



Impact of COVID-19 Lockdown on Emergency Department Visits, Hospital Admissions, and Mortality in Northern Jordan: An Interrupted Time Series Analysis

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ABSTRACT

Background: The Jordanian healthcare system was significantly affected by the COVID-19 pandemic, as lockdowns and infections strained the healthcare system. The impact of the ensuing national lockdown on emergency department visits, hospital admissions, and mortality is unclear. **Purpose:** To assess the impact of COVID-19 lockdown on the pattern of emergency department visits, hospital admissions, and mortality at a major hospital in northern Jordan. **Methods:** An electronic database belonging to King Abdullah University Hospital was used for a retrospective analysis, and the data was accessed in 2022. All patients who visited the emergency department before, during, and after the lockdown in 2020 and 2019 were analyzed using an interrupted time-series analysis. Descriptive statistics were calculated for categorical variables, followed by the Wilcoxon Signed-Ranks Test to detect mean differences. **Results:** ED visits decreased by 53.5% during the lockdown period and by 22% after the lockdown period compared to the same periods a year before. During lockdown, hospital admissions rose significantly from 11.8% in 2019 to 17.1% in 2020, with 23.96% critical care unit admissions. Post-lockdown, ED admissions increased from 11.3% in 2019 to 16.3% in 2020, with critical care admissions rising to 30.10%, and the mortality rate increased by 50%. **Conclusion:** The study concluded a decrease in hospital admissions and emergency visits during lockdown, but an increase in mortality rates. Future planning should focus on optimizing care for life-threatening emergencies, improving national emergency preparedness, and developing Hospital Readiness Checklists for effective response to emergencies like COVID-19. **Implications for Nursing:** Nursing has faced challenges and changes due to the COVID-19 lockdown. Patient admissions decreased after the 2020 lockdown, impacting nursing practice, mental health, and patient care. Nurses should be adapted to telehealth services, maintain care remotely, and address nurses' mental health issues. Virtual tools should be utilized to connect with patients.

Keywords: Jordan, COVID-19, Lockdown, Emergency department, Hospital admissions, Interrupted time series analysis.

What does this paper add?

1. Jordan, like other middle-income countries, has

resource limitations. Analyzing programs during lockdown can improve healthcare quality.

2. Analyzing the lockdown's impact on non-COVID care outcomes is crucial for understanding the COVID-19 health burden, guiding service allocation, and informing public health strategies to reduce hospital admissions.
3. The lockdown in Jordan has led to decreased emergency admissions, impacting hospital resources and service utilization.
4. Limited studies explored the pandemic's impact on ED visits during the lockdown.

Introduction

In December 2019, the severe acute respiratory syndrome coronavirus 2 caused the coronavirus disease 2019 (COVID-19) pandemic, which began in Wuhan, China, then spreading globally by January 2020 (Wu et al., 2020). With no effective treatment available, many countries implemented lockdowns to control the spread. This led to a rapid response worldwide, with measures like isolation, quarantine, and social distancing. Airports were closed, travel was restricted, and people had to work from home. Italy and India enforced nationwide lockdowns (de Feo, 2021; Schultz & Gettleman, 2020). Before the pandemic, healthcare in Jordan and around the world often failed to meet the needs of all demographic groups equally, resulting in disparities in access and quality of care based on gender, socioeconomic status, and ethnicity (Altare, 2023).

In Jordan, the first case that tested positive for COVID-19 was on March 2, 2020, culminating in one of the strictest lockdowns that the country had ever experienced (Jordanian Department of Statistics, 2023). Therefore, a strict lockdown was enforced for 10 weeks (March 18 to May 31, 2020), with a stay-at-home order and suspension of social, religious, and work activities. Only essential workers could use cars, hospitals only admitted emergency cases, and people could walk to nearby stores for groceries within 1 km from 10 am to 6 pm (Jordanian Department of Statistics, 2023). To enforce the lockdown strategy, martial law was enforced, that enabled the government to implement strict public health measures, including curfews and movement restrictions, with the support of military and security forces to ensure compliance (Alkhalaf, 2021). Civil defense and military departments monitored the entrances and exits of all cities. Globally, media reported that the Jordanian lockdown was among the strictest worldwide (Picheta & Qiblawi, 2020).

