HIV post-exposure prophylaxis: In-take, completion rates and reasons for non-completion among health care workers at a regional referral hospital

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Research Article

Keywords: HIV, post-exposure prophylaxis, PEP intake, completion rates

Posted Date: March 14th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1404297/v1

Abstract

Background: Worldwide, 19.2% of healthcare workers (HCWs) get occupationally exposed to Human immune deficiency virus (HIV) annually, resulting in approximately 1,000 new HIV infections but the use of HIV post-exposure prophylaxis (PEP) is largely undocumented. We aimed at assessing the prevalence of ever taking PEP, completion rates and the self-reported reasons for non-completion among HCWs.

Methods: In a cross-sectional study, we randomly selected and enrolled 206 HCWs from records of HCWs at a large Regional Referral Hospital between March and October 2020, which included medical staff, cleaners and medical students. Participants' socio-demographic, medical, PEP initiation and completion information was obtained using a self-administered questionnaire. Comparison of "ever taking PEP" and completing PEP across gender, health cadre, age, religion and marital status categories of the HCWs was done using Pearson's chi square test in STATA 15.0 software.

Results: Majority of HCWs were aged above 35years (41.8%), female (54.4%) and qualified medical workers (64.6). Overall, 37.4% (95% CI: 30.9 - 44.2) reported to have ever taken PEP, of whom 72.7% (95% CI: 61.5 - 81.7) completed their mandatory 28days of treatment. Reasons for PEP non-completion were: drug side effects (81%), the source patient testing HIV negative (14.3%) and not finding reason to complete the treatment (4.7%).

Conclusion: The prevalence of ever taking PEP is high, indicating a high rate of HCW occupational exposure to HIV. About a third of HCWs, majorly females, married and above 35-year-old do not complete PEP treatment, with the major reason being drug-related side effects. To avoid potential HIV sero-conversion, counselling on adverse events and sensitization of HCWs on good occupational safety and infection control measures, and dangers of PEP non-completion should be emphasized.

Background

Globally, an estimated 38 million people are currently living with HIV of whom 25.7 million are in Africa and 1.5 million in Uganda (1) which has an estimated HIV prevalence of 5.8% in the general population (2, 3). Although there has been a reduction in HIV prevalence in Uganda from 6.2% in 2017 to 5.8% in 2018, 13.5% of households still have at least one HIV-positive member (3) and there is an estimated 53,000 new infections and 23,000 HIV/AIDS related deaths annually (4).

With the high HIV burden in Africa, HCWs are at a particularly high risk of HIV acquisition through occupational exposure (5). Occupational HIV exposure to HCWs may be through percutaneous accidents such as instrument cuts and needle stuck injuries which has been associated with a. HIV transmission probability of 0.3% (6), or mucus membrane exposure such as blood and other body fluid splashes which has been associated with a transmission probability of 0.09% (7) as well as exposure to tissues, and contaminated medical equipment and environmental surfaces. Although HIV transmission through non-intact skin has been documented, its average risk has been estimated to be less than the risk for mucous membrane exposures (8).

HIV Post-exposure prophylaxis (PEP) is preventive treatment with antiretroviral drugs given to persons following exposure to blood and/or other body fluids from HIV infected or suspected infected persons, initiated within the first 72 hours of exposure and taken for 28days (USAID, 2017). If started soon enough after exposure and adhered to, PEP can reduce the risk of HIV infection by over 80%. However, recent evidence from African studies shows poor PEP uptake, with only 52 – 74% of HCWs initiated on PEP completing the 28day treatment course (8-10). Unfortunately, there is scanty literature on the how many HCWs initiate PEP, the rates of PEP completion and the reasons for non-completion in Uganda.

Therefore, our study aimed at assessing the prevalence of ever taking PEP, completion rates and the self-reported reasons for non-completion among HCWs at Mbarara regional referral hospital.

