Original article

MORBIDITY AND MORTALITY RELATED TO COVID-19 AMONG HIV INFECTED INDIVIDUALS IN SELECTED ART SITES OF KATHMANDU VALLEY

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ABSTRACT

Background: HIV control programme is one of the priority program of the government of Nepal. COVID-19 pandemic caused major disruptions in the implementation of health services and; diverting most of the resources and efforts to contain the COVID-19 pandemic. It also fuelled the underachievement of activities of health programmes, including achievement of national HIV programme. The objectives of this study was to determine the morbidity and mortality of COVID-19 among people living with HIV (PLHIV) in selected antiretroviral therapy (ART) sites of Kathmandu valley.

Methodology: A cross-sectional survey was conducted in 7 selected ART sites of Kathmandu valley using mixed methods for data collection. The sample size for the study was 388 PLHIV who were tested for COVID-19. Further, ART focal persons of the sites and key informants were interviewed on response activities of the national HIV programme during pandemics.

Results: Prevalence of COVID-19 among PLHIV was 12.1% and case fatality rate was 4.2%. 7.5% participants had to cancel ART appointment due to lockdown whereas 4.4% had faced the shortage of diagnostics and drugs for treatment. Majority of PLHIV (86.6%) had received multiple months dispensing of ART drugs during pandemics. PLHIV received treatment services easily whereas trainings, meetings and prevention related activities were hampered due to restriction in movement and gathering.

Conclusion: It is important to focus on prevention of spread of COVID-19 among PLHIV. Uninterrupted access to ART and preventive services should be provided to PLHIV in a time of such pandemic.

Key words: Morbidity, mortality, COVID-19, people living with HIV, ART sites, Kathmandu

INTRODUCTION

Coronavirus disease 2019 (COVID-19) had impacted health care services for both providers and clients. The fragile health system and limited resources of low and middle income countries are the challenges to cope the outbreak and to mitigate its consequences.[1] HIV is a chronic disease which requires frequent consultations to clinicians and frequent visits for receiving drugs for anti-retroviral therapy (ART). Although HIV is a priority program of government of Nepal led by National Center for AIDS and STD Control (NCASC), under Ministry of Health and Population, diverting most of the resources and efforts to contain the COVID-19 pandemic fueled the underachievement of activities of national HIV programmes.[2]

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People living with HIV (PLHIV) are immunosuppressed and prone to several infections including SARS-CoV-2. A similar clinical and epidemiological profile of COVID-19 among PLHIV with other group of people has been reported from India.[3, 4] There was high acceptance of multi-month dispensing (MMD) and community-based services support provided by health workers during the pandemics.[5] Supply of essential medicine, maternity services and immunization were found to be the most affected areas of health care delivery during the lockdown in Nepal.[6,7]HIV control programme could be badly impacted during COVID-19 pandemic and lock down. There could be morbid cases of COVID-19 among HIV infected individuals. Since, HIV infected are immune compromised, COVID-19 infection could be fatal among those individuals. PLHIV with low CD4 count and not on anti-retroviral therapy (ART) have the greatest risk of contracting severe symptoms of COVID-19 which may lead to death among this group.

Study of cohorts of PLHIV from nine European countries revealed that 8% had documented SARS-CoV-2 infection.[8] There is no information available on morbidity and mortality of COVID-19 among HIV infected individuals from Nepal. If such information is available that could be useful for preventing morbidity and mortality among immune compromised patients from pandemic diseases. There is the need to identify the impact of COVID-19 to mitigate the gaps created so as to achieve the set target. The analysis of impact of COVID-19 pandemic on health of the HIV infected people, impact in providing and receiving public health services and medical services due to lock down and travel restrictions imposed by the government would provide better picture to develop strategies to the probable next outbreak or pandemic of similar nature in the future. Therefore, this study was conducted to determine the morbidity and mortality of HIV infected individuals due to COVID-19 in selected ART sites of Kathmandu valley and assess the impact of COVID-19 in receiving care services by PLHIV.

METHODOLOGY

Study design

This was a cross-sectional survey conducted among PLHIV, ART focal persons and key informants. Mixed method study including qualitative and quantitative approaches was used for data collection.

Settings

The study was conducted in selected seven ART sites of Kathmandu valley. The site specific sample size has been given in table 1. Some of the sites had no PLHIV meeting the inclusion criteria (i.e. those who had tested for COVID-19), therefore the desired number of samples from that site was not obtained. All PLHIV registered at seven ART sites in Kathmandu valley were included for mortality and morbidity determination due to COVID-19.

