

# The Impact of COVID-19 Lockdown on HIV Care: A Cross-Sectional Study in a Tertiary Center

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## ABSTRACT

**Background:** People living with HIV (PLWH) might be at risk of more severe COVID-19. Although anti-retroviral therapy (ART) may have theoretical activity against COVID-19, which can protect PLWH from COVID-19. Therefore, this study aims to assess the negative consequences of the COVID-19 lockdown on HIV care and anti-retroviral therapy (ART) adherence.

**Methods:** This cross-sectional study included HIV+ patients in Jeddah aged  $\geq 18$  years old who had clinic visits during the lockdown period (April-August 2020) and were on ART for  $\geq 2$  years; newly diagnosed patients were excluded. Data were collected by a tele-questionnaire and electronic medical records system.

**Results:** A total of 85 participants were recruited. The results showed that 58.82% of participants reported no change in their ART adherence during the lockdown, whereas 37.65% increased and 3.53% had decreased compliance. About 63.53% of participants could come to the clinic, yet 36.47% were disturbed. Approximately 10.59% couldn't reach healthcare providers, and nearly 89.41% could disclose their healthcare providers during the lockdown. Thus, 95.29% disagreed that the lockdown affected their HIV care in general. Though, 34.11% did not have ART refills for some period during the pandemic, with median days of 13 [IQR: 5-30]. Clinically, no significant change was observed in lab results before and after the lockdown.

**Conclusion:** The results showed a minimum negative impact on HIV care during the COVID-19 lockdown; this might be due to the enhanced policies applied by the hospital. However, additional research is necessary to raise the standard of healthcare in Saudi Arabia.

**Keywords:** Adherence, Anti-retroviral therapy, COVID-19, HIV, Saudi Arabia

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## INTRODUCTION

Anti-retroviral therapy (ART) with lifelong adherence is crucial to achieving the goal of treatment<sup>1,2</sup>. The therapy goals are virological suppression, preserving the immune system, improving the patient's quality of life, and reducing sickness and death due to HIV<sup>3,5</sup>. People living with the human immunodeficiency virus might be at risk of more severe COVID-19<sup>8</sup>. On the other hand, ART may have theoretical activity against COVID-19, which can protect PLWH from infection<sup>8</sup>. Some protease inhibitors might have an action against COVID-19<sup>7</sup>. However, existing data do not support the efficacy of lopinavir/ritonavir or darunavir<sup>8</sup>. Interestingly, tenofovir may not be effective for prophylaxis against COVID-19<sup>8</sup>.

Virological failure may occur for various reasons, and the most fundamental reason is poor medication adherence<sup>4,5</sup>. Few data showed that PLWH adherence to their ART increased due to quarantine; they believed ART adherence could minimize infection and harm from COVID-19<sup>6</sup>. Despite ART medications, many PLWH thought they had increased susceptibility to COVID-19 due to weakened immune systems; they had to take more precautions to avoid infection with COVID-19<sup>6</sup>. Some PLWH fear contracting COVID-19 at HIV clinics and potential infection on the way to the clinic or while waiting to receive HIV care<sup>6</sup>.

A study estimated that deaths over 5 years would possibly increase by 10% during the COVID-19 pandemic in PLWH due to disruptions of ART adherence<sup>7</sup>. From around the world, there have been many case series describing the course of COVID-19 in PLWH, regarding disease severity, patients requiring hospitalization, and mortality<sup>8</sup>. A cohort study described the incidence and severity of COVID-19 among PLWH receiving ART. It concluded that PLWH receiving tenofovir/emtricitabine (TDF/FTC) have a lower risk for COVID-19 and related hospitalization than those receiving other therapies<sup>9</sup>.

Besides the risk of COVID-19 disease, PLWH are more likely to experience social isolation; as a measure to prevent the spread of COVID-19, this experience may harm mental health<sup>10,12</sup>. These psychosocial stressors may reduce medication adherence, leading to failure to achieve adequate HIV management and increasing the risk of adverse health outcomes among PLWH<sup>10,12</sup>. PLWH are likely to experience treatment interruptions due to restrictions to medical appointments related to physical distancing requirements<sup>11</sup>. However, some PLWH may not have the resources to fully take advantage of telehealth opportunities (e.g., access to devices or adequate Internet service)<sup>11</sup>. PLWH have a compromised immune system, non-adherence to ART, or disease not well managed may be at increased risk for contracting COVID-19 and may be at increased risk of severe symptoms and death<sup>11</sup>.