Methods

We conducted a hospital based cross sectional study among HCWs at Mbarara regional referral hospital (MRRH) in southwestern Uganda. HCWs at risk of occupational HIV exposure, including; doctors, nurses, pharmacists, laboratory personnel, cleaners, dentists, anesthetists/ anesthesiologists, midwives and finalist medical students were considered for enrolment if they provided written consent to participation in the study. A HCW was excluded from participation if he/she; was neither a hospital nor Mbarara University staff, nor a non-finalist medical student.

The sample size of 252 HCWs was calculated using the formula for estimation of a single population proportion with correction for finite population, that is; $n = N*X/(X + N - 1)$(11), where, n is the overall sample size corrected for finite population, and $X = Z_{\alpha/2}^2 *p*(1-p)/MOE^2$, representing the sample size with reference to an infinite population, of which $Z_{\alpha/2}$ is the critical value of the normal distribution at α/2 for α of 0.05= 1.96, p is the proportion of HCWs who have ever taken PEP, assumed to be 0.58, based on a 58% prevalence reported in a study conducted at MRRH (11) and The margin of error (MOE) estimation was assumed at 0.05, that is 5%, plus a 10% addition in sample size to cater for attrition.

Given the expected differences in risk of occupational HIV exposure, proportionate stratified random sampling was used and we purposively enrolled HCWs from the three strata, that is; 133 qualified medical staff (including; doctors, theatre staff, dental staff, clinical officers, nurses, midwives, laboratory and pharmacy staff), 28 support staff (such as cleaners) and 45 final year medical students. Ethical clearance was received from the Mbarara university of science and technology-Research ethics committee (MUST-REC, 23/11-19) prior to commencement of study activities.

Written informed consent of eligible HCWs was obtained prior to enrolment into the study and participants were consecutively recruited basing on the eligibility criteria. Only 206 of the 232 consented HCWs returned the filled study questionnaires.

Participants' socio-demographics, medical information such as drug allergies, comorbidities and medication taken concurrently with PEP as well as PEP related information such as; regimen, dose, duration and side effects were collected using a self-administered questionnaire. As a quality control

measure, the questionnaire was pretested before its use in the study and the principal investigator collected the data.

Data was analyzed using STATA version 13.0. Participants' characteristics were described using medians for continuous variables and proportions for categorical variables. The proportion of participants who have ever taken PEP and those who completed were calculated and compared across age groups, gender and health cadre categories of HCWs using Pearson Chi-square test. Similar analysis was repeated for reasons for their non-completion of PEP.

Results

Out of 232 eligible HCWs approached, 206 consented to participate and were enrolled into the study. Majority of HCWs were aged above 25 years (72.8%), female (54.4%), qualified medical workers (64.6%) and married (58%) (Table 1).

Table 1: Socio-demographic characteristics of study participants, N=206

Characteristic	n (%)
Age	
18-25	56 (27.2)
26-35	64 (31.1)
>35	86 (41.7)
Health cadre	
Qualified Medical worker	133 (64.6)
Support staff/Cleaner	28 (13.6)
Medical student	45 (21.8)
Gender	
Male	94 (45.8)
Female	111 (54.2)
Religion	
Christian	181 (88.7)
Moslem	23 (11.3)
Marital status	
Married	109 (58.0)
Un-married	79 (42.0)
Job position	
Clinician	52 (25.2)
Nurse	56 (27.2)
Medical student	45 (21.8)
Lab technician	19 (9.2)
Pharmacist	7 (3.4)
Cleaner	27 (13.1)

Proportion of healthcare workers that had ever taken PEP

Overall, 77 of the 206 HCWs, (37.4%, 95% CI: 30.9 - 44.2%) reported to have ever taken PEP. Of these, 15.6% had ever taken PEP more than once, with majority (7 of 12) having initiated twice.

Significant disparities were noted in the proportion of participants that had ever initiated PEP across age, health cadre and marital status categories, with the highest PEP initiation rates seen among HWCs aged 25 – 35 years (46.9%, 95% CI: 34.8 - 59.4) compared to other age groups, p=0.005; among the qualified medical cadre (45.9%, 95% CI: 37.5 - 54.5) compared to other cadres, p= 0.002; and among married (48.6%, 95% CI: 39.3 - 58.1) compared to unmarried HCWs, p<0.001 (Table 2).

