

ORIGINAL ARTICLE

# The effectiveness of the disaster plan on the incidence of COVID-19 in emergency department staff of King Abdulaziz Medical City in the Western Region

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## ABSTRACT

**Background:** The coronavirus disease 2019 (COVID-19) pandemic has stressed the importance of preparedness in healthcare institutions. King Abdulaziz Medical City - Western Region (KAMC-WR) implemented a disaster plan to safeguard its emergency department (ED) staff from COVID-19. This research evaluates this plan's effectiveness by studying the disease's prevalence among ED staff.

**Methods:** We conducted a retrospective cohort study from March 2, 2020, to March 2, 2021, involving 212 healthcare workers (HCWs) from the ED of KAMC-WR. The sample consisted of physicians, nurses, and pre-hospital personnel. Data on COVID-19 infection were collected from KAMC-WR medical records and analyzed using JMP Statistical Software Version 17 (JMP Statistical Discovery LLC, Cary, NC).

**Results:** Of the 212 HCWs, 9 (4.24%) contracted COVID-19: 4 physicians, 3 nurses, and 2 pre-hospital personnel. The incidence rate of 4% among KAMC-WR's ED staff over 1 year was relatively low, suggesting the effectiveness of the implemented disaster plan.

**Conclusion:** The disaster plan at KAMC-WR demonstrated success in minimizing COVID-19 infection among ED staff. The study highlights the significance of robust infection control strategies in healthcare settings, especially during public health crises. Hospitals should continuously evaluate and optimize their disaster plans based on lessons from such pandemics.

**Keywords:** Disaster plan, COVID-19, effectiveness, ED staff, KAMC-WR, incidence.

## Introduction

Recent crises have underscored the preparedness levels of organizations. Notably, hospitals have often been more susceptible to damage in such events. The most significant public health crisis is the coronavirus disease 2019 (COVID-19) pandemic, which emerged in December 2019 in Wuhan, China [1]. The causative agent of COVID-19 is the severe acute respiratory syndrome-coronavirus 2, transmitted through inhaled infected droplets or direct contact [1]. Initial diagnostic indicators for the disease include symptoms such as fever or cough and signs such as decreased oxygen saturation or lung auscultation findings [2,3]. These indicators can help rule out COVID-19 or select patients for further diagnostic tests [3].

Although many public health strategies emphasize early detection to contain the disease, asymptomatic transmission significantly contributes to the global spread of COVID-19 [4].

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**Received:** 16 December 2022 | **Accepted:** 30 June 2023

On January 30, 2020, the World Health Organization declared COVID-19 a pandemic [1]. The Ministry of Health in the Kingdom of Saudi Arabia reported its first COVID-19 case on March 2, 2020 [5]. In response, Saudi Arabia implemented rigorous measures such as city lockdowns, school and mosque closures, rapid field hospital construction, travel restrictions, and technology-assisted tracking of new cases [6]. Religious visits such as Hajj and Umrah were also suspended temporarily. Between March 2, 2020, and March 2, 2021, there were 114,480,829 confirmed cases globally and 2,539,926 deaths. Meanwhile, Saudi Arabia reported 378,002 cases and 6,505 deaths [7].

This study sought to identify effective methods to reduce infection transmission, offering insights for tackling future pandemics. We aim to assess the effectiveness of the disaster plan by studying the prevalence of COVID-19 among the emergency department (ED) staff of King Abdulaziz Medical City - Western Region (KAMC-WR) from March 2, 2020, to March 2, 2021. Our primary objectives are to detail the KAMC-WR disaster plan during COVID-19 and evaluate its success based on COVID-19 prevalence in the ED staff. While a previous study in Saudi Arabia outlined COVID-19 safety measures in their disaster plan, it did not evaluate the plan's effectiveness [8]. In contrast, our study evaluates the safety measures' efficiency through the incidence rate of COVID-19 among ED staff.

