EAHRC
EAST AFRICAN HEALTH RESEARCH COMMISSION
Research for Health and Prosperity

ORIGINAL ARTICLE

Facilitators and Barriers to Pre-Exposure Prophylaxis (PrEP) Adherence Among Female Sex Workers in Urban Tanzania: A Descriptive Qualitative Study

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ABSTRACT

Background: Oral pre-exposure prophylaxis (PrEP) is an established biomedical intervention for HIV prevention. Despite the availability of PrEP, female sex workers (FSW) remain disproportionately affected by HIV. This study explored the facilitators and barriers to PrEP adherence among the FSW participating in an HIV vaccine trial in Tanzania.

Methods: We conducted a descriptive, qualitative study nested within a multicentre, Phase IIb, three-arm, two-stage HIV prophylactic vaccine trial with a second randomisation to compare two pre-exposure prophylaxis regimens (PrEPVacc trial). We present findings from the Dar es Salaam site in Tanzania. Between 2021 and 2023, we conducted 15 in-depth interviews (IDIs) at three points and four focus group discussions (FGDs) among FSW enrolled in the HIV vaccine trial. Data were analysed manually using framework and thematic content analysis approaches.

Results: Facilitators for PrEP adherence included perceived benefits of PrEP, manageable side effects, use of reminders, establishing a friendly schedule for taking PrEP, the possibility of engaging in unprotected sex with clients whose HIV status is unknown, concealing PrEP by taking it privately, linkage to trial participation, and a clear understanding of the clinical protocol requirements. Barriers included the use of distinctive PrEP packaging, being away from home or travelling without the pills, concerns about retaining clients for sex work while using PrEP, anxiety related to HIV stigma, forgetfulness, and experiencing hunger.

Conclusion and recommendations: Both trial-related and individual-related factors affected PrEP adherence among the FSW participating in the PrEPVacc trial. Trial participation, perceived benefits, manageable side effects, and personal motivation supported adherence to PrEP, while stigma reduced consistent use. Tailored education and stigma-reduction strategies are necessary to enhance PrEP adherence among the FSW.

BACKGROUND

HIV continues to devastate the lives of people, particularly in sub-Saharan Africa (SSA). In 2023, more than half of all people living with HIV globally were in eastern and southern Africa.[1] More than half (55%) of all new HIV acquisitions in 2022 occurred among the key populations and their sexual partners.[1] Oral Pre-exposure prophylaxis (PrEP) has been proven to be effective in halting acquisition[2] and is a recommended HIV preventive strategy for HIV-uninfected individuals at high risk, such as female sex workers (FSW) and men who have sex with men (MSM).[3,4] In 2024, it is estimated that globally, more than 3.5 million people received PrEP at least once, over 75% of whom (2.6 million) were in the Africa region.[5] The number of people who received PrEP increased by 35% between 2022 and 2023; however, these numbers are still below the target of 10 million people using PrEP by 2025.[5]

Despite the available evidence about the efficacy of oral PrEP, many people discontinue use (47.5% globally), particularly in SSA.[6] Existing evidence suggests that difficulty accessing PrEP,[7]bisexual, and other men who have sex with men (MSM and adhering to PrEP[8] are the reasons behind the low adoption of and retention on PrEP. Several other practical and individual reasons have been reported as the barriers to PrEP adherence in Tanzania, Rwanda,

Uganda and Kenya.[9–12] Additionally, negative reactions from partners and stigmatising health care services have been reported to affect PrEP adherence.[13] These factors, therefore, hinder the widespread adoption of PrEP and the achievement of the UNAIDS target to end the HIV epidemic by 2030.[14]

In this paper we draw on qualitative data collected between 2021 and 2023 as part of the PrEPVacc Trial, a multi-centre Phase IIb three-arm, two-stage HIV prophylactic vaccine trial with a second randomisation to compare tenofovir alafenamide/emtricitabine (TAF/FTC) to tenofovir disoproxil fumarate/emtricitabine (TDF/FTC) as pre-exposure prophylaxis. One study site was located in Dar es Salaam, Tanzania, and recruited female sex workers (FSW) as the study population. This paper draws on data collected from participants at that site. FSW in Tanzania are among the key populations mostly targeted for the available HIV prevention methods, including PrEP. Oral PrEP is freely available to all key and vulnerable populations through the government health facilities and non-governmental health organisations in Tanzania.[15] We explored the reasons for adherence and non-adherence to oral PrEP among FSW who were participating in the PrEPVacc trial in Dar es Salaam.

