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Availability and readiness to provide sexually transmitted infection and HIV testing and counselling service in Nepal: evidence from 2015 comprehensive health facility survey

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Abstract

Introduction

Nepal is facing a concentrated HIV epidemic among selected key populations whereas HIV testing coverage among key populations in Nepal is around 50 percent. Service availability and readiness reflects the system level willingness and preparedness to provide the quality services. Thus, to fulfill the supply side information gap, the current study aimed to assess the health facility service availability and readiness to provide sexually transmitted infections (STI) and HIV testing and counselling (HTC) services in Nepal.

Methods

Using data from 2015 Nepal Health Facility Survey, we used the WHO Service Availability and Readiness Assessment (SARA) manual to assess the readiness of STIs and HIV testing and counselling services. The composite readiness index of STI and HTC service is the outcome variable and was calculated from the tracer domains using weighted additive procedure. Bivariate and multivariate linear regression analysis was used to assess the relationship between covariates and the outcome variable. Analysis accounted for sampling weights and complex sample design.

Results

The mean readiness score of STI and HTC services was 26.2% and 68.9% respectively. This readiness varies significantly according to the managing authority (private vs public) for both HTC and STI services. Interestingly, health facilities with external supervision had better service readiness of STI services compared to those facilities with no external supervision occurred. Regarding HTC services, service readiness was lower at private hospitals and higher at standalone HTC compared to government hospitals. Unlike STI services, the readiness of facilities to provide HTC services was higher at facilities which performed quality assurance.

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Conclusion

The facility readiness for HTC service is higher than the STI services. There is a persistent gap in staffs and guidelines and medicine and commodities across both services. Government should focus on ensuring constant supervision and quality assurance, as these were among the factors of facility readiness.

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Strength and Limitation

- This is the first study in Nepal to identify factors associated with readiness to provide STI and HTC service using the recommended WHO service readiness indicators, and data obtained from a nationally representative sample.
- By using a nationally representative sample, this suggests that our findings accurately reflect the baseline situation regarding availability and readiness to provide STI and HTC service in Nepal.
- The findings were adjusted for clustering effect and weighted to correct for complex sampling procedure and non-response and disproportionate sampling, respectively.
- Being a cross-sectional study, causal relationship could not be established. Therefore, the results should be interpreted with caution.
- Although the most recent data was analyzed, the availability of medicine, commodities, equipment may vary over time

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Introduction

HIV continues to be a global public health issue though significant progress and achievement has been made through community engagement, decentralization of HIV testing and treatment services and implementation of innovative approaches.¹ Preventing STI is one of the strategies to reduce new HIV infections so programs recommend STI screening as a part of HIV services.² Despite these gains, HIV remains a global public health challenge with gaps to attain 90-90-90 by 2020 and ending AIDS by 2030. Of 37.9 million estimated people living with HIV (PLHIV), nearly one in five PLHIV don't know their HIV status, one third of all PLHIV are not on antiretroviral therapy (ART), and half had unsuppressed viral loads in 2018.¹ However, these numbers are disproportionately distributed with varied epidemic scenarios across the regions and nations so tailored interventions are paramount to curb the HIV epidemic.

Nepal is facing a concentrated HIV epidemic with steadily more than five percent prevalence among selected key populations such as people who inject drugs (PWID), male sex workers (MSWs) and transgender people. In 2018, approximately 29,944 PLHIV are in Nepal, with an estimated overall adult (15-49 years) HIV prevalence of 0.14 percent.³ Of total estimated PLHIV, yet, one third of people are unaware of their status as of July 2019, which is mainly because of low access to HIV testing services and reluctant to access HIV testing services either due to lack of key population friendly services or gender sensitive services, and fear of stigma and discrimination.⁴ National HIV Testing and Treatment Guideline 2017 states that screening, diagnosis and treatment of STI should be part of the HIV programs and all adolescents and adults should be offered for STI services while providing HIV services. HIV testing services are the entry for HIV services, primarily provided through government, NGO-run facilities, and few private

clinics. HIV testing services are free of cost through 175 HIV testing centers including 137 government run centers.³ Similarly, HIV testing services have been decentralized through provision of HIV screening at the community level including oral fluid-based HIV self-testing. However, HIV testing coverage among key populations in Nepal is still low with just 50 percent as per integrated bio-behavioral surveillance (IBBS) survey.⁵ In the current context, integration and scale-up of HIV testing services is required to minimize access related barriers, bring services closer to the communities, early detection of HIV cases and link them for treatment, care and support services.⁶ In Nepal, STIs diagnosis and treatment services are available for key populations from government- and NGO-run sites. Syphilis prevalence among key populations is reported to be around 2 percent.³

The recent Nepal Demographic Health Survey 2016 reports only 20.5 percent male and 10.8 percent female of age 15-49 years have ever tested for HIV.⁷ There are different factors that determine the utilization of counselling and testing services for STIs and HIV. Both the demand and supply side factors affect counselling and testing related to STI and HIV.^{5,8} However, most of the researches till date have focused on examining the knowledge and key population's behavioral factors in relation to HTC services.^{5,9} Under the leadership of National Centre for AIDS and STD Control (NCASC), Ministry of Health and Population (MoHP) with the involvement of HIV stakeholders, the National HIV Strategic Plan 2016-2021 has been developed, which focuses on HIV and STI services among key populations.¹⁰ This strategic plan has committed to fast-tracking of the HIV response to reach 90-90-90 targets by 2020 and ending AIDS as a public health threat by 2030. Similarly, the Government of Nepal has endorsed Sustainable Development Goals (SDGs) and ending the AIDS epidemic as public health threat by 2030. Among the supply side factors, service availability, location, facilities, test kits availability and service organizations were reported as potential determinants to improve HTC access among female sex workers.⁹ But there is need for country level information on availability and readiness to assess country capacity in delivering quality HTC services. Service availability and readiness reflects the system level willingness and preparedness to provide the quality services.¹¹ Globally, investigators have assessed service availability and readiness for maternal health, child health services and family planning services using the Service Provision Assessment (SPA) and SARA, however, information on service availability for HIV or STI remains less documented.

Thus, to fulfill the supply side information gap, this analysis has been conducted to assess and inform the health facility service availability and readiness to provide STI and HIV testing and counselling service in Nepal. In our notice, related analysis has not been conducted earlier. This will help the policy makers, planners and managers at all levels of the government for evidence-informed decision making and resource allocation.

Methods

Data source and sampling procedure

We used data from the Nepal Health Facility Survey (NHFS) conducted in 2015 that combines the components of the USAID-supported SPA of the Demographic and Health Survey (DHS) program, WHO's SARA, UNFPA's Facility Assessment for Reproductive Health Commodities and Services, and the Nepal specific Service Tracking Survey. The comprehensive nationally representative cross-sectional survey of health facilities provides information on formal sector

health facilities about the availability of basic and essential health care services and the readiness of health facilities to provide quality health services. The report is published elsewhere.¹²

A total of 963 health facilities were successfully surveyed with 97% of response rate. More detail on the methodology used in this survey can be found in the report published elsewhere.¹² Briefly, the study sample included all non-specialized government hospitals, all private hospitals with 100 or more inpatient beds, and all primary health care centers (PHCCs). The remainder of the sample consisted of health posts, private hospitals with at least 15 beds but fewer than 100 beds, stand-alone HTC sites, and Urban Health Centre (UHC). The sample of the 2015 NHFS was a stratified random sample of health facilities selected with equal probability systematic sampling with the sample allocation. Stratification was achieved by separating by the type of facility/public-private health facility within each domain. The private hospitals were further stratified by the number of beds within domain: 100+ beds and less than 100 beds, where applicable. The sample allocation features a complex allocation by taking many factors into account.

Data collection

The implementation of field work took place from April to November 2015. New ERA, a local research firm in Kathmandu, implemented the survey with technical assistance from USAID supported DHS Program (ICF). The UK Department for International Development (DFID) provided funding for the local costs of the implementation through the Nepal Health Sector Support Program (NHSSP). Trained staff with medical background were mobilized for the survey. Quality assurance officer and key survey management team monitor the field throughout the period. Out of five main types of data collection instruments in NHFS, we have used two types of instrument in our study (Facility Inventory Questionnaire and Health Provider Questionnaire). The information for these two instruments were collected from knowledgeable informants at the facility to determine whether a facility is ready to provide services at acceptable standards.¹²

Unit of analysis and study variables

The WHO SARA manual was used to guide the selection of indicators on STI and HIV testing and counselling services.¹³ The service readiness is described by the tracer items of following domains (Table 1). Two indicators used for the study as per the WHO SARA manual was a) percent of facilities providing HIV counselling and testing services with tracer items on the day of the assessment, and b) percent of facilities providing STI services with tracer items on the day of the assessment.

Based on the indicators on the WHO SARA manual, our unit of analysis is the facilities offering STI services (n=710) and facilities with HIV testing systems (n=57). STI service is defined as “providers in the facility diagnose STIs or prescribe treatment for STIs or both” and HIV testing service is defined as “facility reports conducting HIV testing in the facility or else in an external testing site and having an agreement with that external site that test results will be returned to the facility”. Background covariates used in the study are facility type, managing authority (public/private), ecological region (Mountain, Hill and Terai) and province (Province 1 to 7). The private facilities under the managing authority includes; private not-for-profit: non-governmental organizations (NGOs), private for-profit organizations, and mission/faith organizations. Facility type is categorized as government hospitals (district, zonal and above hospitals), private hospitals (most are managed for profit), peripheral facilities (Primary health care centers (PHCCs)/ Health

Post (HP)s/Urban health centers (UHCs)) and standalone HTC. Similarly, all standalone HTC facilities are operated by NGO/private not-for-profit agencies. Other covariates include facility level variables such as; external supervision in the facility in the last 4 months (occurred/not occurred), monthly management meeting conducted (never/ sometimes/regular), client opinion (reviewed/not reviewed) and quality assurance (performed/not performed). The selection of these variables was based on the literature published elsewhere.^{11, 13}

Statistical analysis

The composite readiness index of STI and HIV testing and counselling service is the outcome variable and it is calculated from the tracer domains using weighted additive procedure. This procedure involves assigning equal weights to each domain, and adjusting for the "variation in the number of indicators within each domain so that the weight of the indicator is inversely proportional to the number of indicators in the domain".¹⁵⁻¹⁷ Percentage distribution of facilities, readiness score of service readiness and specific domain for both services was calculated. Bivariate and multivariate linear regression analysis was used to assess the relationship between covariates and the outcome variable. P-value<0.05 and standard error (SE) were considered to show the significant level in the analysis. Since the 2015 NHFS sample was a stratified sample, sampling weights were calculated based on sampling probabilities separately for each sampling stratum. To ensure the actual representation of the survey results, we have applied the sampling weights and complex sample design was accounted for the analysis using STATA 15.0 (Stata Corp, College Station TX, USA).

Table 1: Tracer items of each domain of STI and HIV testing and counselling services

Domain*	STI service	HIV testing and counselling service
Staff and guidelines	Guidelines for diagnosis and treatment of STIs Staff trained in STI diagnosis and treatment	Guidelines on HIV counselling and testing Staff trained in HIV counselling and testing
Equipment	Not Applicable	Visual and auditory privacy
Diagnostics	Syphilis rapid test	HIV diagnostic capacity
Medicines and commodities	Condoms Metronidazole cap/tab Ciprofloxacin cap/tab (not found in 2015 NHFS), cefixime cap/tab is used instead Ceftriaxone injection	Condoms

**The WHO SARA manual was used to guide the selection of service specific domains, and service readiness is defined by important supportive items given in specific services.*

Ethical considerations

The 2015 NHFS in Nepal was reviewed and approved by the Institutional Review Board of Nepal Health Research Council, Nepal; data were publicly available and did not include facility identity. Before interviews were performed, informed consent was obtained from the health workers present at the facility on the day of visit. We have done the secondary analysis of available datasets and thus did not require ethics approval.

Out of 963 facilities interviewed, 710 (73.8%) reported to provide STI service and 57 (5.9%) reported to provide HTC service during the day of assessment and therefore were included in the analysis of the current study.

Patient and public involvement statement

Patient and public were not involved in the analysis of this study.

Results

General characteristics

STI service

More than 80% of the facilities were peripheral health facilities (Table 2). More facilities were publicly owned, had occurred external supervision in the last 4 months and had regularly conducted monthly management meetings within the facility. Inversely, low number of facilities had reviewed the client opinion and had performed quality assurance.

HTC Service

Nearly one third (30.1%) of the facilities were private hospitals followed by standalone HTC (27.4%) and government hospitals (24.8%). More facilities were managed by the private sector and had regularly conducted monthly management meetings within the facility. Contrary, peripheral facilities had reviewed the client opinion and had performed quality assurance (Table 2).

