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Original Article

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Impact of the COVID-19 Pandemic on HIV Services in Korea: Results from a Cross-Sectional Online Survey

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Conflict of Interest
JAL and YK are paid employees of Gilead Sciences Korea Ltd. JYC does not have any conflict of interests to declare.

ABSTRACT

Background: Globally, the coronavirus disease 2019 (COVID-19) pandemic has compromised human immunodeficiency virus (HIV) services. The study aimed to assess the impact of COVID-19 on the access and delivery of HIV care in Korea.
Materials and Methods: People living with HIV (PLHIV), people at risk of HIV (PAR) and prescribers of HIV care were recruited through a patient advocacy group, online communities for men who have sex with men (MSM) and a HIV care center for a web-based survey between October 22 and November 26, 2020. The survey compared the frequency of hospital/clinic visits, HIV-related testing, access to antiretroviral therapy (ART) or preventive medications, and experience with telehealth services by PLHIV and PAR between the pre-pandemic and pandemic eras.
Results: One hundred and twelve PLHIV (mean age: 38.5 ± 10.2 years), 174 PAR (mean age: 33.5 ± 8.0 years) and 9 prescribers participated the survey; ≥97% of the PLHIV and PAR were male. A greater proportion of PAR than PLHIV reported a decrease in the frequency of hospital/clinical visits (59.2% *vs.* 17.0%) and HIV-related testing (50.6% *vs.* 6.3%) since COVID-19. Among PAR, not engaging or engaging less in high-risk behaviors was the most frequently cited reason (51.1%) for decreased frequency of HIV-related tests. A substantial proportion of PLHIV (12.5%) and PAR (50.0%) experienced interrupted use of ART and HIV preventive medications, respectively. A substantial proportion of PLHIV (35.7%) and PAR (62.5%) were concerned about the long-term accessibility of HIV care, however, >90% had not used any types of telehealth services during the pandemic.
Conclusion: Overall, COVID-19 has negatively impacted the access and delivery of HIV services in Korea, especially HIV-related testing for PAR. Our findings highlight the need to develop strategies to mitigate the interrupted HIV care.

Keywords: COVID-19; SARS-CoV-2; HIV infections; Pre-exposure prophylaxis; Anti-retroviral agents

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has imposed burden on the public healthcare systems, exhausting resources for other diseases managed at the national level,

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Ethics Approval and Consent to Participate
The protocol and questionnaire forms of the study were assessed by the international, independent institutional review board (IRB) Pearl IRB™ and were exempted from IRB review for the period of which the data were being used in the study. All study participants provided informed consent.

Author Contributions
Conceptualization: JAL, JYC. Data curation: JAL, JYC. Formal analysis: JAL, JYC. Funding acquisition: Not applicable. Investigation: JAL, JYC. Methodology: JAL. Software: JAL. Validation: JAL, YK, JYC. Visualization: JAL, YK, JYC. Writing - review & editing: JAL, YK, JYC. Final approval: JAL, YK, JYC.

and measures to curb COVID-19 have disrupted patient journeys for these diseases globally, including human immunodeficiency virus (HIV) infections [1, 2]. A global app-based survey of gay men or men who have sex with men (MSM) reported that of 473 people living with HIV (PLHIV), 23.5% lost access to HIV care provider and 18% had issues with drug refill or access to antiretroviral therapy (ART) since the pandemic [3]. A survey of 317 PLHIV mainly from Belgium and Brazil reported that 17.7% had difficulties obtaining antiretroviral (ARV) medications because of COVID-19-related measures [4]. In a pan-European survey of 19 HIV experts, 42.1% responded that ARV medication procurement might be affected by COVID-19 in their countries [5]. Similarly, the pandemic has affected access to HIV preventive care for people at risk of HIV (PAR). Santos et al. showed that a substantial proportion of 2,247 HIV-negative PAR felt that COVID-19 affected their access to onsite HIV testing (70%), self-test kits (81%), post-exposure prophylaxis (PEP; 83%), or pre-exposure prophylaxis (PrEP; 79%) [3]. A similar survey of PrEP users (N = 406) in the United States showed that 32.0% of users discontinued PrEP during shelter-in-place orders due to COVID-19 [6].