METHODS

Study Design

This descriptive qualitative study design was nested within the PrEPVacc Trial, as noted above. The trial included the randomisation of a subset of FSW into one of the three HIV vaccine arms and one of the two PrEP arms. PrEP was initiated at enrolment into the trial and continued up to two weeks after the third HIV vaccination. Thereafter, participants were advised to continue taking locally available PrEP at the trial site. This study explored the facilitators and barriers to PrEP adherence among the FSW participating in an HIV vaccine trial.

Study Area and Population

The study was conducted at Muhimbili University of Health and Allied Sciences (MUHAS) in Dar es Salaam among female sex workers (FSW) enrolled in the PrEPVacc trial. The estimated HIV prevalence among FSW in Dar es Salaam was 15%.16 Eligible participants were female sex workers enrolled in the PrEPVacc trial who were receiving PrEP at the study site.

Sampling Technique

A sample of 15 participants, representing 10% of those enrolled in the PrEPVacc trial in Dar es Salaam, was selected for the in-depth interviews. The data manager sampled those randomised on TAF/FTC and TDF/FTC after two months of participation (week 8 visit) for the baseline interview. The study's social scientist used simple random sampling to choose 15 potential participants for interviews by drawing names manually from a container she could not see. She made sure half of the selected participants were on TAF/FTC, and another half were on TDF/FTC. The counsellors then scheduled appointments with these selected participants in turn. Whenever a selected participant was unavailable, another name was randomly chosen. Those who agreed to participate were interviewed at three points during the trial (months 2, 6, and 12). Specific questions were included to assess their adherence to PrEP. Participants who were not selected for interviews were considered for focus group discussions (FGD). Participants for the FGDs were selected purposively rather than through random sampling, based on their availability. Allocation into discussion groups was determined by PrEP adherence status, with participants categorised as either good adherers or poor adherers. Poor adherers were defined as participants who discontinued PrEP before Week 26, according to trial records.

Data Collection Procedure and Tools

Data were collected from a total of 15 in-depth interviews (IDIs) and four (04) FGDs, which comprised a total of 30 participants. The IDIs were conducted between November 12, 2021, and May 8, 2023. The four FGDs, each consisting of 7-8 participants, were conducted between September 6, 2022, and July 24, 2023. Two experienced male researchers collected the data using a topic guide. The data collectors were academicians with a nursing background who were experienced researchers in qualitative methods and were not part of the HIV vaccine trial team. The use of male researchers was based on their experience, as well as the fact that FSW in Tanzania seem to be more comfortable discussing their sex work with men.

The pre-tested topic guide included the following PrEP-focused questions: (i) What do you know about PrEP? (ii) What do you think about the pill you are taking in this study? (iii) What are your thoughts on the dosing schedule of PrEP in this study? (iv) How do you feel about using anti-retroviral therapy pills while you are HIV-negative? (v) Have you ever failed to take the pill as instructed? (vi) What has made it easy or difficult to take the pills? The guide was pre-tested among three participants who participate in neither IDIs nor FGDs. All interviews and FGD were conducted in Kiswahili (the official language in Tanzania) and were audio-recorded. The IDI and FGD took between 28 and 40 minutes and 90 and 120 minutes, respectively.

Data Management

All data were audio-recorded after obtaining written informed consent from participants. Following each IDI or FGD, recordings were immediately transferred to a password-protected computer. Each audio file was assigned a unique identification number prior to being sent for transcription. All recordings were transcribed verbatim by eight experienced transcribers. The principal investigator reviewed each transcript against the original audio to ensure transcription accuracy and quality. The transcripts were then anonymised and shared with an independent researcher for back-translation from Kiswahili to English. A team of four researchers familiar with the study context reviewed the translated transcripts to ensure that meaning was preserved during translation. Both Kiswahili and English versions of the transcripts were stored on a password-protected desktop computer, while the English transcripts were additionally archived on the project server.

Data Analysis

Data were analysed using a manual framework analysis approach combined with thematic content analysis. The Framework analysis approach [17] was selected because

it is particularly well suited to team-based qualitative data analysis involving manual coding. Following the identification of preliminary themes and the development of a coding framework, indexing (coding) and charting (organising and summarising data according to thematic categories) were conducted concurrently. Subsequently, mapping and interpretation were undertaken through the visual display of data to facilitate the identification of patterns, relationships, and underlying concepts, which informed the development and refinement of themes for the thematic content analysis.[18] The first four authors independently coded the data to enhance analytical rigour. Upon completion of the independent coding process, the authors compared and reviewed the codes, engaged in discussions to resolve discrepancies, and reached consensus on the final themes.