Table 2 Percentage distribution of the facilities for specific services according to background characteristics

Variable	STI service n(%)	HIV testing and counselling service n(%)
Total	710	57
Facility type		
Government hospitals	21 (3.0)	14 (24.8)
Private hospitals	65 (9.1)	17 (30.6)
Peripheral facilities	605 (85.2)	10 (17.2)
Standalone HTC	19 (2.7)	16 (27.4)
Managing authority		
Public	627 (88.2)	24 (42.0)
Private	84 (11.8)	33 (58.0)
Ecological region		
Mountain	73 (10.3)	3 (4.7)
Hill	392 (55.2)	26 (46.5)
Terai	245 (34.5)	28 (48.8)
Province		
Province 1	118 (16.7)	5 (8.9)
Province 2	117 (16.5)	11 (19.9)

Variable	STI service n(%)	HIV testing and counselling service n(%)
Province 3	158 (22.3)	17 (29.2)
Province 4	90 (12.7)	7 (12.4)
Province 5	105 (14.8)	9 (16.2)
Province 6	47 (6.6)	2 (4.0)
Province 7	74 (10.4)	5 (9.3)
External supervision in the facility in last 4 months		
Occurred	463 (65.2)	41 (71.5)
Not occurred	247 (34.8)	16 (28.6)
Monthly management meeting conducted		
Never	132 (18.6)	3 (5.8)
Sometimes	100 (14.1)	5 (9.6)
Regular	478 (67.3)	48 (84.6)
Client opinion		
Reviewed	75 (10.5)	23 (40.5)
Not reviewed	636 (89.5)	34 (59.5)
Quality assurance		
Performed	143 (20.1)	15 (25.7)
Not performed	568 (79.9)	42 (74.3)

Availability of important supportive items for STI and HTC services

Less than 10% of facilities offering STI services had a staff trained (8.4%) in STI diagnosis and treatment and had guidelines (8.1%) for diagnosis and treatment of STIs. Similarly, 15.9% had syphilis rapid diagnostic test kits available on the day of visit. Majority of facilities providing STI services had condoms on the day of the assessment. As for medicines to treat STIs, most facilities offering STI services had Metronidazole (95.5%). However, less than 1 in 6 facilities had Cefixime capsule/tablet (15.8%) and injectable Ceftriaxone (10.9%). Further, nearly two fifth of these facilities have a staff trained in HIV testing and counseling (38.8%) and guidelines on HIV counselling and testing (34.1%). Almost all facilities (96%) with an HTC service had visual and auditory privacy equipment, 80.8% had HIV test kits available and 61.2% had condoms on the day of the assessment (Table 3).

Table 3: Indicators of readiness to provide STI and HIV testing and counselling service

Indicators	Total n (%) of facilities in which indicator is available
STI services (n=710)	
Staff and guidelines	
Guidelines for diagnosis and treatment of STIs	58 (8.1)
Staff trained in STI diagnosis and treatment	59 (8.4)
Diagnostics	

Syphilis rapid test	113 (15.9)
Medicines and commodities	
Condoms	683 (96.2)
Metronidazole cap/tab	678 (95.5)
Cifixime cap/tab	112 (15.8)
Ceftriaxone injection	77 (10.9)
HIV testing and counselling service (n=57)	
Staff and guidelines	
Guidelines on HIV counselling and testing	19 (34.1)
Staff trained in HIV counselling and testing	22 (38.8)
Equipment	
Visual and auditory privacy	55 (96.3)
Diagnostics	
HIV diagnostic capacity	46 (80.8)
Medicines and commodities	
Condoms	35 (62.1)

Facility readiness to provide STI and HTC services

The readiness score of the three domains and the overall index of facility readiness to provide STI service is presented in Figure 1. The mean readiness score of STI services was 26.2%. However, 106 (14.9%) of all health facilities had overall percentage readiness scores of 50% or above, which were defined as ready to provide STI services. Figure 1 further presents the readiness score of the four domains and the overall index of health facility readiness to deliver HTC service. The mean readiness score of HTC services was 68.9%. In contrary to STI service readiness, 49 health facilities (85.9%) had overall percentage readiness scores of 50% or more, and were considered ready to provide HTC services (Figure 1). The overall readiness score was found to differ significantly according to the managing authority (private vs public) for both HTC and STI service readiness index. Public Health facilities appeared to be less prepared to deliver STI services compared to private facilities. Interestingly, this was different for HTC services; the private facilities outscored private health facilities (Figure 2).

Factors associated with readiness to provide STI and HTC services

In the bivariate and multivariate analysis; readiness of facilities to provide STI services was lower at private and peripheral facilities compared to governmental hospitals. Interestingly, health facilities where external supervision occurred in the last 4 months had better service readiness of STI services compared to those facilities with no external supervision occurred (3.6% points better than those not occurred). While running the model with all proposed covariates, the estimation routine omits a managing authority, it does so because of a dependency among other covariates in the model (Table 4).

Regarding the multivariate results of HTC services, service readiness was lower at private hospitals (35.5% points poorer than government hospitals) and higher at standalone HTC (4.4% points better than government hospitals). Unlike STI services, the readiness of facilities to provide HTC services was higher at facilities which performed quality assurance (5.0% points better than those not performed) (Table 4).

Table 4 Results of unadjusted and adjusted multiple regression models of factors associated with readiness to provide basic emergency obstetric and newborn care services

Variable	STI service				HIV testing and counselling service			
	Unadjusted Coefficient	SE	Adjusted Coefficient †	SE	Unadjusted Coefficient	SE	Adjusted Coefficient †	SE
Facility type								
Government hospitals	ref.		ref.		ref.		ref.	
Private hospitals	-8.6*	2.7	-9.0**	2.8	-35.5***	3.3	-32.6***	4.1
Peripheral facilities	-38.1**	1.6	-37.3***	1.6	-4.3	3.7	-3.1	3.1
Standalone HTC	-0.8	5.2	-2.0	5.2	8.4*	3.2	8.0*	3.4
Ecological region								
Mountain	ref.		ref.		ref.		ref.	
Hill	1.4	1.2	-0.4	1.3	-1.4	5.4	7.0	4.7
Terai	5.7	1.4	3.3	1.7	-7.5	5.0	-3.7	5.1
Province								
Province 1	ref.		ref.		ref.		ref.	
Province 2	0.6	1.8	-1.5	2.0	-14.4**	5.4	2.8	4.7
Province 3	4.7*	1.6	2.1	1.4	-16.5***	4.1	-7.3	4.0
Province 4	0.9	2.1	1.6	1.6	-6.1	9.3	-5.3	4.9
Province 5	1.9	1.7	0.7	1.5	1.5	3.8	2.6	3.6
Province 6	-1.1	2.1	1.1	1.9	-5.6	7.5	-11.1	6.5
Province 7	1.6	1.6	2.5	1.5	1.1	6.1	-0.2	4.7
External supervision in the facility in last 4 months								
Not occurred	ref.		ref.		ref.		ref.	
Occurred	4.3**	1.2	3.6***	0.9	12.0*	4.9	4.4	3.3
Monthly management meeting conducted								
Never	ref.		ref.		ref.		ref.	
Sometimes	3.8	2.2	0.06	1.5	0.35	7.3	-1.6	5.6
Regular	3.3*	1.4	-0.40	1.2	-6.3	5.2	-0.6	5.0
Client opinion								

Not reviewed	ref.		ref.		ref.		ref.	
Reviewed	16.7***	2.8	1.9	2.0	-4.7	5.0	1.2	2.8
Quality assurance								
Not performed	ref.		ref.		ref.		ref.	
Performed	1.0	1.6	-0.7	1.2	13.2**	3.8	5.0*	2.8

*p<0.05, **p<0.01, ***p<0.001, †Adjusted coefficient: each variable in the model has been adjusted by all variables.

Discussion

Nepal is committed to achieving the ambitious target of 90-90-90 by 2020 and ending the epidemic by 2030, thus, it is imperative to understand the country's capacity to deliver high quality HIV and STI services and to track service provision to realize the targets. Health facility readiness to deliver services is critical for reaching the target.¹ To our knowledge, this is the first papers from the nationally representative health facility survey to inform gaps in service provision for HIV and STI albeit, few investigators have assessed the readiness for maternal and newborn care services.

Health service delivery without guaranteeing a minimum level of quality is unethical and waste of resources.¹⁸ Service readiness is a prerequisite to the delivery of quality health care [14]. In Nepal, the investigators reported the overall service readiness to be 68 percent [13] which is in concurrence to the HIV service readiness, however, STI service readiness appears to be quite low compared to overall service readiness. This finding and the similar deficits identified in a study of contraceptive and other general health services and overall service readiness raises concern about the general readiness of the health facilities in Nepal.^{15, 16} Of particular concern is the low readiness of health facilities for the STI services. Despite a large proportion (76%) of health facilities designated to provide STI services, these facilities were mainly lacking in medicines, diagnosis or operating guidelines. The current prevalence of STI is around 0.2 percent in the general population with the prevalence being markedly high among key population. The readiness of HIV services and ANC services are higher than the STI services, indicating that the STI services have-not been fully integrated with these services.²¹

There is a substantial and pervasive gap in the basic capacity to provide health services such as maternal, newborn and family planning services. The low availability of service guidelines, diagnostic services and essential medicines is a perennial problem across all programs including HIV and AIDS.²⁰ Thus, future strategies should be directed on enhancing service readiness through adequate supplies, ensuring the guidelines and enhancing diagnostic capacities at the facility level.

In agreement with Acharya, et.al,¹⁴ our study reported that the facilities with external supervision performed better than those without regular supervision and monitoring in improving service readiness.¹¹ Regular supervision facilitates the management process and improves effectiveness of an organization. Such supervision allows information sharing and performance review to ensure adherence to the standards as well as identifying gaps, issues changes and ways forward for improvement. Standardized training, certification and ongoing supervision are identified as the crucial element in ensuring the quality at the point-of-care testing.²² Factors such as non-adherence to testing procedures, high workload, and inadequate supervision were identified as the major factors impacting the quality of HIV testing in Zambia.²³ Under the federal management, the management of the peripheral health facilities and the provision of basic health services have been

transferred to the local government.²⁴ Thus, this paper underscore the role of the local government in regular monitoring while, improving the procurement and supply system to scale up HIV readiness and service provision.

Service readiness varied by the type of ownership and level of facilities. The peripheral health facilities were reported to have inadequate diagnostic facilities and low availability of essential drugs consistent with the findings from a multi-country analysis for seven low- and middle-income countries.²⁵ Most people in rural areas rely on these peripheral health facilities, thus, poor readiness of peripheral health facilities hinders access of such services to those living in rural areas. Public health facilities appeared to perform lower than the private health facilities, albeit, not all private health hospitals fulfilled the criteria for basic amenities, diagnostic capacity and essential medications. Inadequate supply of basic amenities, diagnostic services and medicines in peripheral health facilities and public facilities can fuel up the growing inequity in health services. Interestingly, HIV counselling and testing services appeared to be better in the public than private sector unlike, maternal and child health services.²⁶ On further disaggregation, stand-alone health facilities appear to perform better than private hospitals and public facilities. Often, these standalone sites are run through external partners, offer dedicated HIV services and are target driven with instituted close monitoring system which might explain the better performance and readiness of these stand-alone facilities.

In Nepal, anti-retroviral therapy is provided mainly through public health facilities. Moreover, HTC services including anti-retroviral therapy are provided free of charge through these public health facilities thus, HIV related services often are not service choice for many for profit private health facilities, which could have potentially enhanced the performance of the public health sites compared to the private sector.²⁷

Though the National HIV Testing and Treatment Guideline 2017 outlines all the health facilities irrespective of ownership (public Vs private) should strictly adhere to the standard guidelines and provide HIV counselling and testing services, however, not all private hospitals were found to be reporting under Integrated Health Managements Information System (IHMS) and thus, the service standard and services provided through private sector remains underreported.²⁷ In an assessment of the safer abortion services readiness, private sector was found to be low performing, although around half of the safer abortion services are being delivered through private sector.²⁸

Stock out of essential drugs has been a perennial problem in most of the low- and middle-income countries.²⁹ The overall availability of essential medicines ranged from 29.4% to 54.4% in many low- and middle-income countries.³⁰ Availability and quality of the services determine the selection and uptake of STI and HIV services.³¹ To improve accuracy of HIV testing, paraprofessionals should receive more standardized HIV rapid testing training and regular supervision. Among the factors affecting the quality of HIV testing, non-adherence to testing procedures, inadequate training and supervision deter the quality of health services [27]. Less than 10 percent for STI service sites and only one third of HIV service sites had operational guidelines which are taken as a proxy indicator for adherence to testing procedures. These persistent deficit and poor readiness of service sites contradicts with the spirit of the Nepal Health Sector Strategy Implementation Plan (2015-20) in ensuring the minimum standard of services. The study has limitation as well. We analyzed the data from the survey conducted before five years therefore

may not reflect recent developments after the federalized health system in Nepal. However, this is the latest data available on the health facility readiness. A further analysis would be a pooled analysis of the closely timed surveys among households and facilities to explore the association between service readiness and uptake of these services. Further, it should be noted that changes over time in the policy alignments of major supporters with respect to STI/HIV programming may have inclined the levels of readiness observable for the later NHFS surveys.

Conclusion

Conclusively, health facility readiness to deliver services is critical for reaching the SDG target. The mean readiness score of the STI service was 26.2 and that of HTC service was 68.9. Service readiness was higher among the government hospital and facilities with external supervision. Likewise, HTC service readiness was higher at standalone HTC and facilities that performed quality assurance. There are persistent gaps in delivering services for HIV and STI, thus, compromising the standard of care delivered through these sites. Future strategies should be directed on enhancing service readiness through adequate supplies, ensuring the guidelines and enhancing diagnostic capacities and local government have a critical role in ensuring the quality and availability of these services. A comparative analysis can be undertaken after the data from the subsequent survey becomes available.

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Contributors

KA conceptualized and designed the study, performed statistical analysis and wrote them. RT, NB and KB conducted literature review and involved in the writing the manuscript, edited and revised the manuscript. BS supervised, provided advice and edited the manuscript. All authors read and approved the final manuscript.

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Competing interests None declared.

Patient consent for publication Not required.

Data sharing statement

The datasets generated during the current study are available from within the Demographic and Health Survey Program repository: <http://dhsprogram.com/data/available-datasets.cfm>.