The interrupted HIV services may subsequently stagnate the global progression towards meeting the Joint United Nations Programme on HIV/acquired immune deficiency syndrome (AIDS) (UNAIDS) 95-95-95 goals and increase HIV-related deaths and HIV transmission [7]. According to UNAIDS, the number of PLHIV currently on treatment declined from January to June 2020 globally [7, 8]. A model analyzing the impact of COVID-19 on HIV services in middle- and low-income countries estimated that COVID-19 would disrupt ART use and increase HIV-related deaths by 10% when compared with a pre-pandemic setting [9]. A similar modeling study in sub-Saharan Africa demonstrated that a 6-month interrupted supply of ART in 50% of the PLHIV population would increase HIV-related deaths by 1.6 times over a year. The study also estimated that interrupted ART use could increase mother-to-child transmission of HIV by approximately 1.6 times [10].

In Korea, HIV diagnosis has been suboptimal. In 2019, 35.2% of PLHIV were estimated to be undiagnosed [11]. In the pre-pandemic era, the incidence of HIV infection was increasing: the annual number of new HIV infection cases increased from 839 in 2008 to 1,222 in 2019 [12]. However, the number of new cases decreased to 1,016 in 2020 [13]. Given the limited local evidence on the impact of COVID-19 on HIV services, assessing the impact of COVID-19 on HIV treatment and prevention in Korea would enable various stakeholders (*e.g.* the government, prescribers, and patient advocates) to make informed decisions to mitigate these impacts. Therefore, the study aims to assess the impact of COVID-19 on HIV services in Korea and identify key challenges to the access and delivery of HIV services by PLHIV/PAR and prescribers, respectively.

MATERIALS AND METHODS

1. Study design

A web-based online survey was conducted among PLHIV, PAR and prescribers in Korea between October 22 and November 26, 2020. This was part of a pan-Asian regional survey rolled out in 10 countries (Hong Kong, India, Japan, Malaysia, the Philippines, Singapore, Korea, Taiwan, Thailand and Vietnam). Upon assessment by the international, independent institutional review board (IRB) Pearl IRB™, the protocol and survey forms (#20-KANT-238) were exempted from IRB review for the period of which the data were being used in the study.

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2. Participants

PLHIV and PAR were invited to participate in the survey through the websites of the following HIV/AIDS patient advocacy group and online communities for MSM: ivan Stop HIV/AIDS Project (iSHAP), IVANCITY, and LOVE4ONE. Participants aged ≥ 21 years who resided in Korea and provided informed consent were included in the study. PLHIV were defined as participants who reported to be HIV-positive. PAR were defined as those who reported to be HIV-negative but engaged in at least 1 HIV-related risky behavior. Participants who were HIV-negative and did not engage in HIV-related risky behaviors were excluded. Prescribers were invited to participate in the survey via email. The number of unique clicks for the links to the questionnaires and number of completed responses are available in **Supplementary Table 1**.

3. Study procedures and evaluations

Three versions of the survey form were developed for PLHIV, PAR and prescribers, respectively. Each form consisted of 2 sections. A 2-minute-long screening section collected information on the participant's demographics and history of using/delivering HIV services (including country of residence, age groups, gender, sexual orientation, a history of HIV diagnosis, presence of risky behaviors, and a history of ART or HIV preventive interventions for PLHIV and PAR, and country of practice, current specialty, type of hospital/clinic, and expertise in managing PLHIV and PAR for prescribers). A 10-minute-long main questionnaire measured the impact of COVID-19 on HIV care access among PLHIV and PAR, and HIV care delivery by prescribers (**Table 1**). The survey was developed in English and translated into Korean. The translation was proofread by a linguist from a translation company, who was a native Korean speaker.

4. Data analysis

Descriptive analyses of participants' characteristics and responses were performed. Continuous measurements were presented using mean and standard deviations (SD). For nominal and ordinal scale measurements, the numbers of participants choosing each option were summarized with percentages. The authors considered results of any item that was answered by ≥30 respondents as robust; the threshold was calculated using the numbers of PLHIV and infectious diseases doctors in Korea.

Table 1. Elements of main questionnaires to assess how COVID-19 affected PLHIV, PAR and prescribers of HIV care

PLHIV	PAR	Prescribers
· Frequency of visits to the hospital/clinic · Frequency of HIV-related testing · Access to ART · Reasons for changes (if any) in their frequency of visits to hospital/clinic, HIV-related testing, and/or access to ART · Concerns over long-term accessibility to ART · Use of telehealth services (*i.e.*, remote consultation, refill of ART, where applicable) with prescribers · Preferred telehealth services	· Frequency of visits to the hospital/clinic · Frequency of HIV testing · Ability/willingness to get tested for HIV · Ability/willingness to obtain preventive care, including preventive medications (*e.g.*, PrEP/PEP) · Reasons for changes (if any) in their access to testing or preventive care · Concerns over long-term accessibility to HIV preventive medications · Use of telehealth services (where applicable) with prescribers · Preferred telehealth services	· Patient load (*i.e.*, number of PLHIV or PAR seen by prescribers and/or frequency of consultations or consultation time per visit) · Patient access to routine HIV testing and laboratory tests · Prescription of ART or preventive medications for PLHIV or PAR · Telehealth services adopted for HIV care delivery to PLHIV or PAR and its relevance for future HIV care