Initial research from Jordan has indicated a significant influence of the COVID-19 outbreak on healthcare services (Alqutob et al., 2020). However, little is known about the patterns and volumes of injuries that could negatively impact hospital resources during periods of national lockdowns. To address public concerns about visiting the emergency department during the lockdown, it is crucial to assess the impact of the lockdown on the care provided and outcomes of care in non-COVID-related morbidity and mortality. This analysis will provide decision-makers with information needed on the health burden of COVID-19, which offers a sense of how big a problem is. This can, in turn, inform priority setting for service utilization in the future, should more pandemics or unexpected events happen. Additionally, this will help guide public health efforts to reduce any negative impacts and to identify potential benefits that can be used to decrease hospitalizations in vulnerable populations in the future.

In Jordan, while the impact of the global Covid-19 pandemic on healthcare usage has been studied, there is only a limited number of studies that have looked at the trends in emergency department visits during the lockdown period. Jordan, like other middle-income countries, suffers from resource limitations. Indeed, this analysis can be useful for hospital administrators and policymakers in understanding the implementation of different programs during the lockdown to promote the quality of care based on the proper diagnosis at the proper time in the proper setting. These programs shall emphasize the importance of saving health-related costs to better utilize the available 'limited' healthcare services and resources (Moynihan et al., 2021).

The authors believe that this study is an important initiative to set the stage for a better understanding of the healthcare costs and associated factors. Further, the results revealed will increase the awareness of the healthcare members as well as the whole society about the costs associated with the provision of care at the different levels of care services with detailed expenditures per each service (Kastritis et al., 2020; Pak et al., 2021).

Lockdown measures are believed to have possibly worsened existing inequalities in healthcare (Khatatbeh, 2020). The effects on healthcare delivery and whether they have been temporary or have had lasting negative consequences after lockdown measures were lifted remain uncertain. Therefore, it is crucial to evaluate the

effectiveness of the healthcare system and its capacity to address non-COVID-19 health issues amid the lockdown.

The study proposed a research question; what is the impact of COVID-19 national lockdown on emergency department visits, hospital admissions, and mortality in northern Jordan?

Thus, the authors hypothesized that numerous patients with medical conditions at northern Jordan refrained from seeking hospital treatment because of the uncertainties surrounding the pandemic, lockdown measures, and other restrictions implemented during the early stages of the pandemic. Therefore, this study evaluated how the COVID-19 lockdown has affected the rates of non-COVID visits and admissions at King Abdullah University Hospital (KAUH) in Irbid, Jordan. Furthermore, gaining a deeper understanding of how the pandemic has affected medical admissions over time would offer valuable insights for decision-makers and healthcare strategists.

Methods

Study Design

An interrupted time-series analysis was performed to assess the effects of the lockdown order implemented on March 22, 2020, on visits to the emergency department.

Data Source

Secondary data was collected during the selected periods from the electronic database of KAUH. During the study period, KAUH was not involved in the management of patients with COVID-19 (Alqutob et al., 2020).

Setting

This research was conducted at KAUH, a teaching hospital associated with Jordan University of Science and Technology. It is located on the university's campus next to its medical schools. KAUH is the biggest healthcare facility in northern Jordan. It is a tertiary referral center that caters to around 3 million patients from northern Jordan, equivalent to about one-third of the population of Jordan. It serves cities like Irbid, Jerash, Ajloun, and Al-Mafraq. KAUH is equipped with full-time doctors and surgeons who are part of the Faculty of Medicine at JUST, as well as many others from the Ministry of Health and the Royal Medical Services (RMS). KAUH can accommodate 750 beds,

but this capacity can be expanded to 900 beds during emergencies.

Period Definitions

Three periods in 2019 as well as in 2020 were identified:

1. Pre-lockdown period:
 - a. From 01/ January to 21/ March (2019).
 - b. From 01/ January to 21/ March (2020).
2. During lockdown period:
 - a. From 22/ March to 4/ June (2019).
 - b. From 22/ March to 4/ June (2020).
3. Post-lockdown period:
 - a. From 05. June- 30. June (2019).
 - b. From 05. June- 30. June (2020).

Ethical Approval

This research was approved by KAUH's Institutional Review Board (IRB) under the number (628/2020). Informed consent was waived by the IRB as data was completely anonymous. This was a secondary analysis of the anonymous dataset; therefore, further ethical approval was not required.

Data Collection

Data was collected in 2022 at the largest university hospital in northern Jordan by the researcher team on all ED visits from 1 January to 30 June 2019 (48,721 admissions) and the same period in 2020 (36,227 admissions). To investigate the impact of the COVID-19 lockdown on ED admission trends for patients, data was collected for the 6 months starting from 1 January to 30 June in 2019, 2020. Data pertaining to patients' demographics such as age, gender, time of visit, and cause of visit was collected; data about admission time, cause of admission, place of admission and death records was also extracted. During the periods studied, Jordan still had no recorded COVID outbreaks, and the recorded daily cases were less than 20 (COVID-19 Updates in Jordan, 2021).