King Faisal Specialist Hospital & Research Centre has activated the Phone Clinic during the lockdown for patients who cannot come and have chronic diseases, including PLWH. Pharmacists who attended the HIV phone clinic have extended the number of refills. Also, the ambulatory care pharmacies increased mail delivery for prescriptions and initiated a drive-thru pharmacy for emergency supplies to provide continuum care. There is little evidence to date regarding the effect of the COVID-19 lockdown on PLWH's ability to attend clinics and continue ART. Therefore, this study aimed to assess the negative consequences of the COVID-19 lockdown on HIV care and ART adherence.

## METHODOLOGY

**Study Design/Settings:** This is a cross-sectional study conducted at King Faisal Specialist Hospital and Research Centre-Jeddah (KFSHRC), Saudi Arabia.

**Study Duration and Population:** All HIV-positive adult patients with the following eligibility criteria from April 2018 to August 2020 were included in the study.

Adult patients aged  $\geq 18$  with HIV who had clinic visits during the lockdown period (April-August 2020) and were on ART for  $\geq 2$  years were included. Patients were excluded if they were newly diagnosed.

**Data Management:** Pharmacists with adequate training and HIV experience collected the data using a tele-questionnaire and an electronic medical records system and were entered in REDCap (10.8.0 - © 2021 Vanderbilt University). All patients' records were assigned to unique codes.

The tele-questionnaire contains three sections: the first includes demographic data such as age group and gender. The second section has 4 questions taken from another study (Linnemayr, et.al 2020)<sup>6</sup>, and modified as appropriate: (1) What are the Perceived effects of the COVID-19 lockdown on HIV clinic attendance; (2) Does the COVID-19 lockdown affect your communication with your HIV healthcare provider; (3) Does COVID-19 lockdown affect your HIV care in general; (4) How COVID-19 lockdown affect your ART adherence. The tele-questionnaire was initially written in English, then translated into Arabic to apply to the Saudi population. Three experts tested the validity of the questionnaire, and then the questions were edited according to their comments.

The last section was collected by the electronic medical records system, including comorbidities, current ARTs, other medications, BMI, refills dates, lab results before and during the lockdown, including renal profile (serum creatinine), liver profile (ALT and AST), lipid profile (LDL), CD4+T-cells count, HIV viral load.

**Definitions:** Adherence problem to ART is defined as missing 1 or more ART refills, having missed a clinic visit, or patient(s) complaining of non-adherence to ART.

HIV care is a public health model that outlines the steps or stages that people with HIV go through, from diagnosis to achieving and maintaining viral suppression (a very low or undetectable amount of HIV in the body) through care and treatment<sup>13</sup>. These steps are the diagnosis of HIV infection, linkage to HIV medical care, receipt of HIV medical care, retention in medical care and achievement, and maintenance of viral suppression.

**Data Analysis:** Data were analyzed using Stata17 software (StataCorp. 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC.). Categorical data were presented as frequency(n), and percentages (%). Quantitative data were described as a median, interquartile range (IQR) due to the lack of normality assumption by the Kolmogorov-Smirnov test.

