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Original Article

Impact of the initial wave of COVID-19 pandemic in Taiwan on local HIV services: Results from a cross-sectional online survey

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KEYWORDS
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Post-exposure prophylaxis;
Pre-exposure prophylaxis

Abstract *Purpose:* This study aimed to investigate the impact of the initial wave of the COVID-19 pandemic on HIV services in Taiwan.
Methods: An online, cross-sectional survey was conducted among people living with HIV (PLWH), individuals at risk of HIV infection (IAR), and service prescribers between 20th October and 30th November, 2020. Representatives from patient advocacy groups were interviewed.
Results: In total, 66 PLWH, 104 IAR, and 32 prescribers from Taiwan completed the survey. Mild to moderate disruptions to HIV-related services (including medical consultation, HIV-related testing, and medications) were found by the survey, with IAR appearing more affected than PLWH. Nine (13.6%) PLWH and 31 (29.8%) IAR reported disruptions in hospital/clinic visits and two (3.0%) PLWH and 25 (24.0%) IAR reported decreased frequency of HIV testing. Similar observations were also made by four patient advocacy group representatives interviewed. Telehealth services were received by only limited proportions of PLWH and IAR who participated in the survey.

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Conclusion: HIV services in Taiwan were not severely affected by the initial wave of COVID-19, but notable disruptions were still observed in HIV screening and prevention services. Multi-pronged strategies, including telehealth services, are warranted to overcome new challenges in HIV care in the COVID-19 era.

Introduction

With sustained efforts to raise public awareness and improve prevention and treatment of human immunodeficiency virus (HIV) infection, such as the initiation of a government-funded pre-exposure prophylaxis (PrEP) program by the Taiwan Centers for Disease Control (CDC) in 2016,[1] the annual number of newly diagnosed HIV infections in Taiwan has been declining for three consecutive years.[2] By the end of 2020, 90% of people living with HIV (PLWH) in Taiwan knew their status, 93% of people diagnosed with HIV infection were receiving sustained antiretroviral therapy (ART), and 95% of PLWH receiving ART had achieved virologic suppression,[3] surpassing the 90-90-90 goal proposed by the United Nations Program on HIV/AIDS (UNAIDS).[4]

The COVID-19 pandemic has challenged healthcare systems and disrupted HIV treatment services worldwide. The Global Fund estimated that across over 100 countries surveyed, 85% of HIV programs were disrupted in 2020 due to COVID-19 containment measures.[5] In an online survey conducted among men who have sex with men (MSM) across the United States in April 2020, 27.0% of PLWH reported less frequent visits to HIV care providers.[6] Likewise, another online survey conducted between April and May in 2020 among cisgender gay men and other MSM from Brazil, Mexico, Taiwan, and other regions showed that during the pandemic, 23% of PLWH lost access to HIV care providers due to social distancing measures and 18% of PLWH taking ART had difficulty refilling or accessing medications.[7]

Similar to treatment services, HIV screening and prevention services for individuals at risk of HIV infection (IAR) have also been disrupted by the pandemic. A preliminary study investigating the impact of COVID-19 on testing services for HIV and other infectious diseases in the WHO European Region showed that, compared to the same periods in 2019, 95% and 58% of respondents from relevant organizations reported decreased testing volumes during March—May and June—August 2020, respectively.[8] For prevention services, only 21% of HIV-negative participants in the above-mentioned multicenter survey among cisgender were confident that they had access to PrEP during the pandemic.[7] Also, data from 56 Dean Street sexual clinic in the UK showed that compared to a 4-week period before COVID-19 lockdown, there were 80% fewer postexposure prophylaxis (PEP) prescriptions during the first four weeks of lockdown.[9]

With an incidence rate of 20.7 cases of COVID-19 per million population as of 31 August 2020, Taiwan was less severely impacted by COVID-19 in 2020 as compared to many other regions.[10] However, it is likely that the pandemic still led to disruptions to local HIV services given the diversion of medical resources and various containment measures to curb the spread of the virus. Local evidence, which would help make informed decisions to mitigate the impacts of the pandemic on the HIV care continuum, has been extremely limited. As such, this study aimed to investigate the impact of the initial wave of the COVID-19 pandemic in 2020 on HIV services in Taiwan and identify the difficulties experienced by PLWH and IAR.