Data Analysis

All information was inputted into a password-protected database using Microsoft Excel. After cleaning the data, it was transferred to the Statistical Package for Social Sciences (SPSS), version 22. The daily visits and hospital admissions were analyzed and compared with equivalent data from the previous year

(2019) to account for seasonal effects and random fluctuations. The information was condensed using graphs and averages. Descriptive statistics were used to explore some patients’ characteristics and relations of the emergency department visits for three distinct periods: pre-lockdown, lockdown, and post-lockdown corresponding during 2020. The same time periods were studied in 2019. The authors calculated the average, variation, and median for the continuous data and analyzed the percentages, counts, and relationships for the categorical data. The Wilcoxon Signed-Ranks Test was utilized to identify mean variations in the daily visits and hospital admission patterns between 2019 and 2020. A p-value less than 0.05 was deemed to be

statistically significant.

Results

Emergency Department Visits

Figure 1 reports the number of emergency department visits at KAUH for the three periods in 2019 and 2020. There were minimal differences detected in the pre-lockdown periods, while the lockdown period and its corresponding dates from 2019 showed a decrease in ED visits by 57%. After the lockdown, ED visits dropped by 23.2% compared to the same period one year before. The same data is represented as a daily average of the emergency department visits in Table 1.

Table 1. Number of emergency department visits at KAUH for three periods (pre-lockdown, lockdown, and post-lockdown) in 2019 and 2020

Period	Year	ED Visits	(%)	Change in ED Visits (%)
Pre-lockdown	2019	19216	49%	2% (Increase)
	2020	19695	51%	
During lockdown	2019	21226	68%	-53% (Decrease)
	2020	10079	32%	
Post-lockdown	2019	8279	56%	-22% (Decrease)
	2020	6453	43%	

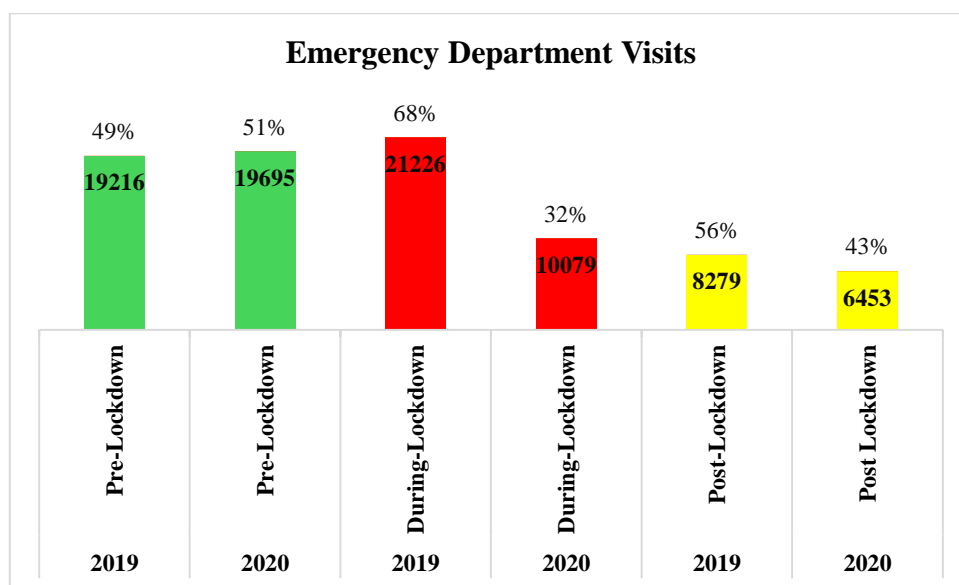


Figure 1. Bar chart of the emergency department visits during three periods in 2019 compared to the same periods in 2020

Pre-lockdown Period

Table 2 shows the patients’ characteristics for the two baseline periods (pre-lockdown) in 2019 and 2020, where the numbers showed that most of the ED visitors

were females, contributing to 51.2% and 51.3% in 2019 and 2020, respectively. Among the ED visitors in the first period, 12.9% of the cases were admitted, and 24.5% of them were admitted to critical care units. In the

first period of 2020, 11.97% of the ED visitors were admitted, and 28.17% of them were admitted to critical care units.