Table 1: ART sites specific sample distribution

S.N.	Name of ART sites	District	Number of PHIV receiving ART (Male)	Number of PLHIV receiving ART (Female)	Total Number of PLHIV receiving ART	Actual sample size taken
1	Sukra Raj Tropical and Infectious Disease Hospital (Teku) ART Site	Kathmandu	1123	870	1993	214
2	Bir Hospital ART Site	Kathmandu	306	184	490	87
3	Sparsa Nepal ART Site	Lalitpur	276	119	395	66
4	Bhaktapur District Hospital AR T Site	Bhaktapur	54	23	77	9
5	Maiti Nepal ART Site	Kathmandu	10	35	45	5
6	Paropakar Maternity Hospital ART Site	Kathmandu	61	67	128	7
7	Kanti Children's Hospital ART Site	Kathmandu	18	9	27	0
	Total		1848	1307	3155	388

Note: When adequate number of sample was not captured from the particular ART site as stated, next ART site was considered to fulfill the sample target (as of June 01, 2021)

PLHIV, who were registered in respective ART sites and taking ART and who had tested for COVID-19 were the study population. Further, key informant interview (KII) was conducted with program managers including director and medical officer of NCASC. ART focal persons of ART sites were interviewed to assess the functionalities of the control programme and care services during COVID-19 pandemic.

Using the estimated 50% prevalence (as prevalence of COVID-19 positive cases was unknown for PLHIV in Nepal) and 5% margin of error, the required sample size was 385. We collected data from 388 PLHIV. 388 PLHIV who had tested for COVID-19 by RT-PCR/Antigen/Antibody test were included in the study.

Operational definitions

Morbidity: For this study, morbidity has been defined as the prevalence of COVID-19 among PLHIV, duration of illness due to COVID-19 and severity of illness (hospitalization, oxygen requirement in hospital, ICU admission and requirement of ventilators).

Health outcomes: It includes appearance of symptoms after COVID-19 test result, mortality, and severity of illness.

Multiple months dispensing: According to national guideline, multiple doses of ART is provided for one month to PLHIV. In our study, we considered more than one month dispensing as multiple months dispensing of ART.

Key variables

We collected data on COVID-19 positivity among PLHIV, duration of illness, severity of illness, mortality due to COVID-19, public health services to PLHIV during COVID-19.

Data collection

Data was collected in collaboration with NCASC and ART centers within the Kathmandu valley. The study included COVID-19 tested cases among PLHIV since the report of first case of COVID-19 in Nepal i.e. 23 January, 2020 to the date of data collection.

Interview of PLHIV on morbidity and impact of COVID-19

All of the PLHIV receiving ART from the selected sites were approached for collection of data on COVID-19 mortality and morbidity. PLHIV were approached at ART centers during the day of their visit. Participants who cannot be contacted at ART centers were contacted through telephone. The contact telephone numbers were obtained from ART register. They were asked about their COVID-19 test status and the results of the test. Those tested with RT-PCR/Antigen/Antibody test and found as COVID-19 positive were included in calculation of morbidity. All 388 COVID-19 tested PLHIV during the time of data collection from seven ART centers of Kathmandu valley were interviewed to assess the impact of COVID-19.

Determination of COVID-19 mortality among PLHIV

COVID-19 mortality data were collected from peer contact, ART service provider, COVID-19 treating clinicians' tracking record. These data were confirmed through death audit or verbal autopsy with immediate family members.

Interview of service providers

Key informant interview of director of NCASC was conducted to collect data on the impact of COVID-19 in providing services as well as the mitigation measures taken. In addition, interview of in-charge of all 7 ART sites was conducted to collect data on HIV diagnosis, treatment, response and reporting status during COVID-19 pandemic and supply chain management.

Validity of the collected data

The data on COVID-19 test, positivity status and deaths were recorded in the ART sites. The PLHIV identified through records were interviewed and further confirmed regarding COVID-19 test and the results. Death data were verified through verbal autopsy. The questionnaire was validated through face and content validity.

Data management and analysis

After the completion of data collection, it was reviewed, organized, coded, entered and analysed by using the SPSS version 25 and MS Excel 13. Descriptive and inferential analysis was done. The finding was presented using tables and figures. Data was summarized as counts and percentages.