Methods

Survey overview

An online, cross-sectional survey on HIV services was conducted among PLWH, IAR, and prescribers of HIV services in Taiwan between 20th October, 2020 and 30th November, 2020. This was part of a multicenter survey conducted in 10 countries/regions in Asia, including Hong Kong, India, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam. The study protocol and questionnaires (#20-KANT-238) were exempted from institutional review board (IRB) review for the purpose of this study after being assessed by Pearl IRB™.

Survey participants

PLWH and IAR aged ≥20 years were recruited via patient advocacy groups (PAGs); prescribers of HIV services were recruited from the Taiwan HIV Study Group. PLWH were individuals who were self-reported as HIV-positive; IAR were defined as individuals who reported to be HIV-negative but engaged in behaviors associated with high risks of HIV exposure. Participants were provided with an email containing succinct instructions for participating in the survey and a link to the study questionnaire. All participants gave informed consent before answering the questionnaire.

Survey procedure

Three different versions of the questionnaire were administered to PLWH, IAR, and prescribers, respectively (Supplementary Document 1—3). Each questionnaire consists of two sections: the screener section surveyed the participants' demographics and past experiences with HIV services, while the main questionnaire section included items pertaining to various types of HIV services received by

PLWH and IAR, such as testing and prescriptions of medications, and how these were impacted by the COVID-19 pandemic. Additionally, the questionnaires for PLWH and IAR also contained items regarding the impact of COVID-19 on their sexual behaviors and experiences of stigma and discrimination.

Table 1 Participant information.

	PLWH (n = 66)	IAR (n = 104)
Age, mean ± SD, years	37.3 ± 9.3	33.5 ± 7.7
Gender[a], n (%)		
Male	64 (97.0)	100 (96.2)
Female	2 (3.0)	4 (3.9)
Sexual orientation[b]		
Bisexual	7 (10.6)	10 (9.6)
Gay	55 (83.3)	89 (85.6)
Straight	4 (6.1)	5 (4.8)
Risk behaviours/groups, n (%)		
MSM	60 (90.9)	97 (93.3)
Sex worker	0 (0)	1 (1.0)
People who use/inject drugs	12 (18.2)	4 (3.9)
People who engage in unprotected sex	26 (39.4)	36 (34.6)
People who have multiple sexual partners	15 (22.7)	32 (30.8)
People who have sex with a person with a high risk of HIV	11 (16.7)	7 (6.7)
Prescribed ART or preventive medications, n (%)	66 (100.0)	38 (36.5)
Frequency of taking PrEP[c], n (%)		
Daily		12 (31.6)
On demand	—	21 (55.3)
Mixed		5 (13.2)
	Prescribers (n = 32)	
Specialty, n (%)		
Infectious diseases/HIV specialist	31 (96.9)	
General practitioner	1 (3.1)	
Type of Hospital, n (%)		
Medical center	21 (65.6)	
Regional hospital	9 (28.1)	
Area hospital	2 (6.3)	
Years in practice, mean ± SD, years	14.2 ± 7.1	

[a] Other options included "trans-man", "trans-woman", "gender-nonconforming" and "prefer not to answer" but were not selected by any participants.
[b] Other options included "lesbian", "other" and "prefer not to answer" but were not selected by any participants.
[c] The percentages were calculated with the number of patients who had been prescribed preventive medications as the denominator.
ART, antiretroviral therapy; HIV, human immunodeficiency virus; IAR, individuals at risk; MSM, men who have sex with men; PLWH, people living with HIV; PrEP, pre-exposure prophylaxis; SD, standard deviation.