Table 2: Proportion of healthcare workers who "ever initiated on PEP", overall and across selected categories

Overall	N	Ever initiated on PEP, n	% (95% CI)	p- value
	206	77	37.4 (31.0 - 44.2)	NA
Age category				0.005
18-25	56	11	19.6 (11.0 - 32.6)	
26-35	64	30	46.9 (34.8 - 59.4)	
>35	86	36	41.9 (31.7 - 52.7)	
Gender				0.338
Male	94	45	45.6 (31.7 - 50.0)	
Female	112	32	54.4 (25.0 - 44.4)	
Health cadre				0.002
Qualified Medical worker	133	61	45.9 (37.5 - 54.5)	
Support staff/Cleaner	28	8	28.6 (14.3 - 48.9)	
Medical student	45	8	17.8 (9.0 - 32.4)	
Religion				0.443
Christian	181	70	38.7 (31.8 - 46.0)	
Moslem	23	7	30.4 (14.3 - 53.4)	
Marital status				<0.001
Married	109	53	48.6 (39.3 - 58.1)	
Un-married	79	17	21.5 (13.7 - 32.2)	

Characteristics of participants who "ever initiated on PEP"

Among participants who had “ever initiated PEP”, majority (66.2%) was due to percutaneous injury exposure, 15.6 % had initiated it more than once and took PEP for a median duration of 28 days (range: 2 - 31 days, IQR: 25.5 - 28 days). Six participants (7.8%) reported concurrent comorbidities at the time of PEP initiation of whom 2 reported peptic ulcer disease. Of those who had ever initiated PEP, 46 (59.7%) were able to remember the PEP regimen they received, with the most predominant regimen being Efavirenz - based (63.0%), followed by Protease inhibitor - based (26.1%) and lastly Integrase-based (10.9%) regimens. (Table 3)

Table 3: Characteristics of participants who ever taken PEP

Characteristic	n (%)
Number of times PEP was ever initiated	
Once	65 (84.4)
Twice	7 (9.1)
3 times	4 (5.2)
4 times	1 (1.3)
Concurrent medical conditions at time of PEP initiation	6 (7.8)
Medical conditions at time of PEP initiation	
Asthma	1 (16.7)
Flue and cough	1 (16.7)
Hypertension and diabetes	1 (16.7)
Malaria	1 (16.7)
Peptic ulcer disease	2 (33.3)
Concurrent medications at time of PEP initiation	
Amoxycillin	1 (14.3)
Anti-ulcer	2 (28.6)
Coartem	1 (14.3)
Salbutamol inhaler	1 (14.3)
Telvastatin	1 (14.3)
Oraxin syrup	1 (14.3)
Participants who remembered the PEP regimen received	46 (59.7)
PEP regimen received	
PI-based	12 (26.1)
Efavirenz-based	29 (63.0)
Integrase-based	5 (10.9)
Average duration on PEP (days) (IQR)	24 (7 – 28)
Nature of occupational exposure	
Percutaneous injury	51 (66.2)
Mucus membrane exposure	20 (26.0)
Non-intact skin exposure	6 (7.8)

Sexual exposure	1 (1.3)
Splash	1 (1.3)

Proportion of Healthcare Workers that completed PEP treatment

Of the 77 participants who reported to have ever initiate on PEP, 72.7% reported to have completed the recommended 28 days of prophylaxis. No significant disparities were noted in PEP completion rates across the age, gender, religion, marital status and health cadre categories, $p>0.05$.

Lower PEP completion rates (less than 70%) were particularly noted among HCWs aged above 35 years, females, and the married. (Table 4)

Motivation for completing PEP was mainly because of fear of seroconversion (89.5%), while others included; knowledge that PEP is protective (2.6%), because PEP was recommended (2.6%), desire to protect the spouse (2.6%) and fear for HIV (2.6%).