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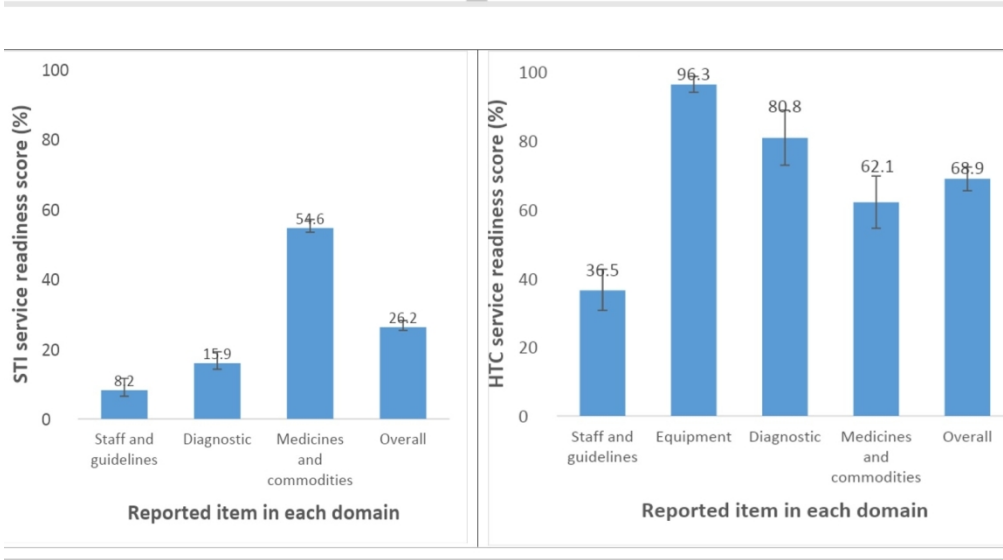


Figure 1 Percentage score of the four domains of readiness to provide STI and HIV testing and counselling service

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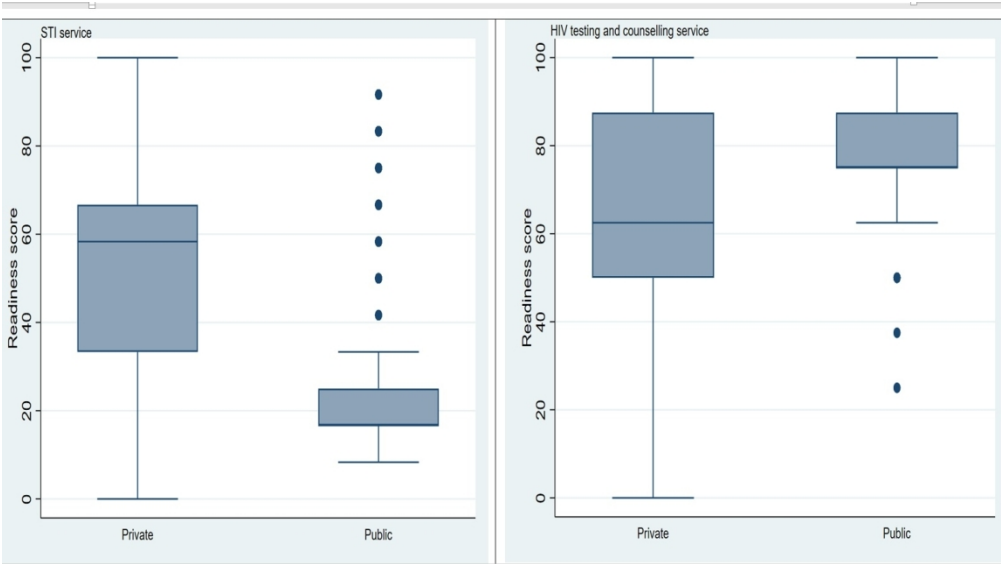


Figure 2 Overall readiness score for STI and HIV testing and counselling service according to the managing authority

341x192mm (120 x 120 DPI)

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Availability and readiness to provide sexually transmitted infections and HIV testing and counselling services in Nepal: evidence from comprehensive health facility survey

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Abstract

Objective: We assessed the availability and readiness of health facilities to provide sexually transmitted infections (STI) and HIV testing and counselling (HTC) services in Nepal.

Design: This study was a cross-sectional survey.

Setting: We used data from the most recent nationally representative Nepal Health Facility Survey (NHFS) 2015. A total of 992 health facilities of different levels was included in the sample size of NHFS 2015.

Primary and secondary outcome measures: The primary outcome of this study was to assess the availability and readiness of health facilities to provide STI and HTC services using the World Health Organization (WHO) Service Availability and Readiness Assessment (SARA) manual.

Results: Nearly three-fourths (73.8%) and less than one-tenth (5.9%) of health facilities reported providing STI and HTC services respectively. The mean readiness score of STI and HTC services was 26.2% and 68.9% respectively. The readiness scores varied significantly according to the managing authority (private vs public) for both STI and HTC services. Interestingly, health facilities with external supervision had better service readiness scores for STI services that were almost four points higher than compared to those facilities with no external supervision. Regarding HTC services, service readiness was lower at private hospitals (32.9 points lower) and compared to government hospitals. Unlike STI services, the readiness of facilities to provide HTC services was higher (4.8 point higher) at facilities which performed quality assurance.

Conclusion: The facility readiness for HTC service is higher than that for STI services. There are persistent gaps in staff, guidelines and medicine and commodities across both services. Government of Nepal should focus on ensuring constant supervision and quality assurance, as these were among the determining factors for facility readiness.

Strength and Limitation

- This is the first study utilizing nationally representative survey data to identify factors associated with readiness to provide STI and HTC services in Nepal.
- This study accurately reflects the baseline situation regarding availability and readiness to provide STI and HTC service in Nepal.
- The findings were adjusted for clustering effect and weighted to correct for complex sampling procedure and non-response and disproportionate sampling, respectively.
- This study provides the evidences using the standard WHO SARA manual.
- The causal relationship could not be established from the current study.

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Introduction

HIV continues to be a global public health issue though significant progress and achievement has been made through community engagement, decentralization of HIV testing and treatment services and implementation of innovative approaches.¹ Preventing STI is one of the strategies to reduce new HIV infections so programs recommend STI screening as a part of HIV services.² Despite these gains, HIV remains a global public health challenge with gaps to attain 90-90-90 by 2020 and ending AIDS by 2030. Of 37.9 million estimated people living with HIV (PLHIV), nearly one in five PLHIV don't know their HIV status, one third of all PLHIV are not on antiretroviral therapy (ART), and half had unsuppressed viral loads in 2018.¹ However, these numbers are disproportionately distributed with varied epidemic scenarios across the regions and nations so tailored interventions is paramount to curb the HIV epidemic.

Nepal is facing a concentrated HIV epidemic with more than five percent prevalence among selected key populations such as people who inject drugs (PWID), male sex workers (MSWs) and transgender people. In 2018, there are approximately 29,944 PLHIV in Nepal, with an estimated overall adult (15-49 years) HIV prevalence of 0.14%.³ Of the total estimated PLHIV, one third of people are unaware of their status as of July 2019, which is mainly because of low access to HIV testing services and reluctance to access HIV testing services either due of lack of population friendly services or gender sensitive services, and fear of stigma and discrimination.⁴ Sexually transmitted infections (STIs) are a growing problem in Nepal affecting more females than males. A total of 140,559 cases of STIs were reported in Nepal in 2017. Syphilis prevalence among key populations is reported to be around two percent.³ The National HIV Testing and Treatment Guideline 2017 states that screening, diagnosis and treatment of STI should be part of the HIV programs and all adolescents and adults should be offered STI services while receiving HIV services. STI services are also part of basic health services and HIV testing is the entry for HIV services, primarily provided through government, non-governmental organization (NGO)-run facilities, and a few private clinics. HIV testing services are free of cost through 175 HIV testing centers including 137 government run centers.³ Similarly, HIV testing services have been decentralized through provision of HIV screening at the community level including oral fluid-based HIV self-testing. However, HIV testing coverage among key populations in Nepal is still low with just 50%.⁵ The recent Nepal Demographic Health Survey 2016 reports only 20.5% male and 10.8% female ages 15-49 years have ever tested for HIV⁶. STI symptoms were reported among 15% of women and 2% of men who had ever had sexual intercourse⁶. In the current context, integration and scale-up of HIV testing services is required to minimize access related barriers, bring services closer to the communities, provide early detection of HIV cases and link them for treatment, care and support services.⁷ In Nepal, STIs diagnosis and treatment services are currently provided through government- and NGO-run sites. In Nepal, based on the available resources, syndromic diagnostic approach and laboratory testing is recommended.^{8,9} HIV and STI counselling and testing are provided up to the health post level and by both public and private sectors in Nepal.¹⁰ STI services are provided as a part of maternal and child health and family planning services in Nepal.⁹

There are different factors that determine the utilization of counselling and testing services for STIs and HIV. Both the demand and supply side factors affect counselling and testing related to STI and HIV.^{5,11} However, most of the research to date have focused on examining the

knowledge and key population's behavioral factors in relation to HTC services.^{5,12 13} The HIV Strategic Plan 2016-2021 has committed to fast-tracking the HIV response to reach 90-90-90 targets by 2020 and ending AIDS as a public health threat by 2030. Similarly, the Government of Nepal has endorsed the Sustainable Development Goals (SDGs) and ending the AIDS epidemic as public health threat by 2030. Among the supply side factors, service availability, location, facilities, test kits availability and service organizations were reported as potential determinants to improve HTC access among female sex workers.¹² But there is need for country level information on availability and readiness to assess country capacity in delivering quality HTC services. Service availability and readiness reflects the system level willingness and preparedness to provide quality services.¹⁴ Globally, investigators have assessed service availability and readiness for maternal health, child health services and family planning services using the Service Provision Assessment (SPA) and SARA, however, information on service availability for HIV or STI remains less documented.

Thus, to fulfill the supply side information gap, this analysis has been conducted to assess and inform the health facility service availability and readiness to provide STI and HIV testing and counselling service in Nepal. In our knowledge, related analyses have not been conducted earlier and the findings are critical to inform gaps to guide resource allocation and service provisions in low- income countries such as Nepal.

Methods

Data source and sampling procedure

We used data from the Nepal Health Facility Survey (NHFS) conducted in 2015 that combines the components of the USAID-supported SPA of the Demographic and Health Survey (DHS) program, WHO's SARA, UNFPA's Facility Assessment for Reproductive Health Commodities and Services, and the Nepal specific Service Tracking Survey. The comprehensive nationally representative cross-sectional survey of health facilities provides information on formal sector health facilities regarding the availability of basic and essential health care services and the readiness of health facilities to provide quality health services. The report is published elsewhere.¹⁵

The survey sampling was based on a master list of 4,719 formal-sector health facilities in Nepal, obtained from the Ministry of Health and Population (MoHP). This was used as the sampling frame and out of them a total of 1,000 facilities were selected for the survey. Briefly, the study sample included all non-specialized government hospitals, all private hospitals with 100 or more inpatient beds, and all primary health care centers (PHCCs). The remainder of the sample consisted of health posts, private hospitals with at least 15 beds but fewer than 100 beds, stand-alone HTC sites, and Urban Health Centres (UHCs). The sample of the 2015 NHFS was a stratified random sample of health facilities selected with equal probability systematic sampling with the sample allocation. Stratification was achieved by separating by the type of facility/public-private health facility within each domain. The private hospitals were further stratified by the number of beds within domain: 100+ beds and less than 100 beds, where applicable. The sample allocation features a complex allocation accounting for different factors. Eight sampled facilities turned out to be duplicates during the implementation of the survey, resulting in an effective sample size of 992 facilities. A total of 963 health facilities were

successfully surveyed with 97% response rate. More detail on the methodology used in this survey can be found in the report published elsewhere.¹⁵

Data collection

The implementation of field work took place from April to November 2015. New ERA, a local research firm in Kathmandu, implemented the survey with technical assistance from USAID supported DHS Program (ICF). The UK Department for International Development (DFID) provided funding for the local costs of the implementation through the Nepal Health Sector Support Program (NHSSP). Trained staff with medical backgrounds were mobilized for the survey. Eight quality assurance officers and the core survey management team monitored the data collection throughout the period. Out of five main types of data collection instruments in NHFS, we have used two types of instruments in our study (Facility Inventory Questionnaire and Health Provider Questionnaire). The information for these two instruments was collected from knowledgeable informants at the facility to determine whether a facility is ready to provide services at acceptable standards.¹⁵ We used the Facility Inventory Questionnaire to assess staffing levels and support systems for general management and quality assurance. Similarly, a Health Provider questionnaire was used to assess the status of training received. The rest of the questionnaires used in the survey are related to Antenatal care (ANC), Family Planning (FP), curative services of sick children like observations and Health facility operation and management Committee/Health development committee which is beyond our scope of study. The questionnaires/tools used in the survey were harmonized from the standard SPA and SARA tools used worldwide.¹⁶ The online version of all the questionnaires is published elsewhere.¹⁵ The specific questionnaire taken for the analysis for this study in particular, is presented in the Supplementary Table 1.

Unit of analysis and study variables

Based on the indicators on the WHO SARA manual,¹⁷ Service availability refers to facilities offering STI services and facilities with HIV testing systems. STI service is defined as “providers in the facility diagnose STIs or prescribe treatment for STIs or both” and HIV testing service is defined as “facility reports conducting HIV testing in the facility or else in an external testing site and having an agreement with that external site that test results will be returned to the facility”.

Facility readiness was defined as the willingness or state of the health facility to provide STI and HTC services. This was analyzed by the availability of essential equipment and supplies for a specific service in a location reasonably accessible when providing that service; the availability of staff with recent training relevant to the service, as well as service guidelines; the availability of medicines and commodities; and laboratory capacity for tests related to the service. Further, based on the National guidelines on case management of STI⁹, we further assessed the availability of recommended drugs like azithromycin, doxycycline and penicillin in STI services though not mentioned in the WHO SARA manual. For readiness we were strict to follow the SARA manual, did not include those drugs for the readiness score. The service readiness, however, is described by the tracer items of following domains (Table 1).