Interview

Four relevant PAGs were interviewed to gather their observations of how COVID-19 has affected PLWH and IAR in Taiwan as well as their contributions during the pandemic. The four local PAGs were Persons with HIV/AIDS Rights Advocacy Association of Taiwan (PRAA), Taiwan AIDS Foundation, Taiwan Lourdes Association (Lourdes) and Taiwan Tongzhi (LGBTQ+) Hotline Association (Hotline). One representative from each organization provided written consent and attended a 1-h, semi-structured, virtual interview. The interviews were recorded. Meeting minutes were summarized by a local medical writer and reviewed and approved by the interviewees. The interview questions are listed in Supplementary Document 4.

Statistical analysis

Survey results were summarized using descriptive analyses. Mean and standard deviation (SD) were calculated for continuous measurements, while the number (and percentage) of participants selecting each option was reported for items with nominal or ordinal scales.

Results

Participant information

In total, 66 PLWH, 104 IAR, and 32 prescribers from Taiwan completed the survey. Key participant demographics are

Table 2 Prescriber-reported changes to the delivery of HIV services during COVID-19.

	Prescribers (N = 32), n (%)	
	PLWH	IAR
Hospital/clinic visits		
Patient load in a typical month, mean ± SD, n		
Before COVID-19	178.8 ± 148.4	19.7 ± 18.6
During COVID-19	183.3 ± 149.7	16.3 ± 18.1
Changes to the frequency of visits		
More frequent	0 (0)	0 (0)
Same	22 (68.8)	13 (40.6)
Less frequent	8 (25.0)	18 (56.3)
Delayed or rescheduled due to closure of clinics	2 (6.3)	1 (3.1)
Changes in consultation time per visit		
Longer	1 (3.1)	0 (0)
Same	29 (90.6)	30 (93.8)
Shorter	2 (6.3)	2 (6.3)
HIV-related testing		
Changes to the access to routine HIV-related testing		
Increased	0 (0)	1 (3.1)
Remained the same	22 (68.8)	18 (56.3)
Decreased	10 (31.3)	13 (40.6)
Medications		
Changes to the frequency of refilling ART/preventive medications		N = 31[†]
More frequent	4 (12.5)	1 (3.2)
Same	19 (59.4)	14 (45.2)
Less frequent	9 (28.1)	16 (51.6)
Reasons behind the change	N = 13	N = 17
Patient's willingness/preference	6 (46.2)	7 (41.2)
Level of ART stock in hospitals/clinics/pharmacies	1 (7.7)	1 (5.9)
People's modified risky/unsafe practices[a]	—	5 (29.4)
Travel constraints	5 (38.5)	8 (47.1)
Other	2 (15.4)	3 (17.7)
Adoption of telehealth services		
Types of telehealth services provided during COVID-19		
Phone consultation	2 (6.3)	
Video consultation	11 (34.4)	
Refill medications remotely	14 (43.8)	
Other	1 (3.1)	
None of the above	12 (37.5)	
Anticipated adoption of telehealth services in the future		
Increase	23 (71.9)	
No change	8 (25.0)	
Decrease	1 (3.1)	
Main drivers for an anticipated increase in the use of telehealth services in the future	N = 23	
Improve clinical workflows and efficiency	19 (82.6)	
Able to reach more patients	14 (60.9)	
Convenient and timesaving	13 (56.5)	
Reduce the spread of illness	11 (47.8)	
Reduce overheads and cut costs	5 (21.7)	

[a] This option was only applicable to IAR. † Only 31 prescribers had prescribed preventive medication prior to the pandemic.
ART, antiretroviral therapy; HIV, human immunodeficiency virus; IAR, individuals at risk; PLWH, people living with HIV; SD, standard deviation.

summarized in Table 1. The average ages of PLWH and IAR were 37.3 and 33.5 years, respectively. PLWH and IAR were predominantly male, and 83.3% and 85.6%, respectively, identified themselves as gay for sexual orientation. All PLWH had been prescribed ART and 36.5% (n = 38) of IAR had been prescribed preventive medications.