Table 4: PEP Completion rates across age, gender, religion, marital status and health cadre categories

Type of PEP completion rate	N	Completed PEP, n	% (95% CI)	p- value
Overall rate	77	56	72.7 (61.5 - 81.7)	
Age-category				0.507
18-25	11	9	81.8 (42.0 - 96.5)	
26-35	30	23	76.7 (57.2 - 88.9)	
>35	36	24	68.6 (49.1 - 80.5)	
Gender-specific				0.509
Male	45	34	75.6 (60.3 - 86.2)	
Female	32	22	68.8 (50.0 - 82.9)	
Religion-specific				0.936
Christian	70	51	72.9 (61.0 – 82.2)	
Moslem	7	5	71.4 (21.5 – 95.8)	
Marital status-specific				0.312
Married	53	37	69.8 (55.8 – 80.9)	
Un-married	17	14	82.4 (53.7 – 94.9)	
Health cadre-specific				0.590
Qualified medical worker	60	43	70.5 (57.5 - 80.7)	
Support staff/ Cleaner	8	6	75.0 (27.9 - 95.9)	
Medical student	8	7	87.5 (31.9 - 99.0)	

Self-reported reasons for PEP non-completion and their variation between age, gender and health cadre categories

Of the 21 participants with PEP non-completion, 17 (81%) reported their experience of PEP side effects as the major reason for non-completion, followed by the source patient testing HIV negative (14.3%) and not finding reason to complete the treatment (4.7%). Of the 17 HCWs who failed to complete PEP due to side effects, 10 (58.8%) were aged >35 years, 14 (82.4%) qualified medical workers and 9 (52.9%) females (Table 5).

Table 5: Variation of reason for PEP non-completion between age, gender and health cadre categories, N=21

Participant category	Reason for PEP non-completion		
	No reason to complete, n	**HIV negative source patient, n**	**PEP side effects, n**
Overall, n (%)	1 (4.8)	3 (14.2)	17 (81.0)
Age			
18-25	0	0	2
26-35	0	2	5
>35	1	1	10
Gender			
Male	1	2	8
Female	0	1	9
Health cadre			
Qualified medical worker	1	3	14
Cleaner	0	0	2
Student	0	0	1

Discussion

Proportion of healthcare workers that had ever taken PEP

In this study, we noted a considerably higher (37.4%) rate of having ever taken PEP among HCWs. This finding concurs with what was reported in Botswana in a study done among doctors and nurses which found that 40% of their participants had ever taken PEP (8). On the other-hand, among the medical students, the 17.8% rate of ever taking PEP was higher compared to only 4.9% reported in Cameroon (12). This high rate of ever taking PEP potentially reflects increased risk of occupational HIV exposures in our setting. It further confirms earlier reports in Uganda which indicated HCWs to be at an increased risk of exposure to potentially infectious body fluids (46%), with the common routes being needle stick injuries (27.7%), mucosal exposure (19.1%) and cuts with sharp objects (5.1%) (13).

The higher PEP initiation rates noted among HCWs older than 35 years could potentially be related to longer durations in clinical services which may have contributed to cumulative occupational exposure episodes compared to younger HCWs who have been probably exposed for a shorter duration. Also, the higher rates noted among qualified medical workers are reflective of their already known increased risk of

exposure to infectious fluids amidst challenges related to inadequate personal protective equipment, and poor waste disposal and infection control practices.

Characteristics of participants who “ever initiated PEP”

Our study finding of percutaneous needle stick injury as the commonest occupational HIV exposure (66.2%) among those that had ever taken PEP, is an agreement with what was reported in a similar Ugandan hospital (14), but also in the Cameroonian study that found needle stick injury as commonest (38.3%) followed by mucosal blood/body fluid splashes (37%) (12). However, the 15.6 % rate of having taken PEP more than once in this study is lower compared to 50.6% reported in Cameroon. It is not clear whether the difference in these rates could be due to hesitancy to take PEP on subsequent occupational exposures especially among HCWs in Uganda, or if it is a true difference between these countries. This will necessitate exploration in future studies so as to document the practices of HCWs with regard to intake of PEP during subsequent HIV-risk exposures.