Table 2. Characteristics of all patients for the pre-lockdown period in (2020) compared to the same time period a year earlier in (2019)

Pre-lockdown Period					
Variables		2019		2020	
		Count	(%)	Count	(%)
Gender	Male	9395	48.80%	9593	48.70%
	Female	9821	51.20%	10102	51.30%
Admission Status	YES	2486	12.86%	2357	11.97%
	NO	16730	87.14%	17338	88.03%
Admission Ward	General	1877	9.80%	1693	8.60%
	Critical	609	3.20%	664	3.37%
	Not Admit.	16730	87%	17338	88.03%
Discharge Ward	General	2008	10.40%	1815	9.20%
	Critical	478	2.50%	542	2.80%
	Not Admit.	16730	87.10%	17338	88.00%
CPR	YES	158	0.80%	178	0.90%
	NO	19058	99.20%	19517	99.10%
DEATH	ALIVE	19064	99.20%	19541	99.20%
	DEAD	152	0.80%	154	0.80%

During-lockdown Period

Table 3 first section shows the basic characteristics of all the patients in the lockdown and its corresponding period of 2019 and 2020. During the lockdown, the admissions among the ED visits increased significantly from 11.8% in 2019 to 17.1% in 2020, and 24.82% of the admissions during the second period in 2019 were to critical care units, while 23.96% of the admissions during the lockdown period in 2020 were critical care units' admissions. On the other hand, there were more patients discharged from critical care units in comparison to the year before (2.3% vs. 3.6%, respectively). The in-hospital mortality rate during the

lockdown had doubled significantly in comparison with the same period of the year before.

Post-lockdown Period

Table 3 second section compares the data from the post lockdown period in 2020 with the same data from 2019. It shows a significant increase in the percentage of admissions among the ED visits from 11.3% in 2019 to 16.3% in 2020. In 2019, 25.55% of the admissions were to critical care units, compared to 30.10% in 2020. Looking at the mortality rate, we can see a 50% increase during 2020 compared to the same period in 2019.

Table 3. Characteristics of all patients during lockdown and post-lockdown in (2020) compared to the same time-period a year earlier in (2019)

During-lockdown Period						
Variables		2019		2020		P-value
		Count	(%)	Count	(%)	
Gender	Male	10341	48.60%	5213	48.30%	
	Female	10912	51.40%	4866	51.70%	

Admission Status	YES	2510	11.80%	1723	17.10%	<0.001
	NO	18743	88.20%	8356	82.90%	
Admission Ward	General	1887	8.80%	1310	13%	<0.001
	Critical	623	2.90%	413	4.10%	<0.001
	Not Admit.	18736	88.30%	8356	82.90%	<0.001
Discharge Ward	General	2004	9.40%	1365	13.50%	<0.001
	Critical	486	2.30%	358	3.60%	<0.001
	Not Admit.	18736	88.30%	8356	82.90%	<0.001
CPR	YES	142	0.70%	93	0.90%	0.009
	NO	21084	99.30%	9986	99.10%	
DEATH	ALIVE	138	0.65%	130	1.30%	<0.001
	DEAD	21088	99.30%	9949	98.70%	
Post-lockdown Period						
Variables		2019		2020		P-Value
		Count	(%)	Count	(%)	
Gender	Male	3997	48.30%	3178	49.20%	
	Female	4282	51.70%	3275	50.80%	
Admission Status	YES	947	11.30%	1053	16.30%	<0.001
	NO	7332	88.70%	5400	83.70%	
Admission Ward	General	705	8.50%	736	11%	<0.001
	Critical	242	2.90%	317	4.90%	<0.001
	Not Admit.	7332	88.60%	5400	83.70%	<0.001
Discharge Ward	General	764	9.20%	794	12.30%	<0.001
	Critical	183	2.20%	259	4.00%	<0.001
	Not Admit.	7332	88.60%	5400	83.70%	<0.001
CPR	YES	94	1.10%	52	0.80%	
	NO	8186	98.90%	6401	99.20%	
DEATH	ALIVE	47	0.60%	58	0.90%	0.009
	DEAD	8232	99.40%	6397	99.10%	

Admitted and Non-admitted Patients

Table 4 highlights some characteristics of the ED visits during the lockdown and the post-lockdown

periods in 2019 and 2020. The mortality rate increased significantly during the lockdown period from 5.1% in 2019 to 6.6% in 2020.