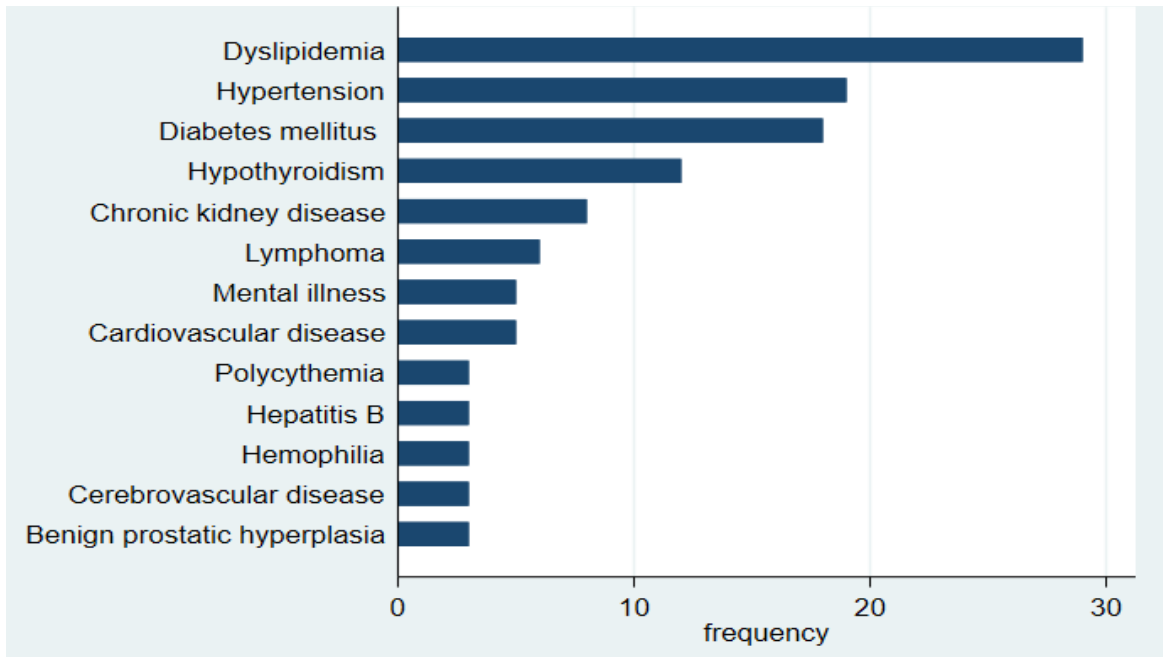
## RESULTS

**Table 1:** Demographic data of study participants n=85

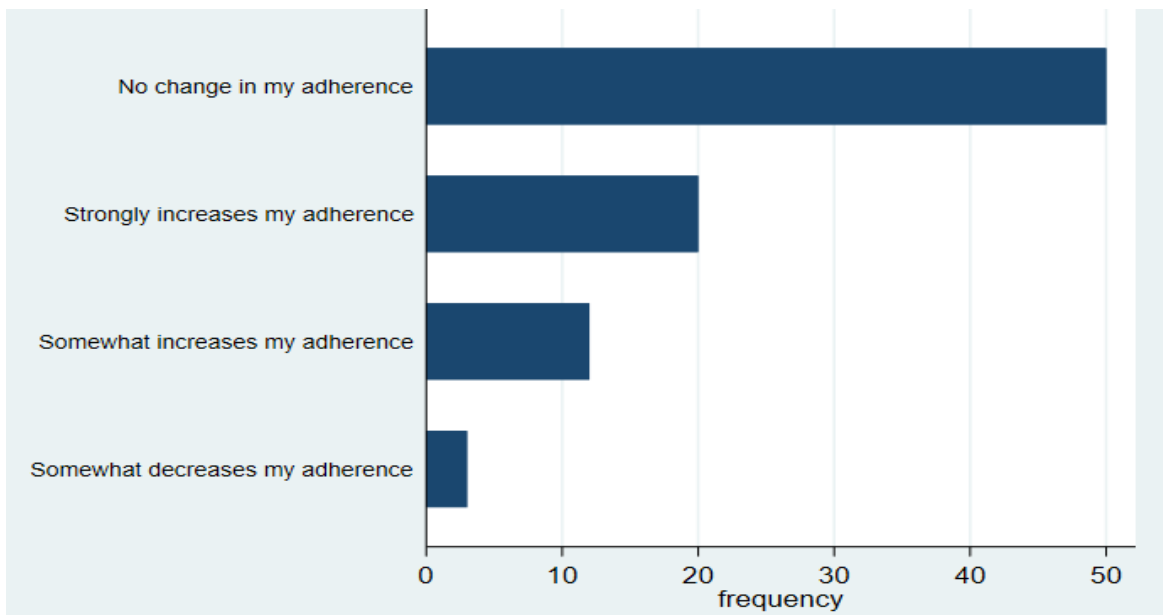
Demographic data	n (%)	
Gender	Males	54 (63.53)
	Females	31 (36.47)
Age groups (years)	[18-29]	4 (4.71)
	[30-49]	48 (56.47)
	[50-69]	31 (36.47)
	[70-89]	2 (2.35)
	Underweight [Below 18.5]	6 (7.06)
BMI classification <sup>14</sup>	Normal weight [18.5-24.9]	19 (22.35)
	Pre-obesity [25.0-29.9]	29 (34.12)
	Obesity class I [30.0-34.9]	14 (16.47)
	Obesity class II [35.0-39.9]	15 (17.65)
	Obesity class III [Above 40]	2 (2.35)