Other covariates used in the study are facility type, managing authority (public/private), ecological region (Mountain, Hill and Terai) and province (Province 1 to 7). The private facilities under the managing authority includes; private not-for-profit: non-governmental organizations (NGOs), private for-profit organizations, and mission/faith organizations. Facility type is categorized as government hospitals (district, zonal and above hospitals), private hospitals (most are managed for profit), peripheral facilities (primary health care centers (PHCCs)/ Health Post (HP)s/Urban health centers (UHCs)) and standalone HTC facilities. All standalone HTC facilities are operated by NGOs/private not-for-profit agencies. Other covariates include facility level variables such as; external supervision in the facility in the last four months (occurred/not occurred), monthly management meeting conducted (never/ sometimes/regular), client opinion (reviewed/not reviewed) and quality assurance (performed/not performed). The selection of these variables was based on the published literature. The urban-rural distribution was not available in the openly available datasets but we have classified them using the GPS location¹⁸ available upon the request from the DHS program.

Statistical analysis

The composite readiness score of STI and HIV testing and counselling service is the outcome variable and it is calculated from the availability of tracer items in each domain mentioned above (three domains for STI and four domains for HTC) using weighted additive procedure. This procedure involves assigning equal weights to each domain, and adjusting for the "variation in the number of indicators within each domain so that the weight of the indicator is inversely proportional to the number of indicators in the domain".^{19–21} For instance, to make the score of 0–100%, each domain was accounted for 33.3% (100/3) of the index for STI services while each domain was accounted for 25% (100/4) was accounted for HTC services. The percentage for each indicator within the domain was equal to 33.3% for STI services care and 25% for HTC services divided by the number of indicators in that domain. The summary of the measurement procedure of the readiness score is given in the Supplementary Table 2. Percentage distribution of facilities, readiness score of service readiness and specific domain for both services was calculated. Bivariate and multivariate linear regression analysis was used to assess the relationship between covariates and the outcome variable. All covariates were tested for collinearity before fitting the model. Since facility types and managing authority were highly correlated, we dropped the managing authority from the model and included all other variables. P-value<0.05 was considered to show the significant level in the analysis. Since the 2015 NHFS sample was a stratified sample, sampling weights were calculated based on sampling probabilities separately for each sampling stratum. To ensure the actual representation of the survey results and to provide unbiased estimates of the parameters, we have applied the sampling weights. Further, complex sample design has been taken into account to adjust standard errors that accompany the properly weighted estimates. This was done using “svy” command in STATA 15.0 (Stata Corp, College Station TX, USA).

Table 1: Tracer items of each domain of STI and HIV testing and counselling services

Domain*	STI service	HIV testing and counselling service
Staff and guidelines	Guidelines for diagnosis and treatment of STIs,	Guidelines on HIV counselling and testing,

Equipment Diagnostics Medicines and commodities	Staff trained in STI, Diagnosis and treatment	Staff trained in HIV counselling and testing,
	Not Applicable	Visual and auditory privacy,
	Syphilis rapid test,	HIV diagnostic capacity ¹ ,
	Condoms	Condoms
	Metronidazole cap/tab	
	Ciprofloxacin cap/tab	
	(not found in 2015 NHFS), cefixime cap/tab is used instead	
	Ceftriaxone injection	

**The WHO SARA manual was used to guide the selection of service specific domains, and service readiness is defined by important supportive items given in specific services.*

¹ HIV diagnostic capacity was defined as facility reports conducting HIV testing at the facility and had at least one unexpired Determine, at least one unexpired Uni-Gold, and at least one unexpired Stat Pak HIV rapid diagnostic test kit available somewhere in the facility on the day of the survey, or else facility had ELISA testing capacity or other HIV testing capacity observed in the facility on the day of the survey.

Ethical considerations

The 2015 NHFS in Nepal was reviewed and approved by the Institutional Review Board of Nepal Health Research Council, Nepal; data were publicly available and did not include facility identity. Before interviews were performed, informed consent was obtained from the health workers present at the facility on the day of visit. We have done the secondary analysis of available datasets and thus did not require ethics approval.

Patient and public involvement statement

Patient and public were not involved in the analysis of this study.

Results

Service Availability

Out of 963 facilities interviewed, 710 (73.8%) reported to provide STI service and 57 (5.9%) reported to provide HTC service during the day of assessment and therefore were included in the analysis of the current study (Table 2).

General characteristics

STI service

More than 80% of the facilities were peripheral health facilities (PHCCs, UHCs and health posts) (Table 2). The distribution of the facilities in rural and urban was 44% and 66% respectively. Almost 88% of facilities were publicly owned and 65.2% of health facilities reported receiving external supervision in the last 4 months. Interestingly, only 10.5% of facilities had reviewed the client opinion and had performed quality assurance.

HTC Services

Nearly one third (30.1%) of the facilities providing HTC services were private hospitals followed by standalone HTC (27.4%) and government hospitals (24.8%). Most of the facilities offering HTC services were located in the urban areas (95%). More facilities were managed by the private sector and regularly conducted monthly management meetings within the facility. On

contrary, peripheral facilities had reviewed the client opinion and had performed quality assurance (Table 2).

Table 2 Percentage distribution of the facilities for specific services according to background characteristics

Variable	STI services N (%)	HIV testing and counselling services N (%)
Total	710	57
Facility type		
Government hospitals	21 (3.0)	14 (24.8)
Private hospitals	65 (9.1)	17 (30.6)
Peripheral facilities	605 (85.2)	10 (17.2)
Standalone HTC	19 (2.7)	16 (27.4)
Managing authority		
Public	627 (88.2)	24 (42.0)
Private	84 (11.8)	33 (58.0)
Location of facility		
Rural	313 (44.1)	3 (5.1)
Urban	397 (55.9)	54 (94.9)
Ecological region		
Mountain	73 (10.3)	3 (4.7)
Hill	392 (55.2)	26 (46.5)
Terai	245 (34.5)	28 (48.8)
Province		
Province 1	118 (16.7)	5 (8.9)
Province 2	117 (16.5)	11 (19.9)
Province 3	158 (22.3)	17 (29.2)
Province 4	90 (12.7)	7 (12.4)
Province 5	105 (14.8)	9 (16.2)
Province 6	47 (6.6)	2 (4.0)
Province 7	74 (10.4)	5 (9.3)
External supervision in the facility in last 4 months		
Occurred	463 (65.2)	41 (71.5)
Not occurred	247 (34.8)	16 (28.6)
Monthly management meeting conducted		
Never	132 (18.6)	3 (5.8)
Sometimes	100 (14.1)	5 (9.6)
Regular	478 (67.3)	48 (84.6)
Client opinion		
Reviewed	75 (10.5)	23 (40.5)
Not reviewed	636 (89.5)	34 (59.5)
Quality assurance		

Variable	STI services N (%)	HIV testing and counselling services N (%)
Performed	143 (20.1)	15 (25.7)
Not performed	568 (79.9)	42 (74.3)

Availability of important supportive items for STI and HTC services

Less than 10% of facilities offering STI services had a staff trained (8.4%) in STI diagnosis and treatment and had guidelines (8.1%) for diagnosis and treatment of STIs. Similarly, 15.9% had syphilis rapid diagnostic test kits available on the day of visit. Majority of facilities providing STI services had condoms on the day of the assessment. As for medicines to treat STIs, most facilities offering STI services had Metronidazole (95.5%). However, less than one in six facilities had Cefixime capsule/tablet (15.8%) and injectable Ceftriaxone (10.9%). Around one in three (35%) health facilities had doxycycline and less than one in five facilities had azithromycin (19.2%). Only, three percent of health facilities had penicillin injection. Further, nearly two fifth of these facilities have a staff trained in HIV testing and counseling (38.8%) and guidelines on HIV counselling and testing (34.1%). Almost all facilities (96%) with an HTC service had visual and auditory privacy equipment, 80.8% had HIV test kits available and 61.2% had condoms on the day of the assessment (Table 3).

Table 3: Indicators of readiness to provide STI and HIV testing and counselling service

Indicators	Total n (%) of facilities in which indicator is available
STI services (n=710)	
Staff and guidelines	
Guidelines for diagnosis and treatment of STIs	58 (8.1)
Staff trained in STI diagnosis and treatment	59 (8.4)
Diagnostics	
Syphilis rapid test	113 (15.9)
Medicines and commodities	
Condoms	683 (96.2)
Metronidazole cap/tab	678 (95.5)
Cifixime cap/tab	112 (15.8)
Ceftriaxone injection	77 (10.9)
HIV testing and counselling service (n=57)	
Staff and guidelines	
Guidelines on HIV counselling and testing	19 (34.1)
Staff trained in HIV counselling and testing	22 (38.8)
Equipment	
Visual and auditory privacy	55 (96.3)
Diagnostics	
HIV diagnostic capacity	46 (80.8)
Medicines and commodities	
Condoms	35 (62.1)

Facility Readiness

Facility readiness to provide STI and HTC services

The readiness score of the three domains and the overall index of facility readiness to provide STI service is presented in Figure 1. The mean readiness score of STI services was 26.2%. However, 106 (14.9%) of all health facilities had overall percentage readiness scores of 50% or above, which were defined as ready to provide STI services. Figure 1 further presents the readiness score of the four domains and the overall index of health facility readiness to deliver HTC service. The mean readiness score of HTC services was 68.9%. In contrary to STI service readiness, 49 health facilities (85.9%) had overall percentage readiness scores of 50% or more, and were considered ready to provide HTC services. The overall readiness score was found to differ significantly according to the managing authority (private vs public) for both HTC and STI service readiness index. Public sector facilities appeared to be less prepared to deliver STI services compared to private facilities. Interestingly, this was different for HTC services; the public health facilities outscored private health facilities (Figure 2).

Factors associated with readiness to provide STI and HTC services

In the bivariate and multivariate analysis; readiness of facilities to provide STI services was lower at private and peripheral facilities compared to governmental hospitals. Interestingly, health facilities where external supervision occurred in the last four months had better service readiness of STI services compared to those facilities with no external supervision occurred (3.7% points better than those not occurred). While running the model with all proposed covariates, the estimation routine omits a managing authority, it does so, because of a dependency among other covariates in the model (Table 4).

Regarding the multivariate results of HTC services, service readiness was lower at private hospitals (32.9% points poorer than government hospitals) and higher at standalone HTC (8.0% points better than government hospitals). Unlike STI services, the readiness of facilities to provide HTC services was higher at facilities which performed quality assurance (4.8% points better than those not performed) (Table 4).

Table 4 Results of unadjusted and adjusted multiple regression models of factors associated with readiness to provide basic emergency obstetric and newborn care services

Variable	STI service				HIV testing and counselling service			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coefficient	SE	Coefficient †	SE	Coefficient	SE	Coefficient †	SE
Facility type								
Government hospitals	ref.		ref.		ref.		ref.	

Variable	STI service				HIV testing and counselling service			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coefficient	SE	Coefficient †	SE	Coefficient	SE	Coefficient †	SE
Private hospitals	-8.6*	2.7	-9.0**	2.7	-35.5***	3.3	-32.9***	4.1
Peripheral facilities	-38.1**	1.6	-37.2***	1.7	-4.3	3.7	-4.7	3.3
Standalone HTC	-0.8	5.2	-2.0	5.2	8.4*	3.2	8.0*	3.4
Location of facilities								
Rural	ref.		ref.		ref.		ref.	
Urban	8.9***	1.1	0.1	0.9	-8.3**	3.1	-6.7	4.9
Ecological region								
Mountain	ref.		ref.		ref.		ref.	
Hill	1.4	1.2	-0.5	1.3	-1.4	5.4	9.4	5.2
Terai	5.7	1.4	3.3	1.7	-7.5	5.0	--0.8	5.8
Province								
Province 1	ref.		ref.		ref.		ref.	
Province 2	0.6	1.8	-1.5	1.9	-14.4**	5.4	3.5	4.7
Province 3	4.7*	1.6	2.1	1.3	-16.5***	4.1	-6.6	4.0
Province 4	0.9	2.1	1.6	1.5	-6.1	9.3	-4.9	4.8
Province 5	1.9	1.7	0.7	1.4	1.5	3.8	2.8	3.6
Province 6	-1.1	2.1	1.1	1.9	-5.6	7.5	-10.0	6.6
Province 7	1.6	1.6	2.4	1.5	1.1	6.1	1.0	4.6
External supervision in the facility in last 4 months								
Not occurred	ref.		ref.		ref.		ref.	
Occurred	4.3**	1.2	3.7***	0.9	12.0*	4.9	4.8	3.3
Monthly management meeting conducted								
Never	ref.		ref.		ref.		ref.	
Sometimes	3.8	2.2	0.1*	1.5	0.35	7.3	--2.1	5.6
Regular	3.3*	1.4	-0.4	1.2	-6.3	5.2	-1.0	4.9
Client opinion								
Not reviewed	ref.		ref.		ref.		ref.	
Reviewed	16.7***	2.8	1.9	1.9	-4.7	5.0	1.2	2.8
Quality assurance								
Not performed	ref.		ref.		ref.		ref.	
Performed	1.0	1.6	-0.7	1.2	13.2**	3.8	4.8*	2.8

*p<0.05, **p<0.01, ***p<0.001, †Adjusted coefficient: each variable in the model has been adjusted by all other variables.

Discussion

Nepal is committed to the global STI strategy to rapidly reduce new sexual infections by 2022. Further, Nepal is aiming to achieve the ambitious target of 90-90-90 by 2020 and ending the epidemic by 2030, thus, it is imperative to understand the country's capacity to deliver high quality HIV and STI services and to track service provision to realize the targets. There is difference between the proportion of the facilities that provides STI services and HTC services. Most notably, nearly all sites providing HTC services were located in the urban regions. This might be due to the reason that STI services is integrated with other health programs such as maternal and neonatal health program which has wide coverage and provided through all health facilities whereas HTC service is focused to key populations.

