in Riyadh region, Saudi Arabia including four governmental hospitals and one private hospital. The questionnaire were developed in order to cover the infection control and measured followed in order to reduce infection among radiographers. Table 1 shows the questionnaire lay out.

2.2. Data collection :

The questionnaire was distributed 9 hospitals, including further details regarding COVID-19 patients managements, however, the researchers faced many restrictions regarding the data of COVID-19 patients and management. Therefore, the study was limited to five hospitals. The questionnaire contains five parts including: Patients and Staff protection with all patients, Staff protection with confirmed case patient (second level of Protection), Staff protection with confirmed case patient tracheal intubation, and tracheotomy (Third level of Protection), and Department Hygiene after the procedure. The study was approved by the Ethics and Research Committee at Prince Sattam bin Abdulaziz University.

Table 1 Questionnaire layout

Primary level of protection				
No	Parameters	Yes	No	Comment
For patients				
1	Temperature measurement			
2	Mask			
3	Wearing Gloves			
4	Disposable gowns			
Staff protection with all patients				
1	Wearing disposable work caps			
2	disposable medical masks			
3	work clothes			
4	isolation gowns			
5	disposable gloves			
6	hand hygiene			
Staff protection with confirmed case patient (second level of Protection)				
1	Protective goggles or face shields			
2	medical protective masks			
3	Protective clothing			
4	disposable shoe covers			
Staff protection with confirmed case patient tracheal intubation, and tracheotomy (Third level of Protection)				
1	full-scale respirators or positive pressure headgears			
Department Hygiene after the procedure				
1. Air disinfection 2. Flour disinfection 3. Other disinfection				
Collection of medical waste: cleaners protection				
1. 2.				

3. RESULTS:

The health care system is one of the most advanced health care systems in the Gulf region

and the Middle East countries. According to the WHO, the KSA health care system ranked 26th globally (1 doctor per 500 population) with a growing network of over 2,000 hospitals and health centers designed to address the country's health care needs. In the Kingdom of Saudi Arabia (KSA) Hospitals, health care centers, and clinics are equipped with state of the art medical technology to providing the highest possible care for the population (WHO, 2000). The Ministry of Health (MoH) in the KSA is responsible for providing and supervising medical services (preventive and curative) through ministry health care systems (Medical cities, hospitals, and university hospitals) free of charge for Saudi nationals. There are also other governmental health care providers such as the Ministry of Interior(Security Force Hospitals), the Ministry of National Guard (National Guard Hospitals), and the Ministry of Defense (Military hospitals) (Almalki et al., 2011; Abd El-Aziz and Stockand, 2020; Algaissi et al., 2020). Since the emergence of the COVID-19 as a fast spread infectious disease, the government of the KSA implemented strict protective strict actions to control virus transmission to the kingdom among the population. The KSA has previous excellent experience in handling the MERS epidemic since its emergence in 2012 (Das et al., 2016). According to the WHO recommendations and epidemiology experts, firm preventive actions are necessary to prevent or reduce the transmission probability from one human to another. Infection control in radiography departments against COVID 19 is recognized as imperative and this is visible through various infection control policies. These policies focus on a range of infection control principles, including hand hygiene, isolation (contact, airborne and droplet), the use of personal protective equipment, as well as managing contaminated equipment and cleaning and disinfecting of equipment. The developed recommendations focused on hand and personal hygiene, personal protective gear and the use of appropriate equipment, safe handling of sharps and sharp containers as well as housekeeping and cleaning and routine infection control practices. The current study showed that all governmental hospitals (King Saud Medical City, King Fahad Medical City and King Khaled Hospital and Prince Sultan Center, Alkharj, and King Khaled Medical City all strictly followed the Ministry of Health guidelines. However, at one private hospitals, because they do on have an isolation center, the don't have the third level of restriction, but the department adhere to the infection control guidelines. The ministry of health recommendations, which based on the international practice and the world health organization guidelines provided the necessary protection for the personnel at the radiology department Thus , all studies radiology departments have adequate infection control resources, including consumables and disinfectants.

4. CONCLUSIONS

The current study showed proper COVID 19 control at radiology departments, at the Kingdom of Saudi Arabia. Careful analysis of infection control data showed that the ministry of health guidelines were followed at all levels, which resulted in effective COVID-19 infection control, while maintaining the work at the department with minimal possible risk. Paperless systems applied at various radiology departments resulted in great reduction of COVID 19 risk of document-mediated transmission. Using PACS (picture archiving and communication system (PACS) is effective methods in elimination direct physical contact. Radiologists can perform remote diagnosis and patients can use mobile APPs or patient portals to check their results. This paperless system contributes significantly to the lack of virus transmission within our institution.

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All authors contributed equally to this work

CONFLICTS OF INTEREST:

The authors declare no conflicts of interest.

REFERENCES

Abd El-Aziz,T., Stockand,J. Recent progress and challenges in drug development against COVID-19 coronavirus (SARS-

CoV-2) - an update on the status. Infect Genet Evol. 83: 104327(2020).

Abubaker M Hamad, HI Al-Mohammed, Mohammed Alkhorayef, Mohammed Y Abbas, Abdelmoneim Sulieman, Ethnicity as a Risk Factor for the Novel Coronavirus Disease 2019 (COVID-19), J Res Med Dent Sci, 2021, 9(12): 66-75.