COVID-19, coronavirus disease 2019; PLHIV, people living with HIV; PAR, people at risk of HIV; HIV, human immunodeficiency virus; ART, antiretroviral therapy; PrEP, pre-exposure prophylaxis; PEP, post-exposure prophylaxis.

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RESULTS

1. Participant characteristics

The analyses included 112 PLHIV and 174 PAR (**Table 2**). The mean age of the PLHIV and PAR groups were 38.5 ± 10.2 years and 33.5 ± 8.0 years, respectively. Of the 9 prescribers who completed the survey, all were infectious disease specialists; 7 (77.8%) practiced in private secondary and tertiary hospitals and 2 practiced in public/government/national hospitals (22.2%). The mean duration of practice was 10.1 ± 5.8 years. When taking the average across the 9 prescribers, each prescriber saw 147.8 ± 136.5 PLHIV per month prior to the pandemic, and 99.7% of them were prescribed /or received consultation on ART; similarly, the

Table 2. Characteristics of PLHIV or PAR who participated in the survey

Variables	PLHIV (N = 112), n (%)	PAR (N = 174), n (%)
Age, years		
Mean ± SD	38.5 ± 10.2	33.5 ± 8.0
21 – 30	31 (27.7)	73 (42.0)
31 – 40	31 (27.7)	67 (38.5)
41 – 50	37 (33.0)	30 (17.2)
51 – 60	11 (9.8)	4 (2.3)
≥61	2 (1.8)	0
Gender		
Male	112 (100.0)	170 (97.7)
Female	0	0
Transman	0	1 (0.6)
Transwoman	0	1 (0.6)
Gender-nonconforming	0	0
Prefer not to answer	0	2 (1.2)
Sexual orientation		
Gay	93 (83.0)	144 (82.8)
Lesbian	0	0
Bisexual	14 (12.5)	27 (15.5)
Straight	3 (2.7)	0
Other	1 (0.9)	3 (1.7)
Prefer not to answer	1 (0.9)	0
Risky behaviors (multiple responses)		
MSM	104 (92.9)	171 (98.3)
Sex worker	0	0
PWID	0	2 (1.2)
Engage in unprotected sex (sex without a condom)	13 (11.6)	26 (14.9)
Have multiple sexual partners	12 (10.7)	31 (17.8)
Have sex with a person with a high risk of HIV	8 (7.1)	12 (6.9)
Had tattoos or other piercings using unsterile equipment	1 (0.9)	3 (1.7)
Ever taken an HIV test		
Yes	112 (100.0)	174 (100.0)
No	0	0
Self-reported HIV status		
Positive	112 (100.0)	0
Negative	0	174 (100.0)
Prescribed to ART		
Yes	112 (100.0)	NA
No	0	NA
Prescribed to any HIV preventive medications		
Yes	NA	8 (4.6)
No	NA	166 (95.4)
Prefer not to answer	NA	0

PLHIV, people living with HIV; PAR, people at risk of HIV; SD, standard deviation; MSM, men who have sex with men; PWID, people who inject drugs; HIV, human immunodeficiency virus; ART, antiretroviral therapy; NA, not applicable.

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prescribers saw 17.6 ± 19.1 PAR per month prior to the pandemic and 49.1% of PAR at their clinics were prescribed / received consultation for preventive medications.

2. Hospital/clinic visits

Among PLHIV and PAR, 19 (17.0%) and 103 (59.2%) reported that they visited hospitals/clinics less frequently or stopped visiting them completely when compared with the pre-COVID period, respectively (**Fig. 1A**). From the prescribers' perspective, 4 (44.4%) and 7 (77.8%) prescribers reported a decrease in hospital/clinic visits or rescheduling of visits due to closure of clinics experienced by PLHIV and PAR, respectively, at their clinics (**Table 3**).