Health service delivery without guaranteeing a minimum level of quality is unethical and waste of resources.²² Service readiness is a prerequisite to the delivery of quality health care. In Nepal, the investigators reported the overall service readiness to be 68% which is in concurrence to the HIV service readiness, however, STI service readiness appears to be quite low compared to overall service readiness.²³ This finding and the similar deficits identified in a study of contraceptive and other general health services and overall service readiness raises concern about the general readiness of the health facilities in Nepal.^{23,24} We found that the health facilities lacked relevant guidelines, staff training, diagnostic equipment's and medicine to provide STI and HTC services. Aryal et. al²⁵ reports the similar gap in health facilities' readiness to provide other health services such as maternal, newborn, family planning services. Of particular concern is the low readiness of health facilities for STI services. Despite a large proportion (76%) of health facilities designated to provide STI services, these facilities were mainly lacking in medicines, diagnosis or operating guidelines, thus, resulting in poor readiness. The current prevalence of STI is around 0.2% in the general population with the prevalence being markedly high among key populations.⁸ The cases of STIs are increasing every year with more than 140,000 cases each year.²⁶ Despite, the national strategy to integrate STI services with HIV and ANC services, the lower readiness of facilities to deliver STI services compared to HIV or ANC services indicates that the STI services have-not been fully integrated with these services.²⁷

In agreement with Acharya, et.al,²³ our study reported that the facilities with external supervision performed better than those without regular supervision and monitoring in improving service readiness.¹¹ Regular supervision facilitates the management process and improves effectiveness of an organization.²⁸ Such supervision allows information sharing and performance review and is pivotal to improving quality of health services, which might explain better performance among those receiving regular supervision.²⁹ In Nepal, such supervision was found to be effective in improving the availability of guidelines or even managing drug stock-outs. Standardized training, certification and ongoing supervision are identified as the crucial element in ensuring the quality at the point-of-care testing.³⁰ Factors such as non-adherence to testing procedures, high workload, and inadequate supervision were identified as the major factors impeding the delivery of quality HIV testing services in Zambia.³¹ Under the federal management, the management of the peripheral health facilities and the provision of basic health services have been transferred to the local government.³² Thus, this paper accentuates the role of the local government in regular monitoring while, improving the procurement and supply system to scale-up HIV readiness and service provision.

Service readiness varied by the type of ownership and level of facilities. The peripheral health facilities were reported to have inadequate diagnostic facilities and low availability of essential drugs consistent with the findings from a multi-country analysis for seven low- and middle-income countries.³³ Most people in rural areas rely on these peripheral health facilities, thus, poor readiness of peripheral health facilities hinders access of such services to those living in rural areas. Public health facilities appeared to perform lower than the private health facilities, albeit, not all private health hospitals fulfilled the criteria for basic amenities, diagnostic capacity and essential medications. Inadequate supply of basic amenities, diagnostic services and medicines in peripheral health facilities and public facilities can exacerbate the growing inequity in health services. Interestingly, HIV counselling and testing services appeared to be better in the public than private sector unlike, maternal and child health services.³⁴ On further disaggregation, stand-alone health facilities appear to perform better than private hospitals and public facilities. Often, these standalone sites are run through external partners, offer dedicated HIV services and are target driven with instituted close monitoring systems which might explain the better performance and readiness of these stand-alone facilities.

In Nepal, anti-retroviral therapy is provided mainly through public health facilities. Moreover, HTC services including anti-retroviral therapy are provided free of charge through these public health facilities thus, HIV related services often are not the service choice for many for-profit private health facilities, which could have potentially enhanced the performance of the public health sites compared to the private sector.²⁶

Though the National HIV Testing and Treatment Guideline 2017 outlines that all health facilities irrespective of ownership (public vs private) should strictly adhere to the standard guidelines and provide HIV counselling and testing services, not all private hospitals were found to be reporting under Integrated Health Managements Information System (IHMIS) and thus, the service standard and services provided through private sector remains underreported.²⁶ In an assessment of the safer abortion services readiness, the private sector was found to be low performing, although around half of the safer abortion services are being delivered through private sector.³⁵

Stock-out of essential drugs has been a perennial problem in most of the low- and middle-income countries.³⁶ The overall availability of essential medicines ranged from 29·4% to 54·4% in many low- and middle-income countries.³⁷ Availability and quality of the services determine the selection and uptake of STI and HIV services.³⁸ To improve accuracy of HIV testing, paraprofessionals should receive more standardized HIV rapid testing training and regular supervision. Among the factors affecting the quality of HIV testing, non-adherence to testing procedures, inadequate training and supervision deter the quality of health services.³⁸ Less than 10% of STI service sites and only one third of HIV service sites had operational guidelines which are taken as a proxy indicator for adherence to testing procedures. These persistent deficits and poor readiness of service sites contradicts with the spirit of the Nepal Health Sector Strategy Implementation Plan (2015-20) in ensuring the minimum standard of services.

Strength and Limitation

This is the first study that analyzed the nationally representative data and assessed the availability and facility level readiness to provide STI and HTC service in Nepal. The study has

some limitations. We analyzed the data from the survey conducted five years earlier therefore the data may not reflect recent developments after the federalized health system in Nepal. However, this is the latest data available on the health facility readiness. A further analysis would be a pooled analysis of the closely timed surveys among households and facilities to explore the association between service readiness and uptake of these services. Further, it should be noted that changes over time in the policy alignments of major supporters with respect to STI/HIV programming may have inclined the levels of readiness observable for the later NHFS surveys.

Conclusion

Conclusively, health facility readiness to deliver services is critical for reaching the SDG target. The mean readiness score of the STI service was 26.2 and that of HTC service was 68.9. Service readiness was higher among the government hospitals and facilities with external supervision. Likewise, HTC service readiness was higher at standalone HTC and facilities that performed quality assurance. There are persistent gaps in delivering services for HIV and STI, thus, compromising the standard of care delivered through these sites. Future strategies should be focused on enhancing service readiness through the provision of adequate supplies, ensuring the guidelines are followed and enhancing diagnostic capacities. Local government has a critical role in ensuring the quality and availability of these services. A comparative analysis can be undertaken after the data from the subsequent survey becomes available.

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Contributors

KA conceptualized and designed the study, performed statistical analysis and wrote them. RT, NB and KB conducted the literature review, involved in the writing the manuscript, edited and revised the manuscript. BS supervised, provided advice and edited the manuscript. All authors read and approved the final manuscript.

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Patient consent for publication Not required.

Data sharing statement

The datasets generated during the current study are available from within the Demographic and Health Survey Program repository: <http://dhsprogram.com/data/available-datasets.cfm>.

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Figure 1 Percentage score of the four domains of readiness to provide STI and HIV testing and counselling service

Figure 2 Overall readiness score for STI and HIV testing and counselling service according to the managing authority

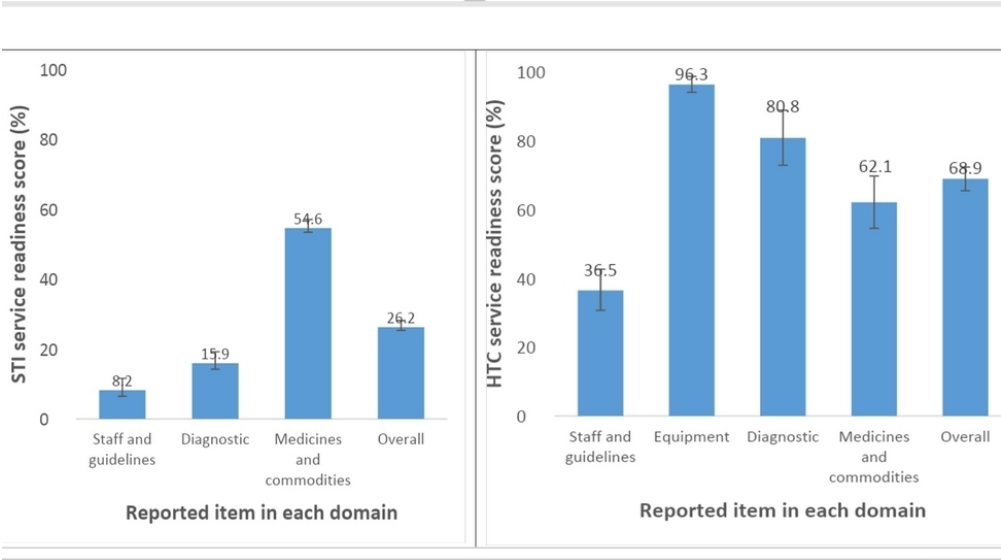


Figure 1 Percentage score of the four domains of readiness to provide STI and HIV testing and counselling service

342x192mm (72 x 72 DPI)

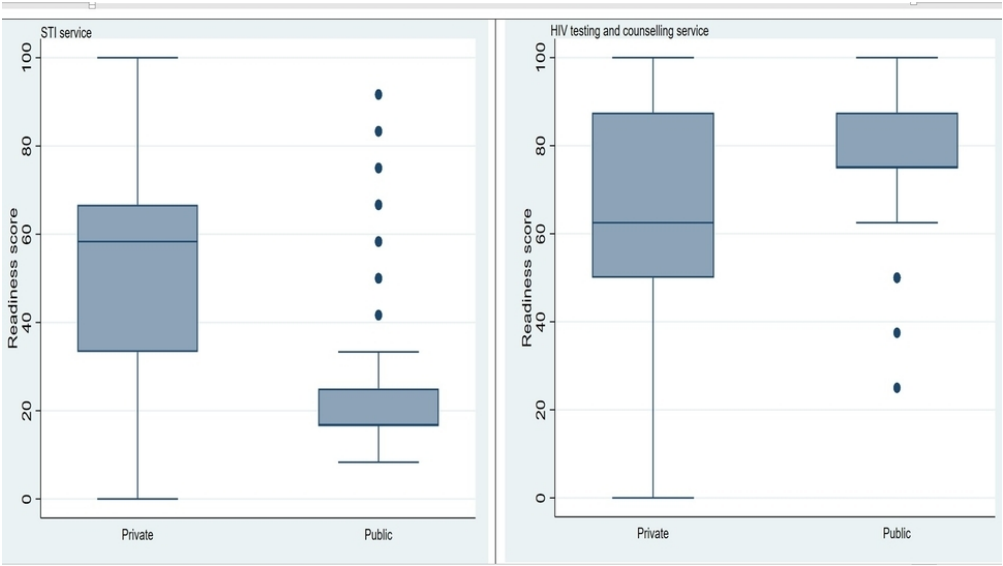


Figure 2 Overall readiness score for STI and HIV testing and counselling service according to the managing authority

341x191mm (72 x 72 DPI)

Availability and readiness to provide sexually transmitted infections and HIV testing and counselling services in Nepal: evidence from comprehensive health facility survey

Supplementary table 1 Description of each domain of the STI and HTC services

Domain	Indicators	Questions Asked
STI Service		
Staff and guidelines	Guidelines for diagnosis and treatment of STIs	Do you have the national guidelines on case management of sexually transmitted infections available in this service area? If YES, may I see the national guidelines? (Observed/Not observed) -Observed is considered for the analysis
	Staff trained in STI diagnosis and treatment	In your current position, and as part of your work for this facility, do you personally provide any STI services? If YES: Have you received any in-service training, training updates or refresher training on topics related to STI services? If YES, have you received any in-service training, training updates or refresher training in Diagnosing and treating sexually transmitted infections (STIs)? IF YES: Was the training, training update or refresher training within the past 24 months or more than 24 months ago? - At least one staff member providing the service trained in in last 24 months is considered for the study.
Diagnostics	Syphilis rapid test	Do you use syphilis rapid diagnostic test to diagnose syphilis at this service site? If YES, May I see a sample syphilis rapid diagnostic test (RDT) kit? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
Medicines and commodities	Condoms	Is Condoms available in the facility/ service area today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Metronidazole cap/tab	Is Metronidazole cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Ciprofloxacin cap/tab (not found in 2015 NHFS), cefixime cap/tab is used instead	Is Cefixime cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Ceftriaxone injection	Is Cefixime cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
STI Service		
Staff and guidelines	Guidelines for HIV counselling and testing	Do you have the national HIV testing and counseling guidelines available in this service area? If YES, may I see the guidelines? (Observed/Not observed) -Observed is considered for the analysis
	Staff trained in HIV counselling and testing	In your current position, and as part of your work for this facility, do you personally provide any HTC services? If YES: Have you received any in-service training, training updates or refresher training on topics related to HTC services? If YES, have you received any in-service training, training updates or refresher training in HIV testing and counselling? IF YES: Was the training, training update or refresher training within the past 24 months or more than 24 months ago? - At least one staff member providing the service trained in in last 24 months is considered for the study.
Equipment	Visual and auditory privacy	Describe the setting if the room or area (Enumerators should assess the room) Whether its

		Private room/Other room with auditory and visual privacy/Visual privacy only/ No privacy) -Room with visual and auditory privacy is considered for the analysis
Diagnostics	HIV diagnostic capacity	Whether the facilities conducting HIV testing at the facility had at least one unexpired Determine, at least one unexpired Uni-Gold, and at least one unexpired Stat Pak HIV rapid diagnostic test kit available somewhere in the facility on the day of the survey, or else facility had ELISA testing capacity or other HIV testing capacity observed in the facility on the day of the survey. -Observed at least one valid expiration of all the mentioned tests are considered for the analysis
Medicines and commodities	Condoms	Is Condoms available in the facility/ service area today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis

Supplementary table 2 Summary of measurement procedure of STI and HTC readiness score

Domain	indicators	Measurement	Percent score (%)	
			Indicator	Domain
STI service readiness index				
Staff and guidelines	Guidelines for diagnosis and treatment of STIs	Yes	16.66	33.33
		No	0.00	
	At least one staff trained in STI	Yes	16.66	
		No	0.00	
Diagnostics	Syphilis rapid test	Yes	33.33	33.33
		No	0.00	
Medicines and commodities	Condoms	Yes	8.33	33.33
		No	0.00	
	Metronidazole cap/tab	Yes	8.33	
		No	0.00	
	Cefixime	Yes	8.33	
		No	0.00	
	Ceftriaxone	Yes	8.33	
		No	0.00	
Total STI readiness index score				100.00
HTC service readiness index				
Staff and guidelines	Guidelines for HTC	Yes	12.50	25.00
		No	0.00	
	At least one staff trained in HTC	Yes	12.50	
		No	0.00	
Equipment	Visual and auditory privacy	Yes	25.00	25.00
		No	0.00	
Diagnostics	HIV diagnostic capacity	Yes	25.00	25.00
		No	0.00	
Supplies and commodities	condoms	Yes	25.00	25.00

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		No	0.00	
Total HTC readiness index score				100.00

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Availability and readiness to provide sexually transmitted infections and HIV testing and counselling services in Nepal: evidence from comprehensive health facility survey

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Abstract

Objective: We assessed the availability and readiness of health facilities to provide sexually transmitted infections (STI) and Human Immunodeficiency Virus testing and counselling (HTC) services in Nepal.