RESULTS

Prevalence of COVID-19 among PLHIV

Among 388 surveyed PLHIV tested for COVID-19 by PCR or antigen test, 47 (12.1%) were positive for COVID-19. As recorded in ART sites, the prevalence of COVID-19 among PLHIV was 1.6% (71/4367). 3 cases of PLHIV died due to COVID-19 as recorded in ART sites and verified by verbal autopsy. The case fatality rate of COVID-19 among PLHIV was 4.2% (Table 2).

Table 2: Prevalence of COVID-19 among PLHIV visiting ART centers of Kathmandu valley

Particulars	Value	Percent
Proportion of COVID-19 among surveyed HIV infected individuals	47/388*100	12.1
Prevalence of COVID-19 among HIV infected individuals as recorded in ART sites	71/4367*100	1.6
Percentage of deaths among PLHIV due to COVID-19	3/4367*100	0.068
Case fatality rate of COVID-19 among PLHIV	3/71*100	4.2

Background characteristics of COVID-19 infected PLHIV

It was found that PLHIV aged higher than 26 years had slightly high prevalence of COVID-19 status; however, no significant relationship was found between age group and COVID-19 positivity.

Around 16.6% female and 8.9% male PLHIV had COVID-19. There was significant association between gender and COVID-19 positive population. Most of the participants (89.9%) were within the Kathmandu valley and 10.1% were from outside the valley.

The prevalence of COVID-19 was high among students (27.3%) followed by housewife (25.0%), service providers (14.0%). There was significant association between occupation and COVID-19 positive population. Unemployed participants had slightly higher COVID-19 prevalence (16.7%) than among employed (10.8%). There was no significant association between employment status and COVID-19 positive population (Table 3). Among the employed participants, maximum (39.2%) had income range from NRs.15001 to 25000.

Table 3: COVID-19 status among PLHIV based on background characteristics

Variables	Positive (n=47)		Negative (n= 341)		Total (n=388)	
	(N)	(%)	(N)	(%)	(N)	(%)
Age group (years)						
≤ 25	3	7.5	37	92.5	40	100.0
26-35 years	11	13.9	68	86.1	79	100.0
36-45 years	20	13.2	132	86.8	152	100.0
46-55 years	11	13.1	73	86.9	84	100.0
More than 55 years	2	11.1	16	88.9	18	100.0
No response	0	0.0	15	100.0	15	100.0
Gender						
Male	20	8.9	204	91.1	224	100.0
Female	27	16.6	136	83.4	163	100.0
Third Gender	0	0.0	1	100.0	1	100.0
Residence						

Variables	Positive (n=47)		Negative (n= 341)		Total (n=388)	
	(N)	(%)	(N)	(%)	(N)	(%)
Inside Kathmandu valley	47	13.5	302	86.5	349	100.0
Outside Kathmandu valley	0	0.0	39	100.0	39	100.0
Marital status						
Married	35	12.3	250	87.7	285	100.0
Unmarried	7	11.1	56	88.9	63	100.0
Separated	1	6.3	15	93.8	16	100.0
Single/widowed	3	13.6	19	86.4	22	100.0
Other (living together)	1	100.0	0	0.0	1	100.0
No response	0	0.00	1	100.0	1	100.0
Education						
Illiterate	4	8.9	41	91.1	45	100.0
Primary (1-5)	14	17.9	64	82.1	78	100.0
Lower Secondary (6-8)	11	14.3	66	85.7	77	100.0
Secondary (9-10)	7	7.7	84	92.3	91	100.0
Higher Secondary (11-12)	6	9.1	60	90.9	66	100.0
Bachelors and above	3	16.7	15	83.3	18	100.0
No response	2	15.4	11	84.6	13	100.0
Occupation						
None	5	8.8	52	91.2	57	100.0
Service (private/government)	19	14.0	117	86.0	136	100.0
Business	5	9.1	50	90.9	55	100.0
Housewife	10	25.0	30	75.0	40	100.0
Agriculture	0	0.0	10	100.0	10	100.0
Daily wage/labor	2	5.1	37	94.9	39	100.0
Student	3	27.3	8	72.7	11	100.0
No response	3	7.5	37	92.5	40	100.0
Employment status						
Employed	26	10.8	214	89.2	240	100.0
Unemployed	18	16.7	90	83.3	108	100.0
No response	3	7.5	37	92.5	37	100.0

COVID-19 related information on PLHIV receiving ART

Out of 388 PLHIV, 47 (12.1%) had positive COVID-19 test results. Out of 47 individuals who had positive COVID-19 results, 34 (72.3%) experienced any type of symptoms of COVID-19 whereas 13 (27.7%) did not experience any symptoms. Most of the symptoms experienced by the COVID-19 positive participants were common cold/cough, fever, body pain, chest pain, and headache. Maximum respondents (36, 76.6%) mentioned that they had treatment at home, whereas 8 (17.0%) were treated at hospitals (Table 4).