Hospital/clinic visits

Ten (31.3%) and 19 (59.4%) prescribers reported interruption of hospital/clinic visits among PLWH and IAR, respectively (Table 2), while nine (13.6%) PLWH and 31 (29.8%) IAR self-reported disruptions in hospital/clinic

Table 3 Self-reported changes to the access to HIV services among PLWH.

	PLWH (N = 66), n (%)
Hospital/clinic visits	
Changes to the frequency of visits	
Increased	2 (3.0)
Remained the same	55 (83.3)
Decreased	7 (10.6)
Have not visited any hospital/clinic	2 (3.0)
HIV-related testing	
Changes to the access to routine HIV-related test	
Increased	1 (1.5)
Remained the same	63 (95.5)
Decreased	2 (3.0)
Medications	
Interruptions to ART	
Yes	6 (9.1)
No	60 (90.9)
Changes to the frequency of taking ART	N = 6
Decreased	3 (50.0)
Stopped completely	0 (0)
Other	3 (50.0)
Reasons behind the decrease in frequency of taking ART	N = 3
Doctors did not fill/refill the prescriptions	2 (66.7)
Travel constraints	0 (0)
Concerns of getting COVID-19 in hospitals/clinics	0 (0)
Financial constraints	1 (33.3)
Reduced frequency of visiting hospitals/clinics	1 (33.3)
Other	0 (0)
Whether concerned about long-term ability to access ART	
Concerned	19 (28.8)
Neutral	34 (51.5)
Not concerned	13 (19.7)
Telehealth services	
Types of telehealth services received	
Phone consultation	1 (3.0)
Video consultation	1 (3.0)
Refill medications remotely	19 (28.8)
None of the above	46 (69.7)
Most preferred type of telehealth services in the future	
Phone consultation	16 (24.2)
Video consultation	18 (27.3)
Refill medications remotely	30 (45.5)
Other	1 (3.0)

ART, antiretroviral therapy; HIV, human immunodeficiency virus; PLWH, people living with HIV.

visits (Tables 3 and 4). For hospital/clinic visits by both PLWH and IAR, only two (6.3%) prescribers reported shorter consultation time per visit as compared to before COVID-19 (Table 2).

HIV-related testing

Ten (31.3%) and 13 (40.6%) prescribers observed reduced access to HIV testing for PLWH and IAR, respectively (Table 2), while only two (3.0%) PLWH and 25 (24.0%) IAR reported decreased frequency of HIV-related testing (Tables 3 and 4). Among the IAR with reduced HIV testing, the most frequently cited reasons were concerns of getting COVID-19 in hospitals/clinics (64.0%, 16/25) and not engaging or engaging less in high-risk behaviors (60.0%, 15/25) (Table 4).

Medications

Nine (28.1%) and 16 (51.6%) prescribers, respectively, reported lower ART refill frequency for PLWH and less frequent preventive medication prescriptions (Table 2). Interruptions in ART were reported by six (9.1%) PLWH (Table 3). Four (10.5%) IAR reported taking preventive medications less frequently and all four reported not engaging or engaging less in high-risk behaviors as the main reason (Table 4). Additionally, 19 (28.8%) PLWH and 11 (29.0%) IAR were concerned about their long-term ability to

Table 4 Self-reported changes to the access to HIV services among IAR.

	IAR (N = 104), n (%)
Hospital/clinic visits	
Changes to the frequency of visits	
Increased	8 (7.7)
Remained the same	65 (62.5)
Decreased	29 (27.9)
Have not visited any hospital/clinic	2 (1.9)
HIV-related testing	
Changes to the access to routine HIV-related test	
Increased	3 (2.9)
Remained the same	76 (73.1)
Decreased	25 (24.0)
Key reasons behind the decrease in testing frequency (IAR)	N = 25
Not engaging or engaging less in high-risk behaviors	15 (60.0)
No longer need to engage in high-risk behaviors	4 (16.0)
Doctor/counsellor recommended less frequent testing	0 (0)
Travel constraint	1 (4.0)
Concerns of getting COVID-19 in hospitals/clinics	16 (64.0)
Financial constraints	0 (0)
Anonymous free testing at public health care centres/hospitals	0 (0)
Other	0 (0)
Medications	
Changes to the frequency of taking preventive medications	N = 38[a]
Increased	5 (13.2)
Remained the same	29 (76.3)
Decreased	4 (10.5)
Stopped completely	0 (0)
Whether concerned about long-term ability to access preventive medications	N = 38[a]
Concerned	11 (29.0)
Neutral	22 (57.9)
Not concerned	5 (13.2)
Telehealth services	
Types of telehealth services received	
Phone consultation	2 (1.9)
Video consultation	5 (4.8)
Refill medications remotely	15 (14.4)
None of the above	86 (82.7)
Most preferred type of telehealth services in the future	
Phone consultation	26 (25.0)
Video consultation	52 (51.0)
Refill medications remotely	25 (24.0)
Other	0 (0)