Design: This study was a cross-sectional survey.

Setting: We used data from the most recent nationally representative Nepal Health Facility Survey (NHFS) 2015. A total of 992 health facilities of different levels was included in the sample size of NHFS 2015.

Primary and secondary outcome measures: The primary outcome of this study was to assess the availability and readiness of health facilities to provide STI and HTC services using the World Health Organization (WHO) Service Availability and Readiness Assessment (SARA) manual.

Results: Nearly three-fourths (73.8%) and less than one-tenth (5.9%) of health facilities reported providing STI and HTC services respectively. The mean readiness score of STI and HTC services was 26.2% and 68.9% respectively. The readiness scores varied significantly according to the managing authority (private vs public) for both STI and HTC services. Interestingly, health facilities with external supervision had better service readiness scores for STI services that were almost four points higher than compared to those facilities with no external supervision. Regarding HTC services, service readiness was lower at private hospitals (32.9 points lower) and compared to government hospitals. Unlike STI services, the readiness of facilities to provide HTC services was higher (4.8 point higher) at facilities which performed quality assurance.

Conclusion: The facility readiness for HTC service is higher than that for STI services. There are persistent gaps in staff, guidelines and medicine and commodities across both services. Government of Nepal should focus on ensuring constant supervision and quality assurance, as these were among the determining factors for facility readiness.

Strength and Limitation

- This is the first study utilizing nationally representative survey data to identify factors associated with readiness to provide STI and HTC services in Nepal.
- This study accurately reflects the baseline situation regarding availability and readiness to provide STI and HTC service in Nepal.
- The findings were adjusted for clustering effect and weighted to correct for complex sampling procedure and non-response and disproportionate sampling, respectively.
- This study provides the evidences using the standard WHO SARA manual.
- The causal relationship could not be established from the current study.

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Introduction

Human Immunodeficiency virus (HIV) continues to be a global public health issue though significant progress and achievement has been made through community engagement, decentralization of HIV testing and treatment services and implementation of innovative approaches.¹ Preventing STI is one of the strategies to reduce new HIV infections so programs recommend STI screening as a part of HIV services.² Despite these gains, HIV remains a global public health challenge with gaps to attain 90-90-90 by 2020 and ending Acquired Immuno Deficiency Syndrome (AIDS) by 2030. Of 37.9 million estimated people living with HIV (PLHIV), nearly one in five PLHIV don't know their HIV status, one third of all PLHIV are not on antiretroviral therapy (ART), and half had unsuppressed viral loads in 2018.¹ However, these numbers are disproportionately distributed with varied epidemic scenarios across the regions and nations so tailored interventions is paramount to curb the HIV epidemic.

Nepal is facing a concentrated HIV epidemic with more than five percent prevalence among selected key populations such as people who inject drugs (PWID), male sex workers (MSWs) and transgender people. In 2018, there are approximately 29,944 PLHIV in Nepal, with an estimated overall adult (15-49 years) HIV prevalence of 0.14%.³ Of the total estimated PLHIV, one third of people are unaware of their status as of July 2019, which is mainly because of low access to HIV testing services and reluctance to access HIV testing services either due of lack of population friendly services or gender sensitive services, and fear of stigma and discrimination.⁴ Sexually transmitted infections (STIs) are a growing problem in Nepal affecting more females than males. A total of 140,559 cases of STIs were reported in Nepal in 2017. Syphilis prevalence among key populations is reported to be around two percent.³ The National HIV Testing and Treatment Guideline 2017 states that screening, diagnosis and treatment of STI should be part of the HIV programs and all adolescents and adults should be offered STI services while receiving HIV services. STI services are also part of basic health services and HIV testing is the entry for HIV services, primarily provided through government, non-governmental organization (NGO)-run facilities, and a few private clinics. HIV testing services are free of cost through 175 HIV testing centers including 137 government run centers.³ Similarly, HIV testing services have been decentralized through provision of HIV screening at the community level including oral fluid-based HIV self-testing. However, HIV testing coverage among key populations in Nepal is still low with just 50%.⁵ The recent Nepal Demographic Health Survey 2016 reports only 20.5% male and 10.8% female ages 15-49 years have ever tested for HIV⁶. STI symptoms were reported among 15% of women and 2% of men who had ever had sexual intercourse ⁶. In the current context, integration and scale-up of HIV testing services is required to minimize access related barriers, bring services closer to the communities, provide early detection of HIV cases and link them for treatment, care and support services.⁷ In Nepal, STIs diagnosis and treatment services are currently provided through government- and NGO-run sites. In Nepal, based on the available resources, syndromic diagnostic approach and laboratory testing is recommended.^{8,9}. HIV and STI counselling and testing are provided up to the health post level and by both public and private sectors in Nepal.¹⁰ STI services are provided as a part of maternal and child health and family planning services in Nepal.⁹

There are different factors that determine the utilization of counselling and testing services for STIs and HIV. Both the demand and supply side factors affect counselling and testing related to STI and HIV.^{5,11} However, most of the research to date have focused on examining the knowledge and key population's behavioral factors in relation to HTC services.^{5,12 13} The HIV Strategic Plan 2016-2021 has committed to fast-tracking the HIV response to reach 90-90-90 targets by 2020 and ending AIDS as a public health threat by 2030. Similarly, the Government of Nepal has endorsed the Sustainable Development Goals (SDGs) and ending the AIDS epidemic as public health threat by 2030. Among the supply side factors, service availability, location, facilities, test kits availability and service organizations were reported as potential determinants to improve HTC access among female sex workers.¹² But there is need for country level information on availability and readiness to assess country capacity in delivering quality HTC services. Service availability and readiness reflects the system level willingness and preparedness to provide quality services.¹⁴ Globally, investigators have assessed service availability and readiness for maternal health, child health services and family planning services using the Service Provision Assessment (SPA) and SARA, however, information on service availability for HIV or STI remains less documented.

Thus, to fulfill the supply side information gap, this analysis has been conducted to assess and inform the health facility service availability and readiness to provide STI and HIV testing and counselling service in Nepal. In our knowledge, related analyses have not been conducted earlier and the findings are critical to inform gaps to guide resource allocation and service provisions in low- income countries such as Nepal.

Methods

Data source and sampling procedure

We used data from the Nepal Health Facility Survey (NHFS) conducted in 2015 that combines the components of the USAID-supported SPA of the Demographic and Health Survey (DHS) program, WHO's SARA, UNFPA's Facility Assessment for Reproductive Health Commodities and Services, and the Nepal specific Service Tracking Survey. The comprehensive nationally representative cross-sectional survey of health facilities provides information on formal sector health facilities regarding the availability of basic and essential health care services and the readiness of health facilities to provide quality health services. The report is published elsewhere.¹⁵

The survey sampling was based on a master list of 4,719 formal-sector health facilities in Nepal, obtained from the Ministry of Health and Population (MoHP). This was used as the sampling frame and out of them a total of 1,000 facilities were selected for the survey. Briefly, the study sample included all non-specialized government hospitals, all private hospitals with 100 or more inpatient beds, and all primary health care centers (PHCCs). The remainder of the sample consisted of health posts, private hospitals with at least 15 beds but fewer than 100 beds, stand-alone HTC sites, and Urban Health Centres (UHCs). The sample of the 2015 NHFS was a stratified random sample of health facilities selected with equal probability systematic sampling with the sample allocation. Stratification was achieved by separating by the type of facility/public-private health facility within each domain. The private hospitals were further stratified by the number of beds within domain: 100+ beds and less than 100 beds, where applicable. The sample allocation features a complex allocation accounting for different factors.

Eight sampled facilities turned out to be duplicates during the implementation of the survey, resulting in an effective sample size of 992 facilities. A total of 963 health facilities were successfully surveyed with 97% response rate. More detail on the methodology used in this survey can be found in the report published elsewhere.¹⁵

Data collection

The implementation of field work took place from April to November 2015. New ERA, a local research firm in Kathmandu, implemented the survey with technical assistance from USAID supported DHS Program (ICF). The UK Department for International Development (DFID) provided funding for the local costs of the implementation through the Nepal Health Sector Support Program (NHSSP). Trained staff with medical backgrounds were mobilized for the survey. Eight quality assurance officers and the core survey management team monitored the data collection throughout the period. Out of five main types of data collection instruments in NHFS, we have used two types of instruments in our study (Facility Inventory Questionnaire and Health Provider Questionnaire). The information for these two instruments was collected from knowledgeable informants at the facility to determine whether a facility is ready to provide services at acceptable standards.¹⁵ We used the Facility Inventory Questionnaire to assess staffing levels and support systems for general management and quality assurance. Similarly, a Health Provider questionnaire was used to assess the status of training received. The rest of the questionnaires used in the survey are related to Antenatal care (ANC), Family Planning (FP), curative services of sick children like observations and Health facility operation and management Committee/Health development committee which is beyond our scope of study. The questionnaires/tools used in the survey were harmonized from the standard SPA and SARA tools used worldwide.¹⁶ The online version of all the questionnaires is published elsewhere.¹⁵ The specific questionnaire taken for the analysis for this study in particular, is presented in the Supplementary Table 1.

Unit of analysis and study variables

Based on the indicators on the WHO SARA manual,¹⁷ Service availability refers to facilities offering STI services and facilities with HIV testing systems. STI service is defined as “providers in the facility diagnose STIs or prescribe treatment for STIs or both” and HIV testing service is defined as “facility reports conducting HIV testing in the facility or else in an external testing site and having an agreement with that external site that test results will be returned to the facility”.

Facility readiness was defined as the willingness or state of the health facility to provide STI and HTC services. This was analyzed by the availability of essential equipment and supplies for a specific service in a location reasonably accessible when providing that service; the availability of staff with recent training relevant to the service, as well as service guidelines; the availability of medicines and commodities; and laboratory capacity for tests related to the service. Further, based on the National guidelines on case management of STI⁹, we further assessed the availability of recommended drugs like azithromycin, doxycycline and penicillin in STI services though not mentioned in the WHO SARA manual. For readiness we were strict to follow the

SARA manual, did not include those drugs for the readiness score. The service readiness, however, is described by the tracer items of following domains (Table 1).

Other covariates used in the study are facility type, managing authority (public/private), ecological region (Mountain, Hill and Terai) and province (Province 1 to 7). The private facilities under the managing authority includes; private not-for-profit: non-governmental organizations (NGOs), private for-profit organizations, and mission/faith organizations. Facility type is categorized as government hospitals (district, zonal and above hospitals), private hospitals (most are managed for profit), peripheral facilities (primary health care centers (PHCCs)/ Health Post (HP)s/Urban health centers (UHCs)) and standalone HTC facilities. All standalone HTC facilities are operated by NGOs/private not-for-profit agencies. Other covariates include facility level variables such as; external supervision in the facility in the last four months (occurred/not occurred), monthly management meeting conducted (never/ sometimes/regular), client opinion (reviewed/not reviewed) and quality assurance (performed/not performed). The selection of these variables was based on the published literature. The urban-rural distribution was not available in the openly available datasets but we have classified them using the GPS location¹⁸ available upon the request from the DHS program.

Statistical analysis

The composite readiness score of STI and HIV testing and counselling service is the outcome variable and it is calculated from the availability of tracer items in each domain mentioned above (three domains for STI and four domains for HTC) using weighted additive procedure. This procedure involves assigning equal weights to each domain, and adjusting for the "variation in the number of indicators within each domain so that the weight of the indicator is inversely proportional to the number of indicators in the domain".^{19–21} For instance, to make the score of 0–100%, each domain was accounted for 33.3% (100/3) of the index for STI services while each domain was accounted for 25% (100/4) was accounted for HTC services. The percentage for each indicator within the domain was equal to 33.3% for STI services care and 25% for HTC services divided by the number of indicators in that domain. The summary of the measurement procedure of the readiness score is given in the Supplementary Table 2. Percentage distribution of facilities, readiness score of service readiness and specific domain for both services was calculated. Bivariate and multivariate linear regression analysis was used to assess the relationship between covariates and the outcome variable. All covariates were tested for collinearity before fitting the model. Since facility types and managing authority were highly correlated, we dropped the managing authority from the model and included all other variables. P-value<0.05 was considered to show the significant level in the analysis. Since the 2015 NHFS sample was a stratified sample, sampling weights were calculated based on sampling probabilities separately for each sampling stratum. To ensure the actual representation of the survey results and to provide unbiased estimates of the parameters, we have applied the sampling weights. Further, complex sample design has been taken into account to adjust standard errors that accompany the properly weighted estimates. This was done using “svy” command in STATA 15.0 (Stata Corp, College Station TX, USA).