3. HIV-related testing

Of 7 PLHIV (6.3%) who reported a decrease in the frequency of HIV-related tests, 5 (71.4%) attributed the decrease to the concern of contracting COVID-19 at hospitals/clinics (**Fig. 1B**, **1C**). Among PAR, 88 (50.6%) reported a decrease in the frequency of HIV-related tests. The most common reason was not engaging or engaging less in high-risk behaviors (**Fig. 1B**, **1D**). A decrease in the frequency of HIV-related tests for PLHIV and for PAR was reported by 2 prescribers each (**Table 3**).

4. Medications

Among PLHIV, 14 (12.5%) experienced interrupted ART use. The key reasons for a decrease in the frequency of ARV medications use (N = 6) were travel constraints (50.0%) and concerns over getting COVID-19 at hospitals/clinics (50.0%) (**Fig. 2A**, **2B**). Of 8 PAR who were on HIV preventive medications before the pandemic, 2 (25.0%) decreased the frequency of taking the medications and 2 (25.0%) stopped taking the medications completely. The main reason was not engaging or engaging less in high-risk behaviors (**Fig. 2C**, **2D**). Four prescribers (44.4%) reported a decrease in the frequency of ARV drugs prescription refill by PLHIV (**Table 3**), and they attributed this change to patient's willingness/preferences and travel constraint. A prescriber (14.3%) reported decreased accessibility of HIV preventive medications during COVID-19 (**Table 3**) without specifying the reasons.

5. Adoption of telehealth services

Substantial proportions of PLHIV (35.7%) and PAR (62.5%) were concerned about the long-term accessibility of ART/HIV preventive medicine (**Fig. 3A**). The majority of PLHIV and PAR reported having never received telehealth services (91.3%) (**Fig. 3B**). Phone consultation (43.7%) was the most preferred type of telehealth services among PLHIV and PAR (**Fig. 3C**). Seven (77.8%) prescribers had provided phone consultation and 5 (55.6%) prescribers anticipated the use of telehealth services to increase in the future, mainly driven by its ability to reach more patients and improve clinical workflows and efficiency (**Table 3**).

DISCUSSION

Globally, COVID-19 and the measures to prevent its spread have interrupted HIV services for PLHIV and PAR [3, 5, 14]. Our study highlighted that in Korea, COVID-19 has more severely affected the utilization of HIV services by PAR than by PLHIV. The survey showed that ART use by PLHIV was moderately affected (12.5%), which is comparable to what were reported by PLHIV around the globe (18%) [3, 4]. The majority of PAR indicated that they had less frequent or no hospital/clinic visits and received HIV-related tests less frequently during COVID-19 compared with the pre-COVID period. Among 8 PAR who were on HIV preventive