Table 4. Characteristics of admitted and non-admitted patients for the lockdown and post-lockdown periods in 2020 compared to the data from 2019

Admitted Patients											
Variables		(During-lockdown Period)				(Post-lockdown Period)					
		2019		2020		P-value	2019		2020		P-value
		Count	(%)	Count	(%)		Count	(%)	Count	(%)	
Gender	Male	1220	49%	840	48.80%		360	44%	458	51.90%	0.001
	Female	1270	51%	883	51.20%		452	56%	425	48.10%	0.001
Admission Ward	General	1867	75%	1310	76%		600	74%	615	70%	0.026
	Critical	623	25%	413	24%		212	26%	268	30%	0.026
Discharge	General	2004	80.50%	1365	79.20%		659	81.20%	673	76.20%	0.007

Ward	Critical	486	19.50%	358	20.80%		153	18.80%	210	23.80%	0.007
CPR	YES	127	5.10%	81	4.70%	0.277	53	6.50%	41	4.60%	0.045
	NO	2363	94.90%	1642	95.30%		759	93.50%	842	95.40%	
DEATH	ALIVE	2364	94.90%	1609	93.40%		777	95.70%	839	95%	
	DEAD	126	5.10%	114	6.60%	0.016 (increase)	35	4.30%	44	5%	
Non-admitted Patients											
Variables		(During-lockdown Period)					(Post-lockdown Period)				
		2019		2020		P-value	2019		2020		P-value
		Count	(%)	Count	(%)		Count	(%)	Count	(%)	
Gender	Male	9094	48.50%	4373	52.30%	<0.001 (increase)	3637	48.70%	2720	48.80%	
	Female	9642	51.50%	3983	47.70%	<0.001 (decrease)	3830	51.30%	2850	51.20%	
CPR	YES	18721	99.90%	8344	99.90%		7425	99.50%	5559	99.80%	
	NO	15	0.10%	12	0.10%		41	0.50%	11	0.20%	0.001
DEATH	ALIVE	18724	99.90%	8340	99.80%		12	0.20%	12	0.20%	
	DEAD	12	0.10%	16	0.20%	0.001 (increase)	7455	99.80%	5558	99.80%	

Discussion

The COVID-19 pandemic has affected all aspects of life, disproportionately impacting the healthcare systems (Moynihan et al., 2021). The emergency department is the primary contact point for patients visiting directly KAUH or those who are referred to it from other hospitals in north Jordan. Analyzing data using the ED visits provides insights into the numbers and types of patients who required treatment. The number of COVID-19 cases in Jordan at the time of this study was very low (single cases). The results represent mostly the effect of lockdown on our region. The results suggest a 26.6% decrease in the total number of non-COVID emergency department visits during the study period from January 2020 to June 2020 in comparison with the same time period during 2019. There was no change in the number of visits in the pre-lockdown period, while there was a 53% and 22% decrease in the number of visits in the lockdown and post-lockdown periods, respectively. Reductions in the number of ED visits were reported in many countries as France (Casalino et al., 2020), Canada (Rennert-May et al., 2021), Italy (66.2%, and 50%) (Giamello et al., 2020; Santi et al., 2021), Holland (29%) (Barten et al., 2022), Finland (16%) (Kuitunen et al., 2020), and Thailand (36%) (Wongtanarasarin et al., 2021). This reduction

involves all age groups and all causes (Santi et al., 2021), and all disease severities (Casalino et al., 2020; Santi et al., 2021).

The reduction in the number of ED visits is multi-factorial (Barten et al., 2022). This may be attributed to: patients’ fear of seeking help in the ED (Barten et al., 2022; Ojetti et al., 2020; Santi et al., 2021); social distancing and stay at home orders besides lockdown seemed to play a vital role (Barten et al., 2022; Santi et al., 2021); in addition to lifestyle changes, postponement of elective procedures, and the sense of civil responsibilities of the population (Barten et al., 2022); decreased visits of low urgency complaints (Giamello et al., 2020); rescheduling chemotherapy caused fewer ED visits for iatrogenic complications (Barten et al., 2022); Other researchers related the decrease in ED visits to the decline in pulmonary and cardiovascular emergencies because of the decreased physical exertion and improved air quality as a result of lockdown (Giamello et al., 2020). Additional potential explanations were connected to the closure of schools and the decline in contagious diseases among children spreading through the air or fecal-oral routes. People were unable to utilize their cars for transportation, which prevented traffic accidents. Trauma and fall cases decreased as a result of people's inability to move around freely, and physically

demanding jobs were put on hold.