Proportion of Healthcare Workers that completed PEP treatment

The PEP completion rate (72.7) documented in this study is comparable with what was reported among HCWs in Ethiopia (74%) and Botswana (72.2%) in recent studies (8, 9, 15)). However, it was higher than the 33.3% that was earlier reported in Taiwan (16), which is another low-income non-African country. The high PEP non-completion rate (27.3%) reported in this study is worrisome considering its negative consequences especially HIV seroconversion.

In this study we noted the lowest rates of PEP non-completion among female, married and aged 35 and above HCWs. The finding in females could be related to potential stigma and non-disclosure associated with taking PEP, with the lack of social support as a consequence. Although not assessed in this study, but we hypothesize that the low disclosure rates as reported among women with regard to HIV status could give an insight in this regard (17).

This study noted that experiencing PEP side effects was the main reason (81%) for non-completion of treatment among HCWs. This finding is comparable to what was reported among medical students in a South African study which also identified PEP side effects as the main reason for non-completion (15). This could be attributed to the PEP drug regimen used. In this study two-thirds of HCWs had been initiated on Efavirenz-based PEP regimens which have been associated with more side effects as compared to integrase or protease inhibitor-based regimens currently recommended for PEP (2).

The strength of this study is that it reports recent data on the use of PEP and related completion rates among HCWs at a large regional referral hospital for South Western Uganda, that could be generalized to other hospitals in the same region. However, it was limited by the missed inclusion of nursing students in the clinical years who could be having a great of risk of occupational HIV exposure given the nature of

their tasks with regard to patient care. As a result, this could have resulted in an under-estimated rate of ever initiating on PEP. The COVID-19 Pandemic provided a difficult environment to conduct this study in the stipulated time. This as well could have increased the non-response rate, with a possibility of missing participants who could have had a previous exposure to PEP.

Conclusion And Recommendation

The prevalence of ever taking PEP is high, indicating a high rate of HCWs occupational exposure to HIV. About a third of HCWs, majorly females, married and above 35-year-old do not complete PEP treatment, with the major reason being drug-related side effects. To avoid potential HIV sero-conversion, counselling on adverse events and sensitization of HCWs on good occupational safety and infection control measures, and dangers of PEP non-completion should be emphasized. In addition, counseling on adherence and adverse effects of PEP, and psychosocial support could be promoted before and during PEP intake by HCWs. Lastly, more research is needed so as to further explore the predictors of PEP non-completion among HCWs including nursing students and at different levels of the health system. Also, the government should be encouraged to provide sufficient personal protective equipment for healthcare workers so as to minimize risk of HIV exposure.

Declarations

Ethics approval and consent to participate

Ethical clearance was received from the Mbarara university of science and technology-Research ethics committee (MUST-REC, 23/11-19) prior to commencement of study activities. Written informed consent of eligible HCWs was obtained prior to enrolment into the study.

Consent for Publication

Not applicable

Availability of data and materials

The dataset from which the information presented in this manuscript originates has been submitted as additional supporting file.

Competing interest

We declare that we have no competing interests.

Funding

No external funding was obtained. The research was self-funded.

Authors' Contributions

DMM DA TMY conceived the study, and participated in its design and coordination and drafted the manuscript. DA DMM DJN performed the statistical analysis and contributed to drafting the manuscript. All authors read and approved the final manuscript.

Acknowledgments

We appreciate the study participants and health care workers at the Mbarara Regional Referral Hospital. We appreciate the great contribution of the team at SOAR Research Foundation who participated in the. We are deeply grateful to the whole team at SOAR Research Foundation, that is; Eunice Asiimwe and Caroline Birungi, who participated in the data management and review of the manuscript.

Abbreviations

Health care worker (HCW); Human Immune deficiency virus (HIV); Margin of error (MOE); Mbarara regional referral hospital (MRRH); Mbarara University of Science and Technology (MUST); Mbarara University of Science and Technology- Research Ethics Committee (MUST-REC); Post exposure prophylaxis (PEP).

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