Table 4: COVID-19 related information on PLHIV receiving ART

Particulars	**Number (N=388)**	**Per cent**
Result of COVID-19 test		
Positive	47	12.1%
Negative	341	87.9%
Symptoms related to COVID-19		
Yes	34	72.3%
No	13	27.7%
Symptoms (Multiple response)		
Common cold / cough	17	22.4%
Fever	22	28.9%
Body pain	14	18.4%
Chest pain	5	6.6%
Headache	5	6.6%
Tasteless	4	5.3%
Breathlessness	4	5.3%
No smell	2	2.6%
Diarrhea	3	3.9%
Place of treatment for COVID-19		
Home	36	76.6%
Hospital	8	17.0%
Pharmacy	2	4.3%
Other	1	2.1%
If in hospital, treated in OPD		
Yes	4	50.0%
No	4	50.0%
If in hospital, require oxygen		
Yes	5	62.5%
No	3	37.5%
If in hospital, admitted in ICU		
Yes	3	37.5%
No	5	62.5%
If in hospital, require ventilator		
Yes	0	0.0
No	8	100.0%
After being COVID-19 positive, days to obtain negative result (in days)		

Particulars	Number (N=388)	Per cent
Min-Max	7-60	-
Median	13 days	-
Time it took to experience feeling ill (in days)		
Min-Max	1-14	-
Median	3 days	-
Time it took to visit the doctor/health professional (In days)		
Min-Max	1-30	-
Median	2 days	-
Time it took to get diagnosed and treatment (in days)		
Min-Max	1-22	-
Median	2 days	-
Person treated COVID-19		
Doctor	17	36.2
Health workers	4	8.5
Pharmacy	7	14.9
Self	9	19.1
No response	10	21.3

The COVID-19 infected PLHIV received treatment services within 2 days of diagnosis. They contacted hospital/doctor after 3 days of feeling ill. In average, the COVID-19 infected individual recovered in 13 days.

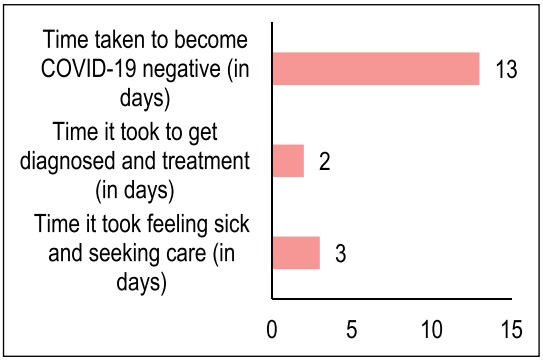

Figure 1: Median days taken for seeking care for COVID-19 positive PLHIV

ART and prevention services at the time of COVID-19

Twenty nine (7.5%) participants had to cancel their ART appointment due to lockdowns. The main reasons for cancelation of appointment were: the hospitals and clinics were closed and doctors and health professionals were unavailable. 17 (4.4%) respondents faced shortage of drugs for HIV/AIDS treatment whereas 2 (0.5%) had partially experienced this problem. 336 (86.6%) had received multiple months dispensing of ART. 26 (6.7%) of the participants had interrupted ART treatment. About 52% of the PLHIV said that health workers visited their house to provide ART drugs (Figure 2). ART focal persons in interview mentioned that the ART sites provided medicines to clients for 2 months at one visit or according to clients' necessity. Programme manager at NCASC mentioned that problems were encountered in HIV/AIDS campaigning and awareness programs, field movement, and counseling. Many important programs like trainings, meetings, prevention related activities were hampered due to restriction in movement and gathering.