A possible explanation of reduced ED utilization is that the population response to lockdown may be more affected by the national level authority risk message than the real local situation (Santi et al., 2021), the drastic reduction of ED admissions during the pandemic may be associated with fear of the virus, suggesting that patients with serious illnesses did not go to the emergency department. Moreover, there was a possible misuse of the ED in the years before. Worrying data emerged regarding a drop in cardiology and neurology admissions. Those patients postponed medical attention, possibly with fatal consequences, just for fear of exposure to COVID-19, leading to unnecessary morbidity and mortality (Ojetti et al., 2020).

Regardless of age, severity, or causes, there was a general decline in ED visits, which may indicate that patients were unable to determine when they needed urgent care (Santi et al., 2021).

Admissions

Although this study showed that the number of emergency department visits decreased in the lockdown and post-lockdown periods, the percentage of admissions through the emergency department had increased by (46% and 58%) in the lockdown and post-lockdown periods, respectively. There was also a 41%, and 69% increase in critical care admissions during the same periods. Authors from Italy, Germany, and Finland had reported decreases in hospital admissions by 46%, 35%, and 15% (Helgeland et al., 2021; Kapsner et al., 2021; Santi et al., 2021). Significant decreases were also reported from Norway, and New Zealand. This contradicts reports from Thailand, where 16% increase in ER admissions was reported during the lockdown (Wongtanasarasin et al., 2021). Similar decreases in critical care admissions were also noted in Italy and Germany, whereas in Thailand (Wongtanasarasin et al., 2021), a study showed a 26.4% increase in ICU admissions. The increase in admission rates in the lockdown period is because of the mostly restricted access to ED through EMS, which prioritizes the more severe cases to be transported first. No patients were able to walk-in into the ED. The reduction of ED visits for minor problems, the worse clinical situation of patients admitted, contributed relatively to increased need for intensive care units and caused higher mortality rates.

Mortality

The findings of this study showed that there was no change in the mortality in the period before lockdown, while, in the lockdown period, and the period after the lockdown, mortality increased by 86%, and 50%, respectively, in comparison with the same periods during 2019. The increase in critical care admissions during the same period suggests that one possible reason for these findings could be the delay in presenting serious cases to the hospital until difficulties arise. This is supported by what was reported by Ojetti et al. (2020) from Rome, Italy, where they reported a drop in cardiology and neurology admissions. Those patients postponed medical attention, possibly with fatal consequences, fearing exposure to COVID-19, leading to unnecessary morbidity and mortality (Ojetti et al., 2020).

Santi et al. (2021) described a drop in the ED visits and hospitalization in northern Italy. We believe that this data is due to a delay in seeking medical attention at hospitals and the system's failure to provide the usual level of care during a public health crisis. This has led to a rise in out-of-hospital deaths, particularly from cancer, heart disease, and metabolic conditions. The decrease in in-hospital mortality was attributed to the decrease in non-COVID-19 patients in healthcare facilities.

Implications for Nursing

The COVID-19 lockdowns have had a major impact on various sectors, including healthcare. As an essential component of the healthcare system, the nursing profession has faced many challenges and changes due to the lockdown measures (Alolayyan et al., 2023). This study results mainly discovered that patient admissions decreased after the first lockdown in 2020, compared to the same period in 2019. Consequently, there is an impact on nursing practice, mental health, patient care, and educational aspects. The impact on nursing practice includes the adoption of telehealth services. Studies indicate that telehealth has become an essential tool in nursing, allowing for continued patient monitoring and consultation during lockdowns (Smith et al., 2021). Hospital managers and administrations should assist and facilitate nurses to quickly adapt to providing care through digital platforms, which involves learning new technologies and maintaining patient care standards remotely. Regarding the impact on mental health and well-being of nurses, Gonzalez et al. (2021) found that

the increased workload, fear of infection, and emotional toll of caring for COVID-19 patients contributed to higher levels of anxiety and depression (Gonzalez et al., 2021). Therefore, hospitals should be provided with resources for psychological support and interventions to decrease stress and burnout among nurses.

Lockdown has impacted traditional patient-nurse interactions, which is related to patient care and safety. Studies like Johnson et al. (2021) emphasized the innovative approaches that nurses adopted to ensure patient safety and care continuity, such as implementing infection control protocols and patient education on COVID-19 prevention (Johnson et al., 2021). Therefore, nurses should find new ways to connect with patients, for example using virtual communication tools (Taylor et al., 2021). Finally, nursing education has seen a major shift to online platforms during lockdowns. The integration of online simulations and virtual clinical experiences should be essential to the continuity of nursing education (Miller et al., 2021).