**Table 2:** Patients' experience during the COVID-19 lockdown n=85

Question	1-Strongly agree	2-Agree	3-Disagree	4-Strongly disagree	Total (%)
	n (%)	n (%)	n (%)	n (%)	n (%)
-Does the COVID-19 lockdown impact your ability to come to the clinic	17(20)	14(16.47)	16(18.82)	38(44.71)	85(100)
-Does the COVID-19 lockdown affect your communication with your HIV healthcare provider	2(2.35)	7(8.24)	28(32.94)	48(56.47)	85(100)
-Does the COVID-19 lockdown affect your HIV care in general	0	4(4.71)	27(31.76)	54(63.53)	85(100)



**Figure 1:** The most reported comorbidities in study participants



**Figure 2:** How COVID-19 lockdown affects your ART adherence?

Table 1 shows the demographic factors of the study participants; 85 participants were recruited for the study, and more than half of them are males (63.53%), whereas (36.47%) are females. The most common age group is [30-49] years (56.47%), followed by [50-69] (36.47%), then [18-29] (4.71%), and [70-89] (2.35%). For BMI classification, (36.38%) are obese patients, (34.12%) are pre-obese, (22.35%) are average weight, and (7.06%) are underweight.

Figure 1 presents the most common comorbidities. The highest comorbidity is dyslipidemia (n=29), followed by hypertension (n=19), diabetes (n=18), hypothyroidism (n=12), Chronic kidney disease (n=8), lymphoma (n=6), and (n=5) for mental illness and cardiovascular disease. A small minority have hemophilia, polycythemia, hepatitis B, cerebrovascular disease Benign prostatic hyperplasia with n=3 for each.

Figure 2 and Table 2 demonstrate the results of the tele-questionnaire during the COVID-19 lockdown. More than half of the participants (58.82%) reported no change in their adherence to taking ART during COVID-19, and (3.53%) reported that COVID-19 somewhat decreased their ability to take ART, whereas (37.65%) said that COVID-19 had increased their ability to take ART (see figure 2). Furthermore, (95.29%) disagreed that the COVID-19 lockdown affects their HIV care in general, and only (4.71%) agreed. Also, (63.53%) disagreed that the COVID-19 lockdown impacted their ability to come to the clinic, and only (36.47%) agreed. In addition, (89.41%) disagreed that the COVID-19 lockdown affects their communication with their HIV healthcare provider, whereas only (10.59%) agreed (Table 2).

Table 3 shows lab results before and after the COVID-19 lockdown. Clinically, no significant change was observed in the median[IQR] of lab results before and after the lockdown; Serum CR: 86[73.5-107] to 83[65-99.5] µmol/L, ALT: 21[13-23] to 22 [14-26] u/l, AST: 17[16-21] to 20[16-23.5] u/l, LDL: 2.95[2.5-3.8] to 3[2.25-3.3] mmol/l, CD4+T-cells: 579.5[416-821] to 647[449-886] 10<sup>6</sup>/L, viral loads: 20[20] to 20[20-85] copies/mL as a significant proportion had an undetectable viral load <20 copies/mL, (65.88%, n=56) before the lockdown and (29.41%, n=25) during the lockdown.

Figure 3 presents the current antiretroviral (ART) medications used by participants. The most prevalent ART is Emtricitabine/Tenofovir AF (n=37), followed by Elvitegravir/Cobicistat/Emtricitabine/TenofovirAF (n=30), then Dolutegravir (n=26), Raltegravir (n=11), Emtricitabine/Rilpivirine/Tenofovir AF (n=11), Darunavir/Cobicistat (n=10), Darunavir (n=2), Emtricitabine/Tenofovir DF (n=2), Lamivudine (n=2), Ritonavir (n=1). Figure.4 illustrates the number of days without refill during the pandemic. 29 out of 85 (34.11%) did not have ART refills for some time during the pandemic, with median days of 13[IQR: 5-30].