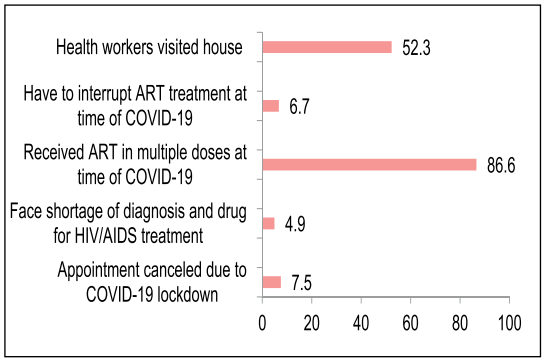

Figure 2: ART services at the time of COVID-19

Multivariate analysis was carried out for the selected independent variables with dependent variable (COVID-19 positive). Compared to ≤

25 years age group, it was found that other age group had comparatively higher COVID-19 positive cases; however, no significant association was observed. Compared to the male, the odds of having COVID-19 positive among female was 1.43 (95% CI: 0.62-3.28); however, it was not statistically significant. Those who were employed had 1.61 odds of not getting COVID-19 as compared to unemployed. Education level was not found as a significant factor for the occurrence of the COVID-19 (Table 5).

Table 5: Bivariate and multivariate analysis of COVID-19 positive participants with background characteristics of the respondents

Variables	Crude OR	Adjusted OR
	OR (CI)	OR (CI)
Age group (years)		
≤ 25	1.00	1.00
26-35 years	1.96 (0.52-7.60)	1.15 (0.21-6.49)
36-45 years	1.87 (0.53-6.64)	1.08 (0.19-6.37)
46-55 years	1.86 (0.49-7.07)	1.11 (0.17-7.28)
More than 55 years	1.54 (0.24-10.13)	1.52 (0.14-16.47)
Gender		
Male	1.00	1.00
Female	2.03* (1.09-3.76)	1.43 (0.62-3.28)
Marital status		
Married	1.00	1.00
Unmarried	1.12 (0.47-2.56)	0.61 (0.18-2.10)
Separated/Single/Other	1.18 (0.35-4.00)	0.43 (0.08-2.44)
Education		
Illiterate	1.00	1.00
Primary (1-5)	2.24 (0.69-7.26)	1.66 (0.40-6.98)
Lower Secondary (6-8)	1.71 (0.51-5.72)	1.81 (0.40-8.08)
Secondary (9-10)	0.85 (0.26-3.08)	0.73 (0.15-3.57)
Higher Secondary (11-12) and above	1.23 (0.36-4.24)	1.23 (0.25-6.02)
Employment status		
Employed	0.61 (0.32-1.16)	0.63 (0.28-1.41)
Unemployed	1.00	1.00
Received multiple doses of ART		
No	1.00	1.00
Yes	0.57 (0.26-1.26)	0.31* (0.10-0.92)
House visit ART		
No	1.00	1.00
Yes	4.21*** (1.97-8.99)	5.70***(2.25-14.47)
ART initiation time (in years ago)		
Within 2 years	1.00	1.00
2-5 years ago	4.45* (1.19-16.59)	4.88* (1.22-19.59)
6-10 years ago	4.72* (1.32-16.89)	4.01* (1.01-15.86)
More than 10 years ago	5.25* (1.46-18.80)	3.88 (0.95-15.74)

*Abbreviations: OR- Odds Ratio, CI- Confidence Interval * P<0.05, **P<0.01, ***P<0.001*

Dependent variable: PLHIV having positive COVID-19 status.

No response variables and those categories in the variables having "zero" for the positive cases were not included in the bivariate and multivariate analysis to compute the odds ratio.

Due to auto-correlation (>0.45) between HIV diagnoses (in years ago), ART initiation time (in years ago) and ART started time before/during COVID-19. ART started time before/during COVID-19 was only included in the bivariate and multivariate analysis.

DISCUSSION

This study found that 12% of PLHIV participating in the study had positive COVID-19 test result. According to the records of ART sites, the prevalence rate of COVID-19 among PLHIV was 1.6%. The nationwide prevalence of COVID-19 in Nepal is around 3.3%.[9] This indicates that the burden of COVID-19 among PLHIV is relatively less as compared to the general population as reported by other studies.[10-14] Advanced disease, low CD4 count, chronic conditions associated with HIV are related factors for high morbidity of COVID-19 among PLHIV; however, the beneficial effects of tenefovir and protease inhibitors remain inconclusive.[15]

In our study, death among total PLHIV due to COVID-19 was 0.068% and case fatality rate among COVID-19 infected PLHIV was 4.2%. Although there were only 3 deaths in our study, CFR among PLHIV due to COVID-19 was comparatively higher than the national CFR (1.2%). The study conducted in UK revealed that PLHIV had higher risk of COVID-19 deaths than those without HIV.[16] All three death cases were male which cannot be explained by limited data.