KAMC-WR anticipated a surge in COVID-19 patients, posing a heightened risk to ED staff. This paper details the protocols KAMC-WR established in the ED to minimize COVID-19 spread among healthcare workers (HCWs) [9]. The guidelines span pre-hospital, hospital, and administrative contexts and encompass several strategies, as discussed below.

### **Multiple Triage Levels**

Triage aims to categorize and prioritize patients to allocate limited resources effectively. At KAMC-WR, the Forward Triage at the main gate was conducted by trained paramedics and senior ED doctors to assess patients in their cars using a clinical algorithm, minimizing unnecessary ED visits. The Booth Screening, positioned at the ED entrance, gauged temperatures, provided face masks, and segregated patients using the acute respiratory infection risk scale (ARIS) [10]. The main ED triage, the third layer, utilized the Canadian Triage Acuity Scale to classify and reassess cases using the ARIS [10].

### ***Patients' streaming***

Streaming involves channeling patients by disease severity or symptom type [10]. High-risk individuals were directed to a respiratory unit, while those at lower risk went to the primary ED.

### ***Workforce splitting***

Considering the elevated risk of infection, frontline HCWs were split into four modular teams, each working 8-hour shifts.

### ***Designated COVID-19 wards***

Daily infection prevention control used telemedicine to monitor home-isolated cases, directing worsening cases straight to specialized wards and bypassing the ED.

### ***COVID-19 testing strategies***

KAMC-WR introduced a drive-through testing service and a rapid polymerase chain reaction (PCR) test, providing results in less than 2 hours, streamlining diagnosis, and reducing the risk of transmission.

### ***Personal protective equipment (PPE) availability and management***

Ensuring protection for staff, KAMC-WR provided PPE to all in the ED and emergency responders. To address potential shortages, they coordinated with the hospital's logistics department and promoted appropriate PPE use across three categories: conventional, contingency, and crisis. Continuous auditing and monitoring of PPE supply were maintained, ensuring KAMC-WR never had to resort to crisis strategies for supply demand.

### ***Subjects and methods***

Between March 2, 2020, and March 2, 2021, we conducted a retrospective cohort study involving HCWs to determine the incidence of COVID-19 in the ED of KAMC-WR. We included a sample size of 212 ED staff members.

### ***Inclusion and exclusion criteria***

Our study considered all ED staff members, including physicians, nurses, and pre-hospital personnel, as eligible participants. We excluded staff from other departments within KAMC-WR.

### ***Sampling technique***

We employed a non-probability consecutive sampling technique, selecting participants based on their availability and accessibility to our research team.

### ***Data collection and analysis***

We reviewed the disaster plan steps implemented during the COVID-19 pandemic in the ED at KAMC-WR. We measured disease prevalence using the PCR test results of symptomatic individuals. The confirmed cases were sourced from KAMC-WR's medical records during the study period. These data, encompassing all ED staff, were input into Microsoft Excel (Microsoft Inc., Redmond, WA), ensuring accuracy by checking and cleaning the data to eliminate potential errors. We categorized the data into "Yes" for COVID-19 positive cases and "No" for COVID-19 negative cases.

We imported the data into JMP Statistical Software Version 17 (JMP Statistical Discovery LLC, Cary, NC) for analysis. Categorical variables were described using frequency and percentages. To calculate percentages, we divided the infected cases by the total ED staff number and multiplied by 100.