**DISCUSSION**

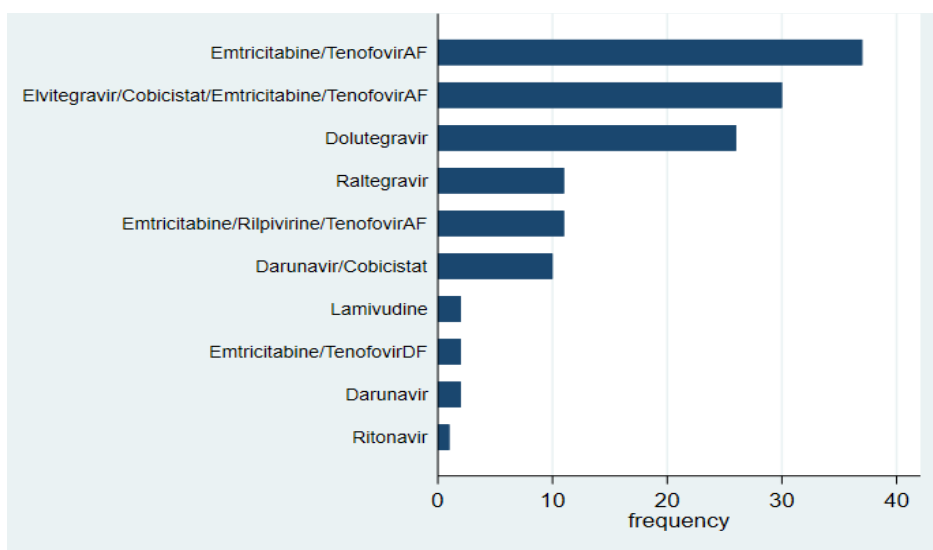
Facilitating access to healthcare services and improving the quality and efficiency of services are part of the Health Sector Transformation Program’s strategic objectives to achieve the ambitions of Saudi Vision 2030<sup>15</sup>. The current study aims to assess the negative consequences

**Table 3:** Labs before and during the COVID-19 lockdown

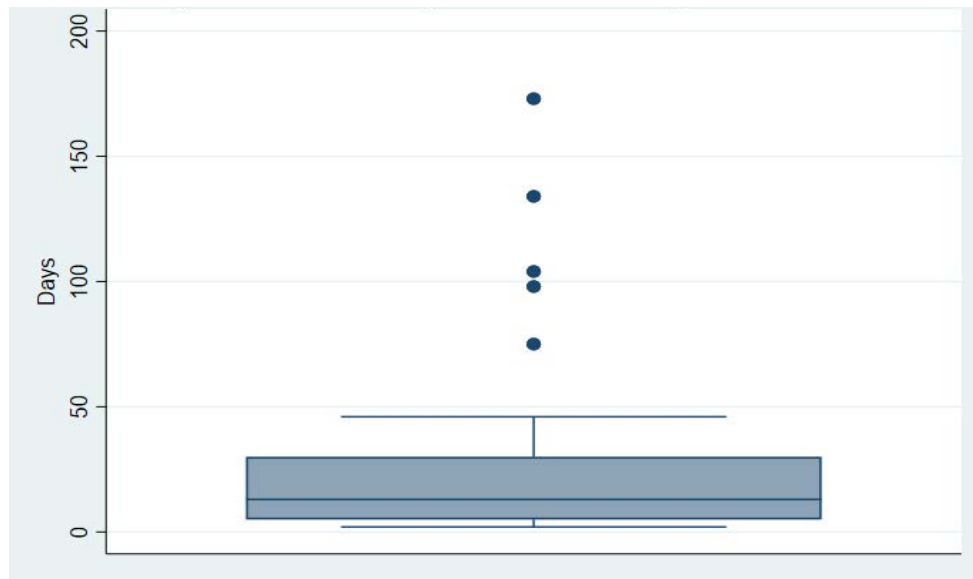
Comparison before and during the lockdown (n=32)			Baseline labs (n=85)		Lab results
n	During the lockdown Median [IQR]	Before the lockdown Median [IQR]	n	Median [IQR]	
32	86 [73.5-107]	83 [65-99.5]	85	80 [63-95]	-Serum CR (µmol/L)
29	21 [13-23]	22 [14-26]	85	18 [13-28]	-ALT (u/l)
28	17 [16-21]	20 [16-23.5]	85	18 [15-23]	-AST (u/l)
24	2.95 [2.5-3.8]	3 [2.25-3.3]	84	2.9 [2.5-3.75]	-LDL (mmol/l)
30	20 [20] <sup>a</sup>	20 [20-85]	85	20 [20-64]	-Viral loads (copies/mL)
30	579.5 [416-821]	647 [449-886]	85	732 [480-931]	-CD4+T-cells (10 <sup>6</sup> /L)

CR: creatinine, ALT: alanine transaminase, AST: aspartate aminotransferase, LDL: low-density lipoprotein, CD4: a cluster of differentiation 4, T-cells: cells mature in the thymus.