Majority of COVID-19 positive individuals had experienced symptoms. The common symptoms according to retrospective reports of participants were fever, cough, common-cold, body pain, chest pain and headache. Studies conducted in India revealed that a similar clinical and epidemiological profile of COVID-19 among PLHIV.[3,4,12] In our study we have not captured data based on WHO criteria; however, we have information on appearance of symptoms, hospitalizations, oxygen required, ICU admission and ventilator support. The findings of our study showed that slightly higher rates of hospitalization and admission to ICU among COVID-19 positive patients with HIV; however, none of them required ventilator support. A study revealed that 9% of PLHIV with COVID-19 required ICU and 9% of them required ventilator support.[17]

This study found that the mean age of PLHIV was 40±10 years, in contrast, a study reported mean age more than this study.[18] The female participants were also in notable proportion in this study. This study showed insignificant relationship of age of PLHIV and COVID-19 positivity. However, a study showed significant relationship between 50 years or older population and COVID-19.[19] This study revealed that COVID-19 in PLHIV was almost double among females as compared to males in contrast to the other studies.[11, 13, 19, 20, 21]

The reported mean duration of illness by PLHIV with COVID-19 was 13 days, in some cases up to 60 days. The mean duration of illness is similar with general population. A study reported that confirmed COVID-19 cases in PLHIV can shed virus up to 30 days.[12]

ART sites practiced multiple months dispensing of ART to their registered PLHIV. Although, we have not assessed the acceptability of this practice; however, there was high acceptance of multi-month dispensing (MMD) and community-based services support provided by health workers in India.[5] Strong monitoring mechanism should be in place in case of supply of multiple months dispensing of antiretroviral drugs during emergency. This can be done through proper counselling, follow up telephone calls or visit by health workers to ensure compliance.

Response by National Center for AIDS and STD Control (NCASC) was found satisfactory during the COVID-19 pandemic. NCASC was able to supply all HIV commodities to the ART centers during this period. Due to the lack of manpower, lab test and viral load were delayed. Prevention programs were unable to reach key populations.

This study has some limitations. Although all 8 ART sites within Kathmandu valley were originally

planned to be included in the study; however, one of the site could not be included and during the time of study no individuals were tested of COVID-19 in Kanti Children's Hospital ART site. Our study focused only on ART sites, but there could be deaths of PLHIV due to COVID-19 in the community. Some of such deaths might be unreported to ART sites.

CONCLUSION

There was no high burden of COVID-19 among PLHIV; however, CFR due to COVID-19 is found to be higher than that of the general population. Specific measures should be taken in order to continue ART as essential health service in emergency so that immunocompromised PLHIV would be least affected by the pandemics. Measures to ensure continued public health services to the community should be taken using universal prevention measures.

EHTICAL ISSUES

Ethical approval (Regd. No. 462/2021 P) was taken from Nepal Health Research Council. Written consent was obtained from the participants before the interview. The participants were explained of purpose, procedure, right to participate and withdraw, benefits, confidentiality of data, right not to participate and contact information before taking written consent. Consent was voluntary. The participants could withdraw their participation at any time. Three of the participants withdrew their participation in the middle of the interview. All the collected questionnaires/forms were kept confidential.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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REFERENCES

1. Koirala A, Joo YJ, Khatami A, Chiu C, Britton PN. Vaccines for COVID-19: The current state of play. Paediatr. Respir. Rev. 2020; 35: 43–49.

2. National Centre for AIDS and STD Control. Interim guidance for continuing HIV program service delivery during COVID-19 pandemic. Ministry of Health and Population, National Centre for AIDS and STD Control, 2020.

3. Patel P, Amin B, Mehta KG, Gopal R, Raval DA, Kadri AM, et al. Clinical features and outcome of COVID-19 among PLHIV in Gujarat, India: A case series. J Family Med Prim Care. 2021; 10(10): 3925-3929.

4. Pujari S, Gaikwad S, Chitalikar A, Dabhade D, Joshi K, Bele V. Short communication: Coronavirus disease 19 among people living with HIV in Western India: An observational cohort study. AIDS Res Hum Retroviruses 2021; 37(8): 620-623.