[a] Among IAR, 38 had been prescribed preventive medications prior to the pandemic.
HIV, human immunodeficiency virus; IAR, individuals at risk; PrEP, pre-exposure prophylaxis.

access ART or preventive medications during the COVID-19 pandemic (Tables 3 and 4).

Adoption of telehealth services

During the pandemic, 12 (37.5%) prescribers reported not adopting any telemedicine services (Table 2) and 46 (69.7%) PLWH and 86 (82.7%) IAR did not receive any telemedicine services (Tables 3 and 4). Most prescribers (71.9%, 23/32) anticipated an increase in the adoption of telemedicine services among prescribers if the pandemic persisted (Table 2). The most preferred telehealth service in the future was refilling medications remotely for PLWH (45.5%) (Table 3) and video consultation with doctors/counsellors for IAR (51.0%) (Table 4).

Sexual behavior, stigma, and discrimination

Notable proportions of PLWH and IAR reported changes in their sexual behaviors since the pandemic. For instance, 35 (53.1%) PLWH and 44 (42.3%) IAR reported having fewer or no sexual partners since the pandemic (Table 5). PLWH barely reported being more stigmatized or discriminated against since COVID-19. However, a small number of IAR

Table 5 Impact of COVID-19 on sexual behavior, stigma, and discrimination.

	PLWH (N = 66)	IAR (N = 104)
Percentage of participants with less or none of the following since Covid-19		
Sexual Partners	35 (53.0)	44 (42.3)
Sexual Encounter	37 (56.1)	42 (40.4)
Apps used to find sex partners	40 (62.1)	59 (56.7)
Condoms used	24 (36.4)	30 (28.9)
Percentage of participants who experienced more of the following since Covid-19		
Been gossiped about	0 (0.0)	2 (1.9)
Verbally insulted/harassed, threatened	0 (0.0)	4 (3.9)
Husband/spouse/other household members have been discriminated against	0 (0.0)	3 (2.9)
Sexual rejection	1 (1.5)	4 (3.9)
Excluded from social gatherings	0 (0.0)	3 (2.9)
Physically assaulted	0 (0.0)	1 (1.0)
Excluded from family activities	1 (1.5)	2 (1.9)

IAR, individuals at risk; PLWH, people living with HIV.

reported being more stigmatized, with 4 (3.9%) IAR reported experiencing more verbal insults/harassments/threats, and 3 (2.9%) IAR felt more excluded from social gatherings (Table 5).

Summary of interview results

According to the interviewees, although the pandemic only affected PLWH in Taiwan to a limited extent, some PLWH had concerns over medical consultations and/or obtaining medications. These could be due to temporary cancellation of evening clinic and medication refills, longer time required due to entrance control at the hospital, and concerns over acquiring SARS-CoV-2 infection in the hospital. Besides, some interviewees underlined that, compared to local PLWH, those residing overseas and foreign PLWH residing in Taiwan could be more affected as their access to medications may be disrupted by travel restrictions and quarantine requirements. Measures taken by the PAGs to facilitate PLWH's access to HIV services included distributing information about ART-providing community pharmacies, collecting and posting ART for PLWH residing overseas, and assisting foreign PLWH residing in Taiwan in visiting HIV care providers and obtaining medications.