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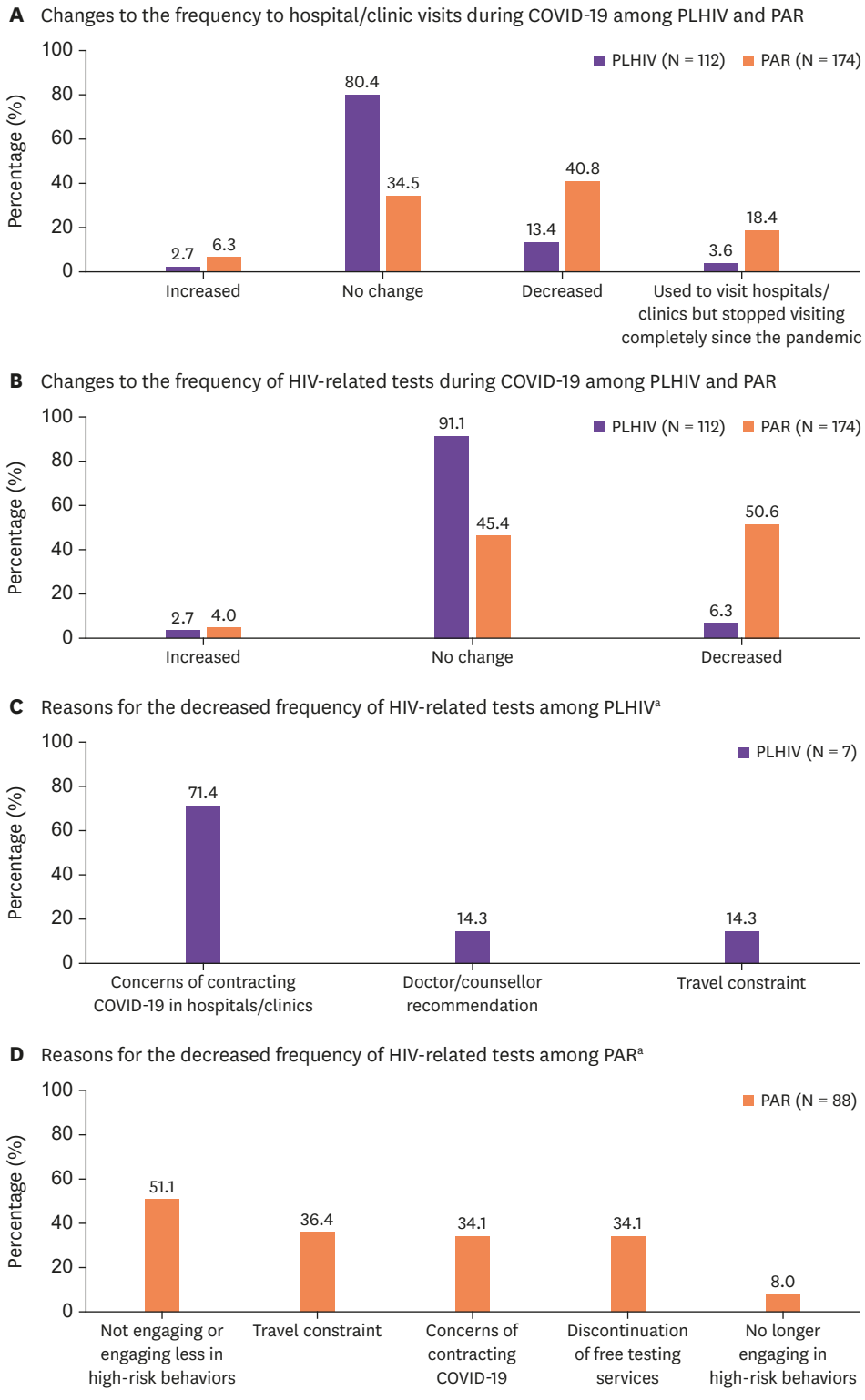

Figure 1. Changes to the frequency of hospital/clinic visits and HIV-related testing during COVID-19 by PLHIV and PAR compared with the pre-COVID period.
[a]Multiple responses were possible.
HIV, human immunodeficiency virus; COVID-19, coronavirus disease 2019; PLHIV, people living with HIV; PAR, people at risk of HIV.

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Table 3. Changes to the delivery of HIV services during COVID-19 by prescribers compared with the pre-COVID period

Category	Prescribers (N = 9), n (%)
Hospital/clinic visits	
Changes to the frequency of visits for PLHIV during COVID-19	
Increased	0
No change	5 (55.6)
Decreased	4 (44.4)
Delayed or rescheduled due to closure of clinics	0
Changes to the frequency of visits for PAR during COVID-19	
Increased	0
No change	2 (22.2)
Decreased	5 (55.6)
Delayed or rescheduled due to closure of clinics	2 (22.2)
Average number of PLHIV visiting their clinics per month	
Before COVID-19	147.8
During COVID-19	86.2
Average number of PAR visiting their clinics per month	
Before COVID-19	17.6
During COVID-19	16.6
HIV-related testing	
Changes to the accessibility of routine HIV viral load test for PLHIV	
Increased	0
No change	7 (77.8)
Decreased	2 (22.2)
Changes to the accessibility of HIV testing for PAR	
Increased	0
No change	7 (77.8)
Decreased	2 (22.2)
Medications	
Changes to the frequency of ARV drugs prescription refill by PLHIV	
Increased	1 (11.1)
No change	4 (44.4)
Decreased	4 (44.4)
Changes to the frequency of HIV preventive medications prescription	N = 7
Increased	0
No change	6 (85.7)
Decreased	1 (14.3)
Adoption of telehealth services	
Types of telehealth services provided during COVID-19[a]	
Phone consultation	7 (77.8)
Remote prescription refill via community pharmacy	3 (33.3)
Video consultation	0
None of the above	2 (22.2)
Anticipated changes to the use of telehealth services in the future	
Increase	5 (55.6)
No change	4 (44.4)
Decrease	0
Key drivers for an anticipated increased in the use of telehealth services in the future[a]	N = 5
Able to reach more patients	3 (60.0)
Improve clinical workflows and efficiency	3 (60.0)
Convenient and time-saving	2 (40.0)
Reduce spread of illness	1 (20.0)
Reduce overheads and cut costs	0

[a]Multiple responses were possible.
HIV, human immunodeficiency virus; COVID-19, coronavirus disease 2019; PAR, people at risk of HIV; PLHIV, people living with HIV; ARV, antiretroviral.