## Results

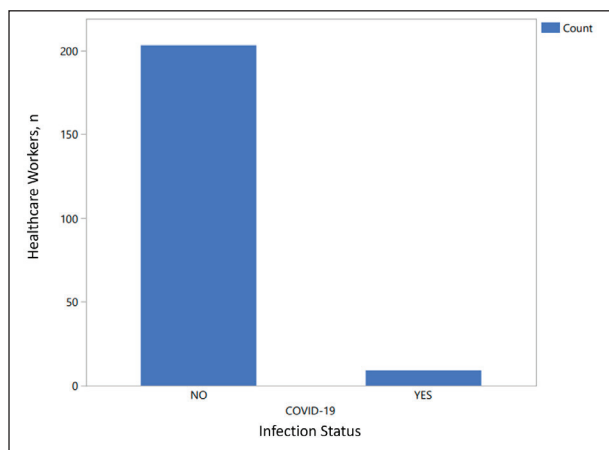
The study included 212 HCWs, including physicians, nurses, and pre-hospital personnel. Of these, 91 were physicians (42.9%), 100 were nurses (47.2%), and 21 were pre-hospital personnel (9.9%). Upon adhering to the multidisciplinary COVID-19 management guidelines, the 1-year prevalence of COVID-19 among ED staff at KAMC-WR was notably low at 4.2% ( $n = 9$ ; Figure 1), while the majority remained uninfected ( $n = 203$ , 95.8%).

Abbreviations: COVID-19, coronavirus disease 2019; ED, emergency department.

Breaking down the infected cases, 4 were physicians, 3 were nurses, and 2 were pre-hospital personnel (Table 1). Of the 9 infected cases, 5 occurred in 2020, and 1 in 2021, but the infection dates for the remaining 3 were not determined.

## Discussion

Different studies have demonstrated that the infection rate among HCWs worldwide ranged from 0.9% to 11% within several months of 2020 [11-14]. A study in the United States conducted at the ED of a large tertiary academic medical center found that 7 of 138 HCWs tested positive for COVID-19 in the month following the pandemic's first wave, yielding a prevalence of 5% [15]. In contrast, a study from Italy reported a 3.4% infection rate in the ED over 9 days [16]. The efficacy of the implemented infection-reduction strategies becomes evident when juxtaposed with the 4% incidence of COVID-19-positive staff at KAMC-WR's ED over 1 year.



**Figure 1.** Bar chart of COVID-19 among ED staff.

**Table 1.** Prevalence of infected HCWs according to their position.

Job title		Total (N = 212), n (%)	Tested positive for COVID-19 (N = 9), n
Hospital	Physicians	91 (42.92%)	4
	Nurses	100 (47.16%)	3
Pre-hospital	First responders	21 (9.90%)	2

Abbreviation: HCW, healthcare worker; COVID-19, coronavirus disease 2019.

Our study had several important limitations. One was the difficulty in ascertaining the infection rate among patients, as they do not face the same level of exposure as frontline HCWs. Another limitation was the study's exclusive focus on the disaster plan's application within the KAMC-WR ED. On the positive side, this research is the first conducted in the Western Region of Saudi Arabia to assess the efficiency of the ED's disaster plan based on the incidence of COVID-19 infections. Furthermore, we encountered no missing data within our sample size, and no participants deviated from the inclusion criteria.

This study underscores the need for stringent infection control strategies to shield HCWs from COVID-19 infection. It also accentuates the importance of prioritizing the well-being and quality of experience of HCWs to enhance the efficacy of any healthcare system. Consequently, we advocate for hospitals to evaluate the effectiveness of their respective disaster plans and refine them based on the challenges experienced during the COVID-19 pandemic.

## List of Abbreviations

ARIS	Acute respiratory infection risk scale
COVID-19	Coronavirus disease 2019
ED	Emergency department
HCW	Healthcare worker
KAMC-WR	King Abdulaziz Medical City - Western Region
PCR	Polymerase chain reaction
PPE	Personal protective equipment

## Acknowledgment

The authors thank the staff and administrators of King Saud Bin Abdulaziz Medical City - Western Region.

## Conflict of interests

The authors declare no conflicts of interest.

## Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Consent to participate

Was not needed due to the study design.

## Consent for publication

All authors consent to the publication of this manuscript.

## Ethical approval

This study was approved by King Abdullah International Medical Research Center- King Saud Bin Abdul-Aziz University for Health Sciences, Jeddah, Saudi Arabia. ID Number SP21J/090/03.

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