Interviewees reported several disruptions experienced by local IAR. For medical services, a marked decrease in HIV testing for IAR was observed. Besides medical services, many off-line events targeted at IAR were cancelled due to social distancing measures, reducing IAR's opportunity to connect with and obtain support from one another and PAG volunteers. Additionally, due to stringent contact tracing, many IAR were concerned that their privacy might be compromised, causing considerable mental stress. To alleviate these negative impacts on IAR, PAGs disseminated relevant medical information to target communities and provided emotional support through online platforms and chat groups.

Regarding how to ensure continuous support for PLWH and IAR, all PAGs stressed the importance of HIV-related telehealth services, especially in terms of improving access to medications. In addition, remote non-medical services, such as online consultations, are warranted during the COVID-19 pandemic.

Discussion

In this study, we demonstrated that various types of HIV-related medical services in Taiwan were affected by the COVID-19 pandemic. IAR appeared more affected than PLWH, with notable disruptions to routine HIV screening and prevention services (Tables 2–4). The reduction in screening and PrEP use among IAR were primarily attributed to the decrease in high-risk behaviors due to containment measures and fear of getting COVID-19. Engaging less in high-risk behaviors could lead to a reduction in the perceived risk of HIV exposure and hence the reduced frequency of HIV testing or preventive medication intake (55.3% of IAR who had been prescribed PrEP only used it on-demand, Table 1). Indeed, similar decreases in high-risk behaviors and reduced PrEP use and HIV screening have also been reported elsewhere. In a prospective study conducted among gay and bisexual men in Australia, 41.8% of PrEP users discontinued PrEP during COVID-19 restrictions, and discontinuing PrEP was independently associated with being less likely to have recently tested for HIV and less likely to report sex with casual partners.[11] Local PLWH were less impacted than IAR. However, Taiwanese PLWH living overseas and foreign PLWH living in Taiwan were more affected by the pandemic than local PLWH in their access to HIV medical services.

Interestingly, a significant proportion of prescribers observed disruptions in HIV services for PLWH and IAR, while self-reported disruptions only occurred in a limited proportion of participants. For instance, 28.1% of prescribers reported less frequent refills of ART prescriptions for PLWH, yet only 9.1% of PLWH self-reported interrupted ART (Tables 2 and 3). This may be because PLWH in Taiwan could also refill their ART prescriptions at selected community pharmacies.[11] Similarly, the disparity between prescriber-observed and self-reported disruptions in preventive medications among IAR could also be due to alternative routes of obtaining preventive medications other than visiting a hospital/clinic. Likewise, the availability of anonymous routes of obtaining HIV test kits in Taiwan, including through online orders, vending machines, and PAGs, could help explain the difference in prescriber-

observed and self-reported reductions in HIV testing among IAR (40.6% vs 24.0%, Tables 2 and 4). These observations highlight the importance of diversifying and decentralizing access to essential HIV services, which can help sustain service continuity when usual in-facility care is interrupted.

Both PLWH and IAR participants in the survey reported that concerns over getting COVID-19 in hospitals/clinics discouraged them from visiting HIV care providers. The diversion of medical resources to control the pandemic also limited PLWH and IAR's access to HIV services, according to the PAG representatives. In fact, around 30% of PLWH and IAR reported concerns over their long-term access to ART or preventive medications. Therefore, telehealth services may become increasingly essential as the pandemic continues. Indeed, studies carried out in the US and Brazil have shown that telehealth services such as remote consultation, HIV self-test kits, and delivery of medications are feasible and efficient under travel constraints due to COVID-19.[12–14] However, although 34.4% and 43.8% of prescribers, respectively, reported the adoption of video consultation and remote medication refill during COVID-19 (Table 5), only limited proportions of PLWH and IAR surveyed in this study reported receipt of such services. Only 3.0% of PLWH and 4.8% of IAR reported the experience of video consultation, and 28.8% of PLWH and 14.4% of IAR refilled their medications remotely.