<sup>a</sup> The vast majority have Viral loads with lower limits of detection (<20).



**Figure 3:** Current antiretroviral medications



**Figure 4:** Number of days without refill during the lockdown n=29

of the COVID-19 lockdown on HIV care and ART adherence. The findings of this study have been compared with the results of other studies to determine the similarities and differences regarding the impact of the lockdown.

A study conducted by (Linnemayr et al 2020) in Uganda revealed that a significant proportion reported no change in their ART adherence, followed by a minority of increased and decreased<sup>6</sup>. Similarly, in the current study, more than half of the participants reported no change in their adherence to ART during COVID-19. An insignificant amount reported that COVID-19 somewhat decreased their ability to take ART. In contrast, a good proportion said that COVID-19 had increased their ability to take ART.

In addition, more than half of the participants disagreed that the COVID-19 lockdown affected HIV clinic visits. However, in the (Linnemayr et al. 2020) study, a significant majority agreed that COVID-19 affected their attendance at the HIV clinic, and a small minority disagreed<sup>6</sup>.

Moreover, the current study revealed that only a minority couldn't reach their healthcare providers, and the majority could disclose their healthcare providers. Also, almost all participants disagreed that the lockdown affected their HIV care. However, there is a lack of studies that discuss the general change in health and communication with healthcare providers during the lockdown.

Therefore, the reason for the positive feedback from participants might be that King Faisal Specialist Hospital & Research Centre has activated the Phone Clinic during the lockdown for patients who cannot come and have chronic diseases, including PLWH. Pharmacists who attended the HIV phone clinic have extended the number of refills. Also, the ambulatory care pharmacies increased mail delivery for prescriptions and initiated a drive-thru pharmacy for emergency supplies to provide continuum care. Nevertheless, despite the efforts of the hospital staff, twenty-nine out of eighty-five did not have ART refills for some period during the pandemic, mostly from five to thirty days. Similarly, another study conducted by (Dorward et al. 2021) in South Africa revealed that ART collection visits decreased slightly and missed ART collection visits increased for a short time<sup>16</sup>. Also, in Vietnam a study conducted by (Matsumoto et al. 2021), thirteen patients discontinued their medications because of the pandemic for up to sixty days<sup>17</sup>.

## STRENGTHS AND LIMITATIONS

The strength of this study is that the data was collected within a limited period with the support of the pharmacy department in the hospital and stakeholders in several specialties. However, the finding of this study cannot be generalized because the sample size needs to be larger, and it was performed at a single tertiary-care hospital. Also, there were some missing data in the lab results during the lockdown; not all patients booked appointments during the lockdown, and usually, the appointments for PLWH are once every six months.

## CONCLUSION

**Ever since COVID-19 started, there have been many challenges in the healthcare sector. However, after the lockdown, healthcare practices changed dramatically in Saudi Arabia, and the pandemic was considered an opportunity for continuous improvement. King Faisal Specialist Hospital & Research Centre (KFSHRC) has extended its lockdown services, including the phone clinic, mail delivery for prescriptions as well as the drive-thru pharmacy for patients who are not able to come and have chronic diseases, including PLWH, to avoid exposing them to infections since they are immunocompromised.**

**Finally, the results showed minimal negative impact on HIV care during the COVID-19 lockdown in PLWH, and a large proportion did not miss ART refills. However, this is a single-center study; to elevate the standard of health in Saudi Arabia, multi-center studies are necessary.**

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**Ethical Statement:** IRB approval was taken from the Office of Research Affairs (ORA) in KFSHRC Jeddah (RAC: #2021-35). Confidentiality of the data was assured safe; no one has access to data files except the research team. Verbal consent was taken from participants before collecting the data to confirm their voluntary participation, and the consent included the study's objective and its benefit to society. Therefore, this study was implemented following Good Clinical Research Practice (Declaration of Helsinki) and the rules and guidelines of the Ethics Committee in KFSHRC.

**Authorship Contribution:** Each author contributes equally to (1) the conception and design, collection, analysis, and interpretation of data; (2) the writing of the article and critical revision of it for significant intellectual content; and (3) the final approval of the manuscript version to be published.

**Potential Conflict of Interest:** None

**Competing Interest:** None

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