5. Pollard R, Gopinath U, Reddy YA, Kumar BR, Mugundu P, Vasudevan CK, et al. HIV service delivery in the time of COVID-19: focus group discussions with key populations in India. J Int AIDS Soc. 2021; 24 (6): e25800.

6. Singh DR, Sunuwar DR, Shah SK, Karki K, Sah LK, Adhikari B, et al. Impact of COVID-19 on health services utilization in Province-2 of Nepal: a qualitative study among community members and stakeholders. BMC Health Serv Res 2021; 21 (1): 174.

7. Khatiwada AP, Maskey S, Shrestha N, Shrestha S, Khanal S, KC B, Paudyal V. Impact of the first phase of COVID-19 pandemic on childhood routine immunisation services in Nepal: a qualitative study on the perspectives of service providers and users. J Pharm Policy Pract. 2020; 14(1): 79.

8. Anonymous. Incidence and severity of SARS-CoV-2 infection in children and young people with HIV in Europe. AIDS. 2023; 37(10): 1633-1639.

9. Ministry of Health and Population. Status of COVID-19 in Nepal, 2022. Available at https://covid19.mohp.gov.np/ (Accessed on February 27, 2022).

10. Del Amo J, Polo R, Moreno S, Díaz A, Martínez E, Arribas JR, Jarrín I, Hernán MA, et al. Incidence and severity of COVID-19 in HIV-positive persons receiving antiretroviral therapy: A cohort study. Ann Intern Med. 2020; 173(7): 536-541.

11. Vizcarra P, Pérez-Elías MJ, Quereda C, Moreno A, Vivancos MJ, Dronda F, et al. Description of COVID-19 in HIV-infected individuals: a single-centre, prospective cohort. Lancet HIV 2020; 7: e554-e564.

12. Huang J, Xie N, Hu X, Yan H, Ding J, Liu P, et al. Epidemiological, virological and serological features of COVID-19 cases in people living with HIV in Wuhan city: a population-based cohort study. Clin Infect Dis 2020: ciaa1186.

13. H€arter G, Spinner CD, Roider J, Bickel M, Krznaric I, Grunwald S, et al. COVID-19 in people living with human immunodeficiency virus: a case series of 33 patients. Infection 2020; 48: 681–686.

14. Park LS, Rentsch CT, Sigel K. COVID-19 in the largest US HIV cohort. In: 23rd International Conference on AIDS, San Francisco, CA, 2020

15. Ssentongo P, Heilbrunn ES, Ssentongo AE, Advani S, Chinchilli VM, Nunez JJ, et al. Epidemiology and outcomes of COVID-19 in HIV-infected individuals: a systematic review and meta-analysis. Sci Rep. 2021; 11(1): 6283.

16. Bhaskaran K, Rentsch CT, MacKenna B, Schultze A, Mehrkar A, Bates CJ, et al. HIV infection and COVID-19 death: a population-based cohort analysis of UK primary care data and linked national death registrations within the Open SAFELY platform. Lancet HIV 2021; 8(1): e24-e32

17. Nagarakanti SR, Okoh AK, Grinberg S, Bishburg E. Clinical outcomes of patients with COVID-19 and HIV coinfection. J Med Virol. 2021; 93(3): 1687-1693.

18. Gervasoni C, Meraviglia P, Riva A, Giacomelli A, Oreni L, Minisci D, et al. Clinical features and outcomes of patients with human immunodeficiency virus with COVID-19. Clin Infect Dis 2020; 71: 2276-2278.

19. Hoffmann C, Casado JL, Härter G, Vizcarra P, Moreno A, Cattaneo D, et al. Immune deficiency is a risk factor for severe COVID-19 in people living with HIV. HIV Med. 2021; 22(5): 372-378.

20. Sigel K, Swartz T, Golden E, Paranjpe I, Somani S, Richter F, et al. Coronavirus 2019 and people living with human immunodeficiency virus: Outcomes for hospitalized patients in New York City. Clin Infect Dis. 2020; 71(11): 2933-2938.

21. Dandachi D, Geiger G, Montgomery MW, Karmen-Tuohy S, Golzy M, Antar AAR, et al. Characteristics, comorbidities, and outcomes in a multicenter registry of patients with HIV and coronavirus disease 2019. Clin Infect Dis. 2021; 73(7):e1964-e1972.