A few factors could have potentially contributed to these differences. Firstly, PLWH and IAR may have different definitions or expectations of telehealth services as compared with prescribers. For example, during the pandemic, PLWH who were stranded overseas could obtain medications by having their families or friends collect the medications by showing the PLWH's National Health Insurance Card to the prescribers and post them overseas. Prescribers may consider this as a telehealth model for medication refill. However, for PLWH who did not disclose their HIV status to their families, this policy remained an obstacle and they may expect a "real" telemedicine model for drug refill and consultations. In addition, the prescribers and PLWH in this study were recruited through different channels (prescribers: the Taiwan HIV Study Group; PLWH: PAGs) and may have different healthcare settings, potentially contributing to the different points of view towards telemedicine. Moreover, it was also possible that some PLWH and IAR were unaware that telehealth services were available or did not need telehealth services as regular hospital/clinic visits were not disrupted for most PLWH and IAR, and therefore did not request such services during the pandemic. Regardless of the reason, telehealth services were received by only small proportions of PLWH and IAR participants at the time of this study. However, in light of the more recent COVID-19 outbreak, the Taiwan CDC released a guidance document for PLWH who are quarantined or hospitalized for COVID-19, outlining specific actions including remote consultation/medication refill and delegating a surrogate to refill medications to ensure uninterrupted treatment for PLWH,[15] which would likely help promote the use of telehealth services and alleviate the negative impact of the ongoing pandemic on PLWH.

Few participants in the survey reported being more stigmatized or discriminated during the initial wave of COVID-19. However, the situation may have changed following the COVID-19 outbreak in April 2021. In a recent COVID-19 press release in Taipei, the gay community was singled out as "a problem" in controlling the pandemic.[16] As gays constitute substantial proportions of PLWH and IAR in Taiwan (more than 80% of PLWH and IAR in this study self-identified as gay), this put PLWH and IAR in general at a greater risk of stigmatization. The interview results showed that IAR were also concerned over compromised privacy (such as having their sexual orientation exposed) due to contact tracing. These factors may make PLWH and IAR prone to psychological distress during the pandemic. In the study on cisgender gay men and other MSM (most were IAR, 17% were PLWH), 31% reported moderate to severe psychological distress, and 35% and 34%, respectively, screened positive for depression and anxiety.[7] As such, apart from removing barriers to HIV-related medical care, measures should also be taken to reduce the psychological distress among PLWH and IAR.

While the results from this study offer important insights into COVID-19's impact on PLWH and IAR in Taiwan, this study has a few limitations. Firstly, self-reported changes in access to HIV related services among PLWH and IAR were subjective and prone to response bias. However, third-person observations offered by HIV service prescribers and PAG representatives enrolled in this study would help more accurately reflect the pandemic's impact. Secondly, the samples of PLWH and IAR were recruited from PAGs and thus may not be representative of all PLWH and IAR in Taiwan. These participants could receive more support compared to those who have no access to services offered by relevant PAGs, leading to an underestimation of the pandemic's impact. Thirdly, the survey items focused on the participants' access to medical services and did not measure the psychological or emotional impacts of the pandemic. Lastly, with the recent COVID-19 outbreak in April 2021, data collected during the survey (October—November 2020) may not fully capture the impact of the pandemic on PLWH and IAR in Taiwan.

Conclusions

Although HIV services in Taiwan had not been severely affected by the COVID-19 pandemic at the time of the study, obstacles to HIV treatment and prevention care delivery were still observed. In particular, IAR appeared more affected than PLWH, with notable disruptions to routine HIV prevention services. Only small proportions of IAR and PLWH received HIV-related telehealth services, which are anticipated to become increasingly important as the pandemic continues. The pandemic has also caused considerable anxiety and stress among PLWH and IAR, affecting their psychological and emotional wellbeing. To achieve the UNAIDS 95-95-95 goal in 2030, multi-pronged strategies, which require concerted efforts from various stakeholders, are warranted to overcome new challenges in HIV care in the COVID-19 era.

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Ethics statement

Informed consent was obtained from all participants in this study.