medications before the pandemic, 4 have decreased their frequency of taking HIV preventive medications or completely stopped the medications during COVID-19. The participants attributed these decreases in HIV service/resource use mainly to them not engaging or engaging less in high-risk behaviors. The decreased access to HIV preventive care among

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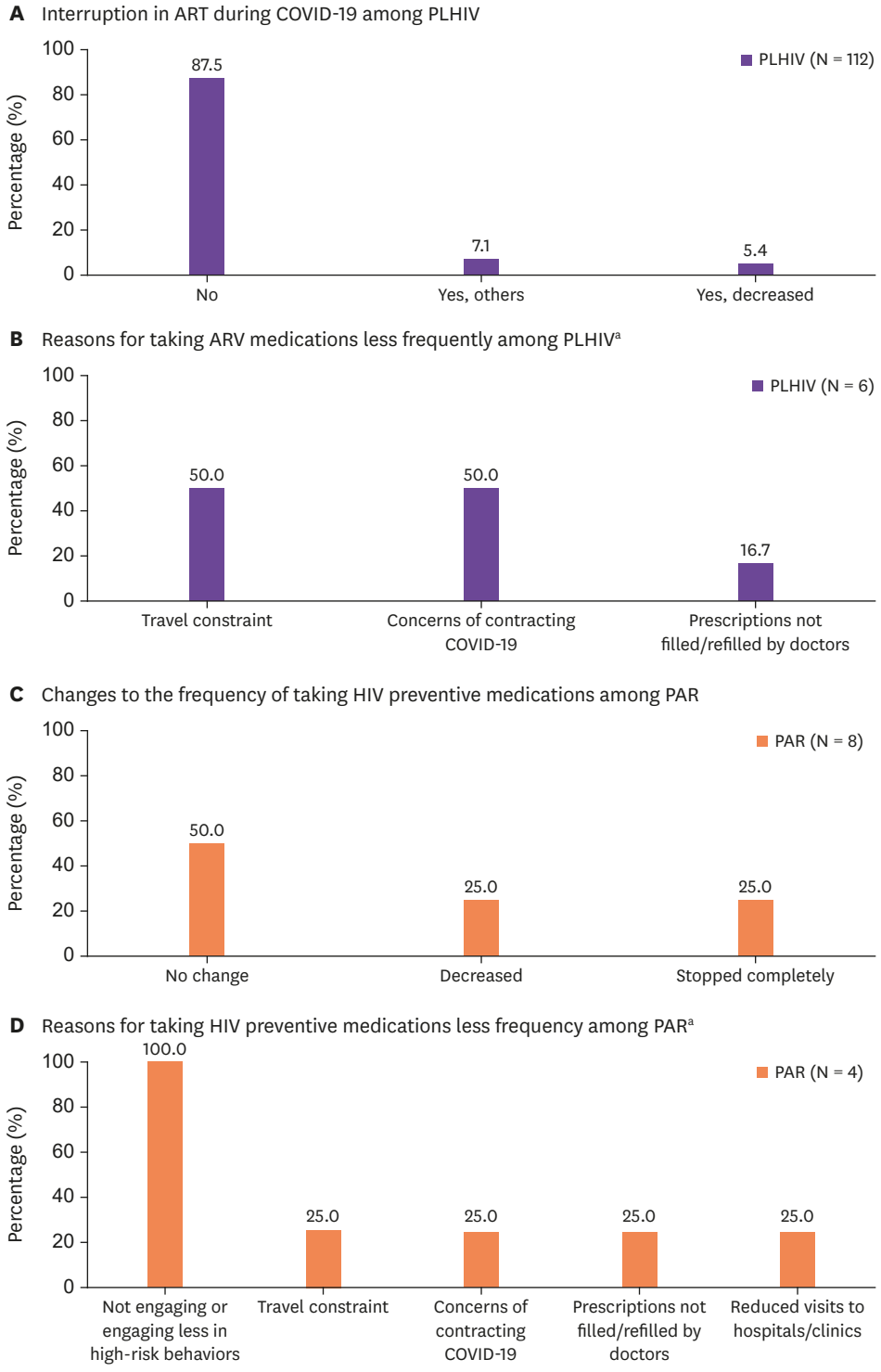

Figure 2. Changes to the use of ART/HIV-preventive medications during COVID-19 by PLHIV and PAR compared with the pre-COVID period.
[a]Multiple responses were possible.
ART, antiretroviral therapy; HIV, human immunodeficiency virus; COVID-19, coronavirus disease 2019; PLHIV, people living with HIV; PAR: people at risk of HIV; ARV, antiretroviral.