Table 1: Tracer items of each domain of STI and HIV testing and counselling services

Domain*	STI service	HIV testing and counselling service
Staff and guidelines	Guidelines for diagnosis and treatment of STIs, Staff trained in STI, Diagnosis and treatment	Guidelines on HIV counselling and testing, Staff trained in HIV counselling and testing,
Equipment	Not Applicable	Visual and auditory privacy,
Diagnostics	Syphilis rapid test,	HIV diagnostic capacity ¹ ,
Medicines and commodities	Condoms Metronidazole cap/tab Ciprofloxacin cap/tab (not found in 2015 NHFS), cefixime cap/tab is used instead Ceftriaxone injection	Condoms

**The WHO SARA manual was used to guide the selection of service specific domains, and service readiness is defined by important supportive items given in specific services.*

¹ HIV diagnostic capacity was defined as facility reports conducting HIV testing at the facility and had at least one unexpired Determine, at least one unexpired Uni-Gold, and at least one unexpired Stat Pak HIV rapid diagnostic test kit available somewhere in the facility on the day of the survey, or else facility had ELISA testing capacity or other HIV testing capacity observed in the facility on the day of the survey.

Ethical considerations

The 2015 NHFS in Nepal was reviewed and approved by the Institutional Review Board of Nepal Health Research Council, Nepal; data were publicly available and did not include facility identity. Before interviews were performed, informed consent was obtained from the health workers present at the facility on the day of visit. We have done the secondary analysis of available datasets and thus did not require ethics approval.

Patient and public involvement statement

Patient and public were not involved in this study.

Results

Service Availability

Out of 963 facilities interviewed, 710 (73.8%) reported to provide STI service and 57 (5.9%) reported to provide HTC service during the day of assessment and therefore were included in the analysis of the current study (Table 2).

General characteristics

STI service

More than 80% of the facilities were peripheral health facilities (PHCCs, UHCs and health posts) (Table 2). The distribution of the facilities in rural and urban was 44% and 66% respectively. Almost 88% of facilities were publicly owned and 65.2% of health facilities reported receiving external supervision in the last 4 months. Interestingly, only 10.5% of facilities had reviewed the client opinion and had performed quality assurance.

HTC Services

Nearly one third (30.1%) of the facilities providing HTC services were private hospitals followed by standalone HTC (27.4%) and government hospitals (24.8%). Most of the facilities offering

HTC services were located in the urban areas (95%). More facilities were managed by the private sector and regularly conducted monthly management meetings within the facility. On contrary, peripheral facilities had reviewed the client opinion and had performed quality assurance (Table 2).

Table 2 Percentage distribution of the facilities for specific services according to background characteristics

Variable	STI services N (%)	HIV testing and counselling services N (%)
Total	710	57
Facility type		
Government hospitals	21 (3.0)	14 (24.8)
Private hospitals	65 (9.1)	17 (30.6)
Peripheral facilities	605 (85.2)	10 (17.2)
Standalone HTC	19 (2.7)	16 (27.4)
Managing authority		
Public	627 (88.2)	24 (42.0)
Private	84 (11.8)	33 (58.0)
Location of facility		
Rural	313 (44.1)	3 (5.1)
Urban	397 (55.9)	54 (94.9)
Ecological region		
Mountain	73 (10.3)	3 (4.7)
Hill	392 (55.2)	26 (46.5)
Terai	245 (34.5)	28 (48.8)
Province		
Province 1	118 (16.7)	5 (8.9)
Province 2	117 (16.5)	11 (19.9)
Province 3	158 (22.3)	17 (29.2)
Province 4	90 (12.7)	7 (12.4)
Province 5	105 (14.8)	9 (16.2)
Province 6	47 (6.6)	2 (4.0)
Province 7	74 (10.4)	5 (9.3)
External supervision in the facility in last 4 months		
Occurred	463 (65.2)	41 (71.5)
Not occurred	247 (34.8)	16 (28.6)
Monthly management meeting conducted		
Never	132 (18.6)	3 (5.8)
Sometimes	100 (14.1)	5 (9.6)
Regular	478 (67.3)	48 (84.6)
Client opinion		
Reviewed	75 (10.5)	23 (40.5)
Not reviewed	636 (89.5)	34 (59.5)

Variable	STI services N (%)	HIV testing and counselling services N (%)
Quality assurance		
Performed	143 (20.1)	15 (25.7)
Not performed	568 (79.9)	42 (74.3)

Availability of important supportive items for STI and HTC services

Less than 10% of facilities offering STI services had a staff trained (8.4%) in STI diagnosis and treatment and had guidelines (8.1%) for diagnosis and treatment of STIs. Similarly, 15.9% had syphilis rapid diagnostic test kits available on the day of visit. Majority of facilities providing STI services had condoms on the day of the assessment. As for medicines to treat STIs, most facilities offering STI services had Metronidazole (95.5%). However, less than one in six facilities had Cefixime capsule/tablet (15.8%) and injectable Ceftriaxone (10.9%). Around one in three (35%) health facilities had doxycycline and less than one in five facilities had azithromycin (19.2%). Only, three percent of health facilities had penicillin injection. Further, nearly two fifth of these facilities have a staff trained in HIV testing and counseling (38.8%) and guidelines on HIV counselling and testing (34.1%). Almost all facilities (96%) with an HTC service had visual and auditory privacy equipment, 80.8% had HIV test kits available and 61.2% had condoms on the day of the assessment (Table 3).

Table 3: Indicators of readiness to provide STI and HIV testing and counselling service

Indicators	Total n (%) of facilities in which indicator is available
STI services (n=710)	
Staff and guidelines	
Guidelines for diagnosis and treatment of STIs	58 (8.1)
Staff trained in STI diagnosis and treatment	59 (8.4)
Diagnostics	
Syphilis rapid test	113 (15.9)
Medicines and commodities	
Condoms	683 (96.2)
Metronidazole cap/tab	678 (95.5)
Cifixime cap/tab	112 (15.8)
Ceftriaxone injection	77 (10.9)
HIV testing and counselling service (n=57)	
Staff and guidelines	
Guidelines on HIV counselling and testing	19 (34.1)
Staff trained in HIV counselling and testing	22 (38.8)
Equipment	
Visual and auditory privacy	55 (96.3)
Diagnostics	
HIV diagnostic capacity	46 (80.8)
Medicines and commodities	
Condoms	35 (62.1)

Facility Readiness

Facility readiness to provide STI and HTC services

The readiness score of the three domains and the overall index of facility readiness to provide STI service is presented in Figure 1. The mean readiness score of STI services was 26.2%. However, 106 (14.9%) of all health facilities had overall percentage readiness scores of 50% or above, which were defined as ready to provide STI services. Figure 1 further presents the readiness score of the four domains and the overall index of health facility readiness to deliver HTC service. The mean readiness score of HTC services was 68.9%. In contrary to STI service readiness, 49 health facilities (85.9%) had overall percentage readiness scores of 50% or more, and were considered ready to provide HTC services. The overall readiness score was found to differ significantly according to the managing authority (private vs public) for both HTC and STI service readiness index. Public sector facilities appeared to be less prepared to deliver STI services compared to private facilities. Interestingly, this was different for HTC services; the public health facilities outscored private health facilities (Figure 2).

Factors associated with readiness to provide STI and HTC services

In the bivariate and multivariate analysis; readiness of facilities to provide STI services was lower at private and peripheral facilities compared to governmental hospitals. Interestingly, health facilities where external supervision occurred in the last four months had better service readiness of STI services compared to those facilities with no external supervision occurred (3.7% points better than those not occurred). While running the model with all proposed covariates, the estimation routine omits a managing authority, it does so, because of a dependency among other covariates in the model (Table 4).

Regarding the multivariate results of HTC services, service readiness was lower at private hospitals (32.9% points poorer than government hospitals) and higher at standalone HTC (8.0% points better than government hospitals). Unlike STI services, the readiness of facilities to provide HTC services was higher at facilities which performed quality assurance (4.8% points better than those not performed) (Table 4).

Table 4 Results of unadjusted and adjusted multiple regression models of factors associated with readiness to provide basic emergency obstetric and newborn care services

Variable	STI service				HIV testing and counselling service			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coefficient	SE	Coefficient †	SE	Coefficient	SE	Coefficient †	SE
Facility type								
Government hospitals	ref.		ref.		ref.		ref.	

Variable	STI service				HIV testing and counselling service			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coefficient	SE	Coefficient †	SE	Coefficient	SE	Coefficient †	SE
Private hospitals	-8.6*	2.7	-9.0**	2.7	-35.5***	3.3	-32.9***	4.1
Peripheral facilities	-38.1**	1.6	-37.2***	1.7	-4.3	3.7	-4.7	3.3
Standalone HTC	-0.8	5.2	-2.0	5.2	8.4*	3.2	8.0*	3.4
Location of facilities								
Rural	ref.		ref.		ref.		ref.	
Urban	8.9***	1.1	0.1	0.9	-8.3**	3.1	-6.7	4.9
Ecological region								
Mountain	ref.		ref.		ref.		ref.	
Hill	1.4	1.2	-0.5	1.3	-1.4	5.4	9.4	5.2
Terai	5.7	1.4	3.3	1.7	-7.5	5.0	--0.8	5.8
Province								
Province 1	ref.		ref.		ref.		ref.	
Province 2	0.6	1.8	-1.5	1.9	-14.4**	5.4	3.5	4.7
Province 3	4.7*	1.6	2.1	1.3	-16.5***	4.1	-6.6	4.0
Province 4	0.9	2.1	1.6	1.5	-6.1	9.3	-4.9	4.8
Province 5	1.9	1.7	0.7	1.4	1.5	3.8	2.8	3.6
Province 6	-1.1	2.1	1.1	1.9	-5.6	7.5	-10.0	6.6
Province 7	1.6	1.6	2.4	1.5	1.1	6.1	1.0	4.6
External supervision in the facility in last 4 months								
Not occurred	ref.		ref.		ref.		ref.	
Occurred	4.3**	1.2	3.7***	0.9	12.0*	4.9	4.8	3.3
Monthly management meeting conducted								
Never	ref.		ref.		ref.		ref.	
Sometimes	3.8	2.2	0.1*	1.5	0.35	7.3	--2.1	5.6
Regular	3.3*	1.4	-0.4	1.2	-6.3	5.2	-1.0	4.9
Client opinion								
Not reviewed	ref.		ref.		ref.		ref.	
Reviewed	16.7***	2.8	1.9	1.9	-4.7	5.0	1.2	2.8
Quality assurance								
Not performed	ref.		ref.		ref.		ref.	
Performed	1.0	1.6	-0.7	1.2	13.2**	3.8	4.8*	2.8

*p<0.05, **p<0.01, ***p<0.001, †Adjusted coefficient: each variable in the model has been adjusted by all other variables.

Discussion

Nepal is committed to the global STI strategy to rapidly reduce new sexual infections by 2022. Further, Nepal is aiming to achieve the ambitious target of 90-90-90 by 2020 and ending the epidemic by 2030, thus, it is imperative to understand the country's capacity to deliver high quality HIV and STI services and to track service provision to realize the targets. There is difference between the proportion of the facilities that provides STI services and HTC services. Most notably, nearly all sites providing HTC services were located in the urban regions. This might be due to the reason that STI services is integrated with other health programs such as maternal and neonatal health program which has wide coverage and provided through all health facilities whereas HTC service is focused to key populations.

Health service delivery without guaranteeing a minimum level of quality is unethical and waste of resources.²² Service readiness is a prerequisite to the delivery of quality health care. In Nepal, the investigators reported the overall service readiness to be 68% which is in concurrence to the HIV service readiness, however, STI service readiness appears to be quite low compared to overall service readiness.²³ This finding and the similar deficits identified in a study of contraceptive and other general health services and overall service readiness raises concern about the general readiness of the health facilities in Nepal.^{23,24} We found that the health facilities lacked relevant guidelines, staff training, diagnostic equipment's and medicine to provide STI and HTC services. Aryal et. al²⁵ reports the similar gap in health facilities' readiness to provide other health services such as maternal, newborn, family planning services. Of particular concern is the low readiness of health facilities for STI services. Despite a large proportion (76%) of health facilities designated to provide STI services, these facilities were mainly lacking in medicines, diagnosis or operating guidelines, thus, resulting in poor readiness. The current prevalence of STI is around 0.2% in the general population with the prevalence being markedly high among key populations.⁸ The cases of STIs are increasing every year with more than 140,000 cases each year.²⁶ Despite, the national strategy to integrate STI services with HIV and ANC services, the lower readiness of facilities to deliver STI services compared to HIV or ANC services indicates that the STI services have-not been fully integrated with these services.²⁷

In agreement with Acharya, et.al,²³ our study reported that the facilities with external supervision performed better than those without regular supervision and monitoring in improving service readiness.¹¹ Regular supervision facilitates the management process and improves effectiveness of an organization.²⁸ Such supervision allows information sharing and performance review and is pivotal to improving quality of health services, which might explain better performance among those receiving regular supervision.²⁹ In Nepal, such supervision was found to be effective in improving the availability of guidelines or even managing drug stock-outs. Standardized training, certification and ongoing supervision are identified as the crucial element in ensuring the quality at the point-of-care testing.³⁰ Factors such as non-adherence to testing procedures, high workload, and inadequate supervision were identified as the major factors impeding the delivery of quality HIV testing services in Zambia.³¹ Under the federal management, the management of the peripheral health facilities and the provision of basic health services have been transferred to the local government.³² Thus, this paper accentuates the role of the local government in regular monitoring while, improving the procurement and supply system to scale-up HIV readiness and service provision.