Afif, M., Abdul Razak, H., Choong, A. 2023. COVID-19 pandemic experience of diagnostic radiographers: A Singapore survey. J Med Imaging Radiat Sci. 2023 Jun;54(2S):S62-S69. doi: 10.1016/j.jmir.2023.01.010.

Akudjedu TN, Lawal O, Sharma M, Elliott J, Stewart S, Gilleece T, McFadden S, Franklin JM. Impact of the COVID-19 pandemic on radiography practice: findings from a UK radiography workforce survey. BJR Open. 2020 Sep 2;2(1):20200023. doi: 10.1259/bjro.20200023. PMID: 33178980; PMCID: PMC7583354.

Algaissi,A., Alharbi,N., Hassanain, M., Hashem,H.Preparedness and response to COVID-19 in Saudi Arabia: Building on MERS experience . Journal of Infection and Public Health 13, 834–838.

Alkhorayef, et al. 2020. Assessment of occupational exposure and radiation risks in nuclear medicine departments. Radiation Physics and Chemistry 170, 108529

Almalki,M., Fitzgerald,G., and Clark, M. 2011. Health care system in Saudi Arabia: an overview. Eastern Mediterranean Health Journal. EMHJ, 17 (10), 784-793.

Cai, Hua. "Sex difference and smoking predisposition in patients with COVID-19." The Lancet Respiratory Medicine 8.4 (2020): e20.

Das K.M.Lee E.Y.Langer R.D.Larsson S.G.Middle East respiratory syndrome coronavirus: what does a radiologist need to know?. AJR Am J Roentgenol. 2016; 206: 1193-1201

Jorge A, Fridell K. "In the Eye of the Storm"-Radiographers' Experience of Working With SARS Covid-19 Patients. J Radiol Nurs. 2021 Dec;40(4):377-383. doi: 10.1016/j.jradnu.2021.09.005. Epub 2021 Sep 20. PMID: 34566537; PMCID: PMC8450059.

Khandaker ., et al. 2023. Investigation of the Radiographer's adherence and compliance with radiation protection and infection control practices during COVID-19 mobile radiography.Radiation Physics and Chemistry, 210,111023, doi.org/10.1016/j.radphyschem.2023.111023.

Khunti K, Singh AK, Pareek M, et al. 2020. Is ethnicity linked to incidence or outcomes of covid-19?. BMJ 2020;369:m1548 doi: 10.1136/bmj.m1548 (2020).

Lewis S, Mulla F. Diagnostic radiographers' experience of COVID-19, Gauteng South Africa. Radiography (Lond). 2021 May;27(2):346-351. doi: 10.1016/j.radi.2020.09.009. Epub 2020 Sep 18. PMID: 33004276; PMCID: PMC7500947.

Pareek, Manish, et al. 2020. Ethnicity and COVID-19: an urgent public health research priority. The Lancet. 395(10234), 1421 – 1422.

Qu, J., et al. 2020. Infection Control for CT Equipment and Radiographers' Personal Protection During the Coronavirus Disease (COVID-19) Outbreak in China. AJR Am J Roentgenol. 2020 Oct;215(4):940-944. doi: 10.2214/AJR.20.23112.

Rahma, N. A. ., M. Khalid, M. Abdelrahman, H. Abdalmahid, M. Eltahir, & D. Belall. (2024). HIV and COVID: Navigating Challenges in Dual Care. Medicine and Biohealth Journal, 1(1). https://doi.org/10.70274/medbiohealth.2024.1.1.12.

Rahman, H., et al. 2020. The transmission modes and sources of COVID-19: A systematic review,International Journal of Surgery Open,Volume ٢٦,٢٠٢٠,Pages 125-136,ISSN 2405-8572,https://doi.org/10.1016/j.ijso.2020.08.017.

Sawalha, Amr H., et al. "Epigenetic dysregulation of ACE2 and interferon-regulated genes might suggest increased COVID-19 susceptibility and severity in lupus patients." Clinical Immunology (2020): 108410.

Sulieman, et al. 2011. Radiation doses to paediatric patients and comforters undergoing chest X rays. Radiation protection dosimetry 147 (1-2), 171-175

The world health report 2000. Health systems: improving performance. Geneva, Word Health Organization, 2000.

WHO, Coronavirus disease (COVID-2019) situation reports. [Internet] accessed on 14 January 2025. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200513-covid-19-sitrep-114.pdf?sfvrsn=17ebbbe_4.

Zaccardi, F., Tan, P.S., Shah, B.R. et al. Ethnic disparities in COVID-19 outcomes: a multinational cohort study of 20 million individuals from England and Canada. BMC Public Health 23, 399 (2023). https://doi.org/10.1186/s12889-023-15223-8

Zhao, Yu, et al. 2020. Single-cell RNA expression profiling of ACE2, the putative receptor of Wuhan 2019-nCov. bioRxiv. 2020." Preprint available at https://www. biorxiv. org/content/10.1101/2020.01 26: v1.

barriers to active living. https://pmc.ncbi.nlm.nih.gov/articles/PMC6257875/. Published December 1, 2018.