PAR was reflected in the prescriber survey of our study, and was similarly observed in studies

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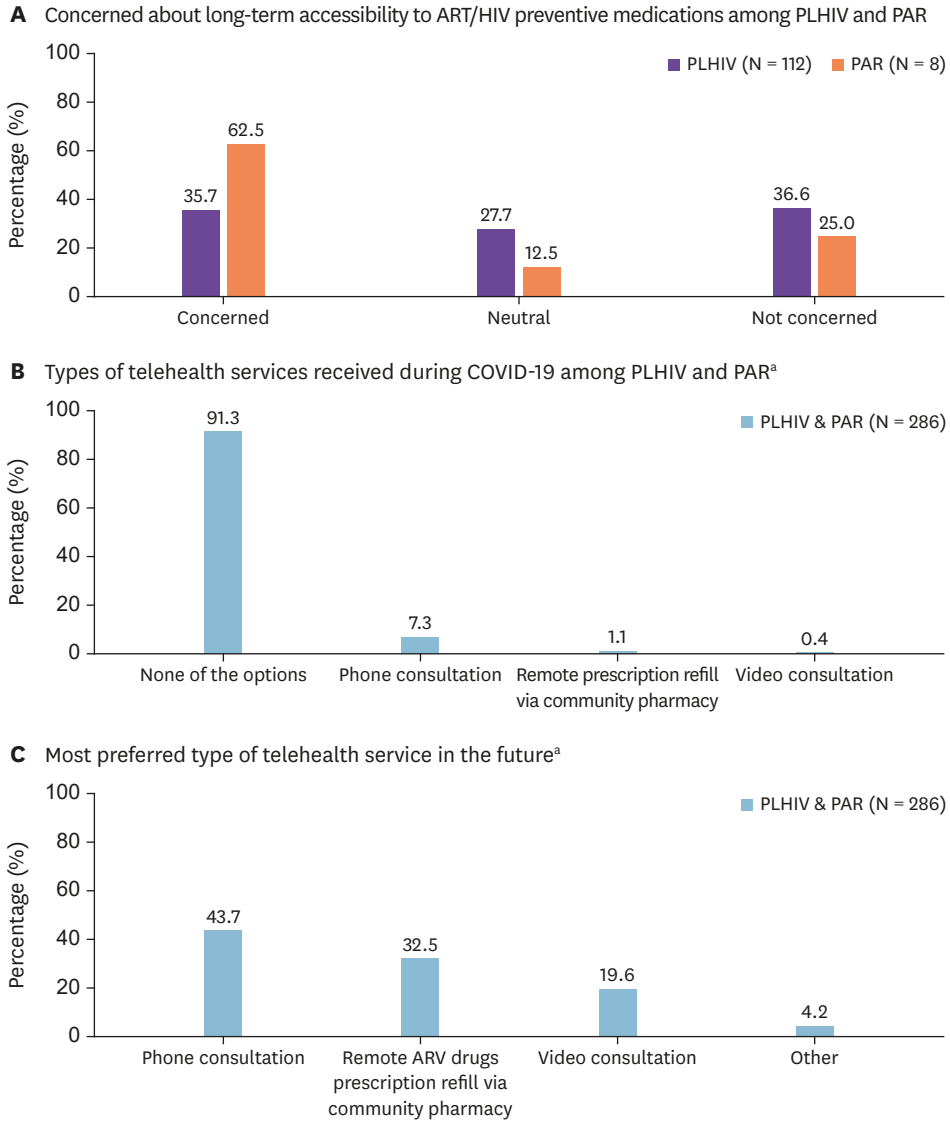

Figure 3. Adoption of telehealth services during COVID-19.
[a]Multiple responses were possible.
COVID-19, coronavirus disease 2019; ART, antiretroviral therapy; HIV, human immunodeficiency virus; PLHIV, people living with HIV; PAR, people at risk of HIV.