Limitations

This study is a retrospective observation of a single hospital. The results cannot be used to explain the situation throughout Jordan and are not generalizable. This study compares the lockdown period with pre-and post-lockdown periods, with the same periods during 2019 to exclude any seasonal changes. The number of reported COVID cases in Jordan was very limited; in KAUH there were no COVID-19 cases treated. Also, the numbers reflect the true impact of lockdown on the number of visits and outcome. KAUH is a referral center

for the north of Jordan, and the number of visits could indicate a widespread change in the pattern of visits in primary care centers and other hospitals in the region.

Conclusion

This paper concluded that the lockdown strategy, along with other measures, could be an effective strategy to mitigate the spread of the pandemic. The findings of this study revealed a decrease in admissions and the total number of emergency visits during and after the pandemic COVID-19 lockdown, while the rate of mortality increased. Therefore, implementing a strategy to optimize life threatening (such as: cardiac and neurological) emergency cases and early care during pandemics is essential in the future. In addition, the increased number of deaths shows the need for improved preparedness in national emergency systems to deal with different pandemics. Furthermore, hospital leaders need to develop a Hospital Readiness Checklist and policies that will assist them with future decision-making, planning, and developing strategies to respond to COVID-19 pandemic and other emergency cases while the lockdown is implemented.

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Conflict of Interests

No conflict of interests is to be declared by the authors.

REFERENCES

- Alkhaldeh, A.A. (2021). Persuasive strategies of Jordanian government in fighting Covid-19. *GEMA Online Journal of Language Studies*, 21 (1).
- Alolayyan, M.N., Azar, S., Hamadneh, S., Alyahya, M., & Bawa'neh, L. (2023). Nurses on the front line: Experiences of nurses caring for patients with COVID-19 in field hospitals. *Jordan Journal of Nursing Research*, 2 (4), 270-278.
- Alqutob, R., Al Nsour, M., Tarawneh, M. R., Ajlouni, M., Khader, Y., Aqel, I., ..., & Obeidat, N. (2020). COVID-19 crisis in Jordan: Response, scenarios, strategies, and recommendations. *JMIR Public Health and Surveillance*, 6 (3), e19332.
- Altare, C., Kostandova, N., Gankpe, G.F., Nalimo, P., Almoustapha Abaradine, A.A., IMPACT CAR Team, ..., & Spiegel, P.B. (2023). The first year of the COVID-19 pandemic in humanitarian settings: Epidemiology, health service utilization, and healthcare seeking behavior in Bangui and surrounding areas, Central African Republic. *Conflict and Health*, 17 (1), 24.
- Barten, D.G., Latten, G.H., & van Osch, F.H. (2022). Reduced emergency department utilization during the early phase of the COVID-19 pandemic: Viral fear or lockdown effect? *Disaster Medicine and Public Health*