Declaration of competing interest

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References

1. Chu Y-HI, Ku W-WS, Li C-W, Toh HS, Yang C-J, Wu K-S, et al. Taiwan guideline on oral pre-exposure prophylaxis for HIV prevention — 2018 update. *J Microbiol Immunol Infect* 2020;**53**:1—10.
2. Taiwan Centers for Disease Control. *HIV/AIDS by year of diagnosis in Taiwan*. 2021. https://www.cdc.gov.tw/En/Category/MPage/kt6yIoEGURtMQubQ3nQ7pA.
3. Taiwan Association of Family Medicine. *U=U (undetectable=untransmittable)*. 2021. https://www.tafm.org.tw/ehctafm/s/w/news_news/article/edfc6e791eab4230bc105f7a5ff3b91e.
4. United Nations Program. *On HIV/AIDS. 90-90-90: treatment for all*. 2021. https://www.unaids.org/en/resources/909090.
5. Mukwenha S, Dzinamarira T, Mugurungi O, Musuka G. Maintaining robust HIV and tuberculosis services in the COVID-19 era: a public health dilemma in Zimbabwe. *Int J Infect Dis* 2020;**100**:394—5.
6. Sanchez TH, Zlotorzynska M, Rai M, Baral SD. Characterizing the impact of COVID-19 on men who have sex with men across the United States in April, 2020. *AIDS Behav* 2020;**24**:2024—32.
7. Santos G-M, Ackerman B, Rao A, Wallach S, Ayala G, Lamontage E, et al. Economic, mental health, HIV prevention and HIV treatment impacts of COVID-19 and the COVID-19 response on a global sample of cisgender gay men and other men who have sex with men. *AIDS Behav* 2021;**25**:311—21.
8. Simões D, Stengaard AR, Combs L, Raben D. Impact of the COVID-19 pandemic on testing services for HIV, viral hepatitis and sexually transmitted infections in the WHO European Region, March to August 2020. *Euro Surveill* 2020;**25**:2001943.
9. Junejo M, Girometti N, McOwan A, Whitlock G, Gedela K, McCormack S, et al. HIV postexposure prophylaxis during COVID-19. *Lancet HIV* 2020;**7**:e460.
10. Summers J, Cheng H-Y, Lin H-H, Barnard LT, Kvalsvig A, Wilson N, et al. Potential lessons from the Taiwan and New Zealand health responses to the COVID-19 pandemic. *Lancet Reg Health West Pac* 2020:100044.
11. Hammoud MA, Grulich A, Holt M, Maher L, Murphy D, Jin F, et al. Substantial decline in use of HIV preexposure prophylaxis following introduction of COVID-19 physical distancing restrictions in Australia: results from a prospective observational study of gay and bisexual men. *J Acquir Immune Defic Syndr* 2021;**86**:22.
12. Beima-Sofie K, Ortblad KF, Swanson F, Graham SM, Stekler JD, Simoni JM. "Keep it Going if You Can": HIV service provision for priority populations during the COVID-19 pandemic in Seattle, WA. *AIDS Behav* 2020;**24**:2760—3.
13. Rogers BG, Coats CS, Adams E, Murphy M, Stewart C, Arnold T, et al. Development of telemedicine infrastructure at an LGBTQ+ clinic to support HIV prevention and care in response to COVID-19, Providence, RI. *AIDS Behav* 2020;**24**:2743—7.
14. Hoagland B, Torres TS, Bezerra DRB, Geraldo K, Pimenta C, Veloso VG, et al. Telemedicine as a tool for PrEP delivery during the COVID-19 pandemic in a large HIV prevention service in Rio de Janeiro-Brazil. *Braz J Infect Dis* 2020;**24**:360—4.
15. Taiwan HIV Story Organization. *COVID-19 resources for PLWH*. 2021. https://hiv-story.org/covid19/covpoz/.
16. Newtalk. *The gay community is an problem in epidemic prevention?* Claire Wang criticizes Ko Wen-je for stigmatization; 2021. https://newtalk.tw/news/view/2021-07-13/603440.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jmii.2022.03.002.