Service readiness varied by the type of ownership and level of facilities. The peripheral health facilities were reported to have inadequate diagnostic facilities and low availability of essential drugs consistent with the findings from a multi-country analysis for seven low- and middle-income countries.³³ Most people in rural areas rely on these peripheral health facilities, thus, poor readiness of peripheral health facilities hinders access of such services to those living in rural areas. Public health facilities appeared to perform lower than the private health facilities, albeit, not all private health hospitals fulfilled the criteria for basic amenities, diagnostic capacity and essential medications. Inadequate supply of basic amenities, diagnostic services and medicines in peripheral health facilities and public facilities can exacerbate the growing inequity in health services. Interestingly, HIV counselling and testing services appeared to be better in the public than private sector unlike, maternal and child health services.³⁴ On further disaggregation, stand-alone health facilities appear to perform better than private hospitals and public facilities. Often, these standalone sites are run through external partners, offer dedicated HIV services and are target driven with instituted close monitoring systems which might explain the better performance and readiness of these stand-alone facilities.

In Nepal, anti-retroviral therapy is provided mainly through public health facilities. Moreover, HTC services including anti-retroviral therapy are provided free of charge through these public health facilities thus, HIV related services often are not the service choice for many for-profit private health facilities, which could have potentially enhanced the performance of the public health sites compared to the private sector.²⁶

Though the National HIV Testing and Treatment Guideline 2017 outlines that all health facilities irrespective of ownership (public vs private) should strictly adhere to the standard guidelines and provide HIV counselling and testing services, not all private hospitals were found to be reporting under Integrated Health Managements Information System (IHMS) and thus, the service standard and services provided through private sector remains underreported.²⁶ In an assessment of the safer abortion services readiness, the private sector was found to be low performing, although around half of the safer abortion services are being delivered through private sector.³⁵

Stock-out of essential drugs has been a perennial problem in most of the low- and middle-income countries.³⁶ The overall availability of essential medicines ranged from 29·4% to 54·4% in many low- and middle-income countries.³⁷ Availability and quality of the services determine the selection and uptake of STI and HIV services.³⁸ To improve accuracy of HIV testing, paraprofessionals should receive more standardized HIV rapid testing training and regular supervision. Among the factors affecting the quality of HIV testing, non-adherence to testing procedures, inadequate training and supervision deter the quality of health services.³⁸ Less than 10% of STI service sites and only one third of HIV service sites had operational guidelines which are taken as a proxy indicator for adherence to testing procedures. These persistent deficits and poor readiness of service sites contradicts with the spirit of the Nepal Health Sector Strategy Implementation Plan (2015-20) in ensuring the minimum standard of services.

Strength and Limitation

This is the first study that analyzed the nationally representative data and assessed the availability and facility level readiness to provide STI and HTC service in Nepal. The study has

some limitations. We analyzed the data from the survey conducted five years earlier therefore the data may not reflect recent developments after the federalized health system in Nepal. However, this is the latest data available on the health facility readiness. A further analysis would be a pooled analysis of the closely timed surveys among households and facilities to explore the association between service readiness and uptake of these services. Further, it should be noted that changes over time in the policy alignments of major supporters with respect to STI/HIV programming may have inclined the levels of readiness observable for the later NHFS surveys.

Conclusion

Conclusively, health facility readiness to deliver services is critical for reaching the SDG target. The mean readiness score of the STI service was 26.2 and that of HTC service was 68.9. Service readiness was higher among the government hospitals and facilities with external supervision. Likewise, HTC service readiness was higher at standalone HTC and facilities that performed quality assurance. There are persistent gaps in delivering services for HIV and STI, thus, compromising the standard of care delivered through these sites. Future strategies should be focused on enhancing service readiness through the provision of adequate supplies, ensuring the guidelines are followed and enhancing diagnostic capacities. Local government has a critical role in ensuring the quality and availability of these services. A comparative analysis can be undertaken after the data from the subsequent survey becomes available.

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Contributors

KA conceptualized and designed the study, performed statistical analysis and wrote them. RT, NB and KB conducted the literature review, involved in the writing the manuscript, edited and revised the manuscript. BS supervised, provided advice and edited the manuscript. All authors read and approved the final manuscript.

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Competing interests None declared.

Patient consent for publication Not required.

Data sharing statement

The datasets generated during the current study are available from within the Demographic and Health Survey Program repository: <http://dhsprogram.com/data/available-datasets.cfm>.

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Figure 1 Percentage score of the four domains of readiness to provide STI and HIV testing and counselling service

Figure 2 Overall readiness score for STI and HIV testing and counselling service according to the managing authority

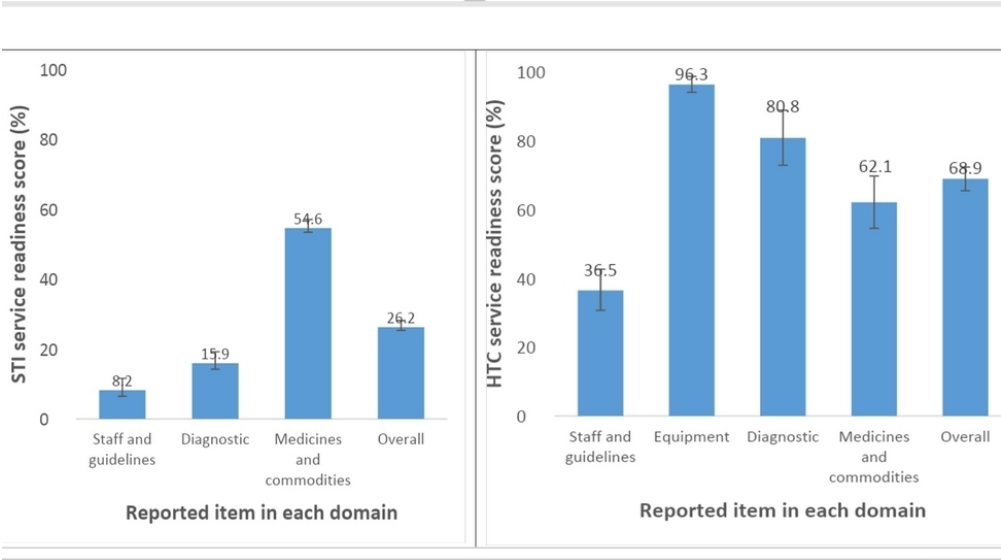


Figure 1 Percentage score of the four domains of readiness to provide STI and HIV testing and counselling service

342x192mm (72 x 72 DPI)

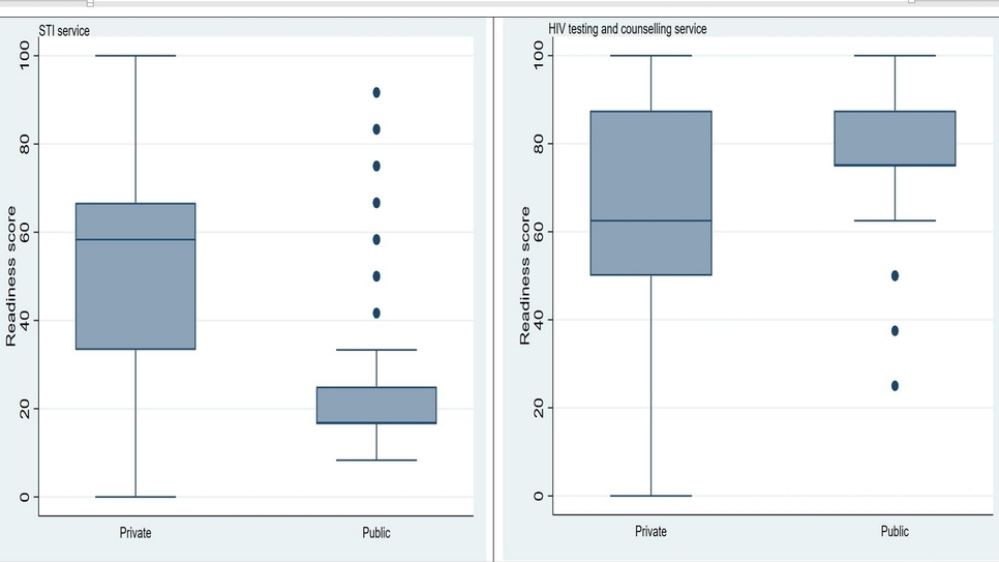


Figure 2 Overall readiness score for STI and HIV testing and counselling service according to the managing authority

341x191mm (72 x 72 DPI)

Availability and readiness to provide sexually transmitted infections and HIV testing and counselling services in Nepal: evidence from comprehensive health facility survey

Supplementary table 1 Description of each domain of the STI and HTC services

Domain	Indicators	Questions Asked
STI Service		
Staff and guidelines	Guidelines for diagnosis and treatment of STIs	Do you have the national guidelines on case management of sexually transmitted infections available in this service area? If YES, may I see the national guidelines? (Observed/Not observed) -Observed is considered for the analysis
	Staff trained in STI diagnosis and treatment	In your current position, and as part of your work for this facility, do you personally provide any STI services? If YES: Have you received any in-service training, training updates or refresher training on topics related to STI services? If YES, have you received any in-service training, training updates or refresher training in Diagnosing and treating sexually transmitted infections (STIs)? IF YES: Was the training, training update or refresher training within the past 24 months or more than 24 months ago? - At least one staff member providing the service trained in in last 24 months is considered for the study.
Diagnostics	Syphilis rapid test	Do you use syphilis rapid diagnostic test to diagnose syphilis at this service site? If YES, May I see a sample syphilis rapid diagnostic test (RDT) kit? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
Medicines and commodities	Condoms	Is Condoms available in the facility/ service area today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Metronidazole cap/tab	Is Metronidazole cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Ciprofloxacin cap/tab (not found in 2015 NHFS), cefixime cap/tab is used instead	Is Cefixime cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
	Ceftriaxone injection	Is Cefixime cap/tab available in the facility/ location today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis
STI Service		
Staff and guidelines	Guidelines for HIV counselling and testing	Do you have the national HIV testing and counseling guidelines available in this service area? If YES, may I see the guidelines? (Observed/Not observed) -Observed is considered for the analysis
	Staff trained in HIV counselling and testing	In your current position, and as part of your work for this facility, do you personally provide any HTC services? If YES: Have you received any in-service training, training updates or refresher training on topics related to HTC services? If YES, have you received any in-service training, training updates or refresher training in HIV testing and counselling? IF YES: Was the training, training update or refresher training within the past 24 months or more than 24 months ago? - At least one staff member providing the service trained in in last 24 months is considered for the study.
Equipment	Visual and auditory privacy	Describe the setting if the room or area (Enumerators should assess the room) Whether its

		Private room/Other room with auditory and visual privacy/Visual privacy only/ No privacy) -Room with visual and auditory privacy is considered for the analysis
Diagnostics	HIV diagnostic capacity	Whether the facilities conducting HIV testing at the facility had at least one unexpired Determine, at least one unexpired Uni-Gold, and at least one unexpired Stat Pak HIV rapid diagnostic test kit available somewhere in the facility on the day of the survey, or else facility had ELISA testing capacity or other HIV testing capacity observed in the facility on the day of the survey. -Observed at least one valid expiration of all the mentioned tests are considered for the analysis
Medicines and commodities	Condoms	Is Condoms available in the facility/ service area today? (observed, at least 1 valid/ Observed not valid/ Reported available, not seen / None available today). Observed, at least 1 valid expiration date is considered for the analysis

Supplementary table 2 Summary of measurement procedure of STI and HTC readiness score

Domain	indicators	Measurement	Percent score (%)	
			Indicator	Domain
STI service readiness index				
Staff and guidelines	Guidelines for diagnosis and treatment of STIs	Yes	16.66	33.33
		No	0.00	
	At least one staff trained in STI	Yes	16.66	
		No	0.00	
Diagnostics	Syphilis rapid test	Yes	33.33	33.33
		No	0.00	
Medicines and commodities	Condoms	Yes	8.33	33.33
		No	0.00	
	Metronidazole cap/tab	Yes	8.33	
		No	0.00	
	Cefixime	Yes	8.33	
		No	0.00	
	Ceftriaxone	Yes	8.33	
		No	0.00	
Total STI readiness index score				100.00
HTC service readiness index				
Staff and guidelines	Guidelines for HTC	Yes	12.50	25.00
		No	0.00	
	At least one staff trained in HTC	Yes	12.50	
		No	0.00	
Equipment	Visual and auditory privacy	Yes	25.00	25.00
		No	0.00	
Diagnostics	HIV diagnostic capacity	Yes	25.00	25.00
		No	0.00	
Supplies and commodities	condoms	Yes	25.00	25.00

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		No	0.00	
Total HTC readiness index score				100.00

For peer review only

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Page 1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 2
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 3
Methods			
Study design	4	Present key elements of study design early in the paper	Page 3-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 3
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	Page 4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 4
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 3-4
Bias	9	Describe any efforts to address potential sources of bias	Page 5
Study size	10	Explain how the study size was arrived at	Page 3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 4-5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Page 5
		(b) Describe any methods used to examine subgroups and interactions	Page 5
		(c) Explain how missing data were addressed	N/A
		(d) If applicable, describe analytical methods taking account of sampling strategy	Page 5
		(e) Describe any sensitivity analyses	N/A
Results			

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Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Table 2
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 2
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	Page 6-9
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 4
		(b) Report category boundaries when continuous variables were categorized	Table 2, 3
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 12-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 13-14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page 12-13
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.