conducted in the US and around the globe [3, 6, 14]. A self-reported decrease in high-risk behaviors among PAR is supported by Sanchez et al, which reported that since COVID-19, MSM had less opportunities to have sex (68.0%), had fewer sex partners (51.3%), and used dating apps to meet in person less frequently (48.8%) [14]. However, in Brawley et al. 2020, 32% of PAR (N = 406) stopped PrEP after the implementation of COVID-19 restriction measures, although the vast majority of PrEP users reported no change in risky behaviors and 88.9% of PrEP providers recommended against dose modification [6]. Therefore, our survey, together with the results of the studies around the globe, warrants HIV prescribers to carefully monitor risky behaviors of PAR and educate PAR on the value of regular HIV-related tests and adherence to HIV preventive medications even during the pandemic. Also, these results indicate that the decrease in the number of new HIV cases from 2019 to 2020 should be interpreted with caution [13], as it could be attributable to a decrease in the number of

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PLHIV as a result of a decrease in high-risk behaviors or an increased number of undiagnosed PLHIV in 2020 as a result of decreased frequency of receiving HIV-related tests.

Our results also demonstrated that for both PLHIV and PAR, concerns of contracting COVID-19 in hospitals/clinics and travel constraints were other key reasons for decreased frequency of HIV-related testing and changes to the use of ARV/HIV preventive medications. In Korea, HIV testing is mainly managed at public health centers, and since the pandemic, these centers have been serving as COVID-19 screening stations [15]. This could have heightened PAR's fear of contracting COVID-19 and subsequently discouraged them from coming forward for HIV testing. The consequence of decreased frequency of HIV testing at facilities is highlighted by a nationwide analysis in Korea, which reported that the number of subjects who came forward for HIV testing at public health centers decreased by 59.4% from 2019 to 2020 [16]. These results suggest that strategies circumventing the need for hospital/clinic visits would alleviate the COVID-19 related disruptions to HIV services in Korea, particularly around HIV-related testing and delivery of HIV preventive medications for PAR. During the pandemic, HIV self-testing and telehealth services have been implemented in the China, US, Brazil, India, and other countries to maintain HIV testing uptake and allow access to ARV and HIV preventive medications among PLHIV/PAR [17-21]. A cross-sectional study of 658 MSM in China reported that the proportion of MSM who received HIV testing using a self-test kit significantly increased from 41.6% to 52.1% ($P = 0.038$), and the proportion of MSM receiving HIV testing within 3 months before and during COVID-19 measures were in place remained unchanged (N = 255 *vs.* N = 261) despite limited access to routine facility-based testing services when the COVID-19 measures were implemented [21]. According to our survey, both PLHIV/PAR in Korea had limited experience with telehealth services, and PLHIV/PAR in Korea are unlikely to be familiar with HIV self-test kits, which only became reimbursable in September 2019 [22]. Therefore, concerted efforts would be needed from the government, healthcare industry, prescribers and patient advocacy groups to establish infrastructure for HIV self-testing and telehealth, train prescribers to design and deliver telehealth services, and educate patients on the accessibility and usefulness of self-testing and telehealth services.

Prescribers reported a decrease in the number of PLHIV and PAR per month compared with the pre-COVID period. While this tallied with the decreased frequency of hospital/clinic visits reported by PLHIV and PAR, the reduction in the provision of HIV services by prescribers could also reflect the reallocation of the public healthcare resources from infectious diseases to COVID-19. In Korea, a substantial proportion of PLHIV are managed at public hospitals, and these institutions have become nationally-designated treatment facilities for COVID-19 since the pandemic [15]. As a result, the health workforce originally designated for infectious diseases in these institutions might have been reallocated to COVID-19 in response to the urgency of treating COVID-19 patients.

Some limitations of the study should be considered. The format of online survey might have led to selection bias against older respondents, who might not be very familiar with the internet. The translated survey forms were not validated by experts in the field prior to the study to check if the questions conform to the Korean cultural context. The situations reflected in the study results may also be transient due to the evolving epidemiology of COVID-19. Finally, the study was based on a small sample size, especially prescribers, and was drawn using convenience sampling. Therefore, the survey results may not represent the general populations of PLHIV, PAR and prescribers in Korea. Nonetheless, this is the

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first study assessing the impact of COVID-19 on PLHIV, PAR and prescribers in terms of HIV services in Korea at the time of writing (December 2021).

In conclusion, our study showed negative impacts of COVID-19 on hospital/clinic visits, HIV-related tests and use of ARV/HIV preventive medications by PLHIV and PAR in Korea. The government, healthcare industry, prescribers and patient advocacy groups in Korea should collaborate to identify barriers to HIV care continuum and develop strategies to retain the timely access to HIV services for PLHIV/PAR in Korea.

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SUPPLEMENTARY MATERIAL

Supplementary Table 1

The number of unique clicks for the links to the questionnaires and number of completed questionnaires

Click here to view

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