- Preparedness*, 16 (1), 36-39.
- Casalino, E., Choquet, C., Bouzid, D., Peyrony, O., Curac, S., Revue, E., ..., & Ghazali, D.A. (2020). Analysis of emergency department visits and hospital activity during influenza season, COVID-19 epidemic, and lockdown periods in view of managing a future disaster risk: A multi-center observational study. *International Journal of Environmental Research and Public Health*, 17 (22), 8302.
- COVID-19 Updates in Jordan. (2021). Jordan Ministry of Health. <https://corona.moh.gov.jo/en/MediaCenter/5827> <https://corona.moh.gov.jo/en/MediaCenter/5827>
- De Feo, G. (2021, May 13). *Sondaggio demos: Gradimento per conte alle stele-YouTrend*. <https://www.youtrend.it/2020/03/20/sondaggio-demos-gradimento-per-conte-alle-stelle>
- Giamello, J.D., Abram, S., Bernardi, S., & Lauria, G. (2020). The emergency department in the COVID-19 era. Who are we missing? *European Journal of Emergency Medicine*, 27 (4), 305-306.
- Gonzalez, M. et al. (2021). Increased stress and burnout among nurses during COVID-19 lockdowns. *Nursing Mental Health Journal*, 23 (2), 89-102.
- Helgeland, J., Telle, K. E., Grøslund, M., Huseby, B. M., Håberg, S., & Lindman, A. S. (2021). Admissions to Norwegian hospitals during the COVID-19 pandemic. *Scandinavian Journal of Public Health*, 49 (7), 681-688.
- Johnson, P. et al. (2021). Maintaining quality of care in nursing during COVID-19 lockdowns. *Patient Safety Journal*, 29 (2), 134-145.
- Jordanian Department of Statistics. (2023). *Population estimates*. <https://dosweb.dos.gov.jo/history/>
- Kapsner, L.A., Kampf, M.O., Seuchter, S. A., Gruendner, J., Gulden, C., Mate, S., ..., & Prokosch, H.U. (2021). Reduced rate of inpatient hospital admissions in 18 German university hospitals during the COVID-19 lockdown. *Frontiers in Public Health*, 8, 594117.
- Kastritis, E., Tsitsimpis, K., Anninos, E., Stamatelopoulos, K., Kanakakis, I., Lampropoulos, C., ..., & Dimopoulos, M.A. (2020). Significant reduction in the visits to the emergency room department during the COVID-19 pandemic in a tertiary hospital in Greece: Indirect victims of the pandemic? *Medicine*, 99 (52), e23845.
- Khatatbeh, M. (2020). Efficacy of nationwide curfew to encounter spread of COVID-19: A case from Jordan. *Frontiers in Public Health*, 8, 394.
- Kuitunen, I., Ponkilainen, V.T., Launonen, A.P., Reito, A., Hevonkorpi, T.P., Paloneva, J., & Mattila, V.M. (2020). The effect of national lockdown due to COVID-19 on emergency department visits. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 28, 1-8.
- Miller, S. et al. (2021). Shift to online education in nursing during COVID-19. *Journal of Nursing Education*, 60 (4), 220-230.
- Moynihan, R., Sanders, S., Michaleff, Z.A., Scott, A.M., Clark, J., To, E.J., ..., & Albarqouni, L. (2021). Impact of COVID-19 pandemic on utilization of healthcare services: A systematic review. *BMJ Open*, 11 (3), e045343.
- Ojetti, V., Covino, M., Brigida, M., Petruzzello, C., Saviano, A., Migneco, A., ... & Franceschi, F. (2020). Non-COVID diseases during the pandemic: Where have all other emergencies gone? *Medicina*, 56 (10), 512.
- Order-Defense. (2020). Prime Ministry of Jordan. <http://www.pm.gov.jo/upload/files/Order-Defense-2.pdf>
- Pak, A., Adegbeye, O.A., & McBryde, E.S. (2021). Are we better-off? The benefits and costs of Australian COVID-19 lockdown. *Frontiers in Public Health*, 9, 798478.
- Picheta, R., & Qiblawi, T. (2020, March 26). *Jordan eases lockdown after total curfew leads to chaos*. CNN. <https://edition.cnn.com/2020/03/25/middleeast/jordan-lockdown-coronavirus-intl/index.html>
- Rennert-May, E., Leal, J., Thanh, N.X., Lang, E., Dowling, S., Manns, B., ..., & Ronksley, P.E. (2021). The impact of COVID-19 on hospital admissions and emergency department visits: A population-based study. *PLoS One*, 16 (6), e0252441.
- Santi, L., Golinelli, D., Tampieri, A., Farina, G., Greco, M., Rosa, S., Beleffi, M., Biavati, B., Campinoti, F., Guerrini, S., Ferrari, R., Rucci, P., Fantini, M.P., & Giostra, F. (2021). Non-COVID-19 patients in times of pandemic: Emergency department visits, hospitalizations and cause-specific mortality in northern Italy. *PloS One*, 16 (3), e0248995. <https://doi.org/10.1371/journal.pone.0248995>
- Schultz, K., & Gittleman, J. (2020). *Modi orders 3-week total lockdown for all 1.3 billion Indians*.
- Smith, J. et al. (2021). Adaptation to telehealth in nursing: A response to COVID-19 lockdowns. *Journal of Nursing Practice*, 45 (3), 150-160.

Taylor, R. et al. (2021). Impact of lockdowns on patient-nurse interaction. *Clinical Nursing Studies*, 34 (3), 190-200.

Wongtanarasasin, W., Srisawang, T., Yothiya, W., & Phinyo, P. (2021). Impact of national lockdown on emergency department visits and admission rates during the COVID-19 pandemic in Thailand: A hospital-based study. *Emergency Medicine*

Australasia, 33 (2), 316-323.

Wu, F., Zhao, S., Yu, B., Chen, Y.M., Wang, W., Song, Z.G., Hu, Y., Tao, Z.W., Tian, J.H., Pei, Y.Y., Yuan, M.L., Zhang, Y.L., Dai, F.H., Liu, Y., Wang, Q. M., Zheng, J.J., Xu, L., Holmes, E.C., & Zhang, Y.Z. (2020). A new coronavirus associated with human respiratory disease in China. *Nature*, 579 (7798), 265–269. <https://doi.org/10.1038/s41586-020-2008-3>