Ethics Approval and Consent to Participate

The PrEPVacc study received ethical approval from the National Health Research Ethics Committee in Tanzania (approval number: NIMR/HQ/R.8a/Vol.IX/3333) and from the Muhimbili University of Health and Allied Sciences (approval number: MUHAS-REC-11-2019-066), and it was conducted in line with the Declaration of Helsinki. Written informed consent was obtained from all the study participants. Participants in this qualitative study signed a supplementary consent, including approval for audio recording. The signed consent was in Kiswahili. The participants were assured of their freedom to participate or withdraw from the study at any time and that by doing so, they would not compromise the services they were entitled to during the study. All the participants received transport compensation of 30,000 Tanzanian shillings, equivalent to 12 US dollars. In addition, the participants were reminded about available referral services if they needed health care or other support. Trial registration: The trial was registered with the US Clinical Trial.gov on 29 September 2021 and can be found at https://clinicaltrials.gov/study/NCT04066881. Registration number: NCT04066881

RESULTS

Socio-demographic Characteristics

A total of 45 participants took part in this study. Of the 45 participants, 15 participated in IDIs and 30 in FGDs. All participants were women aged between 20 and 37 years. More than half of the IDI participants had attained secondary-level education; six had primary-level education (7 years), while only one had stopped in year 4 of primary education (Table 1). Among the FGD participants, half had four years of secondary education, while the other half had seven years of primary education. In addition to sex work, several participants had other income-generating activities such as hairdressing, bar work, small business ownership, and managing social events.

Themes and Sub-themes

We have grouped the findings around two main themes: facilitators of PrEP adherence and barriers to PrEP adherence (Table 2). The following section elaborates on the facilitators and barriers to PrEP adherence as themes. The participants reported on how the intersection of commercial sex work, their participation in the HIV vaccine trial, and their daily life facilitated or hindered PrEP adherence.

Theme 1: Facilitators to PrEP Adherence

This theme was supported by six sub-themes. In these sub-themes, the participants reported various reasons that supported PrEP adherence while participating in the PrEPVacc trial.

Adherence to the Clinical Trial Procedures

Participants reported that compliance with the procedures set out by the trial, including adherence to the PrEP regimen, was a facilitating factor because it was a requirement to use PrEP daily. This adherence was emphasised as being an important requirement for the pill's effectiveness in preventing HIV transmission. Furthermore, many participants reported satisfaction with the flexibility that was offered by the trial team (in line with the study procedures), as it allowed them to choose their preferred time for taking PrEP and thus made it easy for them to maintain the prescribed schedule of taking PrEP.

We were told to use them [pills] ourselves and plan the time to take them, if you decide to take them in the evening only, then it should be at that time always, if it was at ten or eight in the morning then we should stick to that time. So that was a good arrangement because you determine the time to take them. (P5, FGD 1)

Participants also reported that the comprehensive education about the benefits of PrEP and how it works empowered them to prioritise their health. Many participants expressed confidence that they adhered to PrEP because the researchers had provided clear information. The clarity of the information ensured that they took the pills every day, as they understood that the PrEP would prevent them from acquiring HIV infection. They said that the knowledge they were given reduced the fear and uncertainty around PrEP use. On top of that, they did not want to acquire HIV, as it would disqualify them from participating in the HIV vaccine trial project. They said:

"I'm all good with it because we have been given all the information about those drugs [PrEP]; Yes, no hindrance towards PrEP adherence… if you have the virus you can't participate in this project." (P4, IDI)

What made it simple for me to take the medicine is first, when they informed me that the medicine prevents HIV infection" (P6, FGD 2). Another participant insisted: *"It was because of the information that we were given by the researchers; I understood them [PrEP] well, and thus it became easy to take the medicine.* (P3, FGD 2)

Manageable Side Effects from PrEP

The participants recognised that PrEP was a highly effective medication designed to prevent HIV acquisition. They reported that they had no problem taking the PrEP because the side effects were minimal and tolerable. One participant said:

"Yes, the side effects were not annoying; I didn't vomit when I took them, and I didn't feel dizzy, although one day I felt annoyed, but not to the extent of failing to take them; it was normal." (P11, IDI)

TABLE 1: Sociodemographic Characteristics of In-Depth Interviewed Participants

Participant No.	Age (Years)	Education	Marital status
1	30	Form IV	Single
2	30	Form IV	Single
3	28	Form IV	Single
4	35	Standard 7	Cohabiting
5	30	Form VI	Single
6	29	Standard 7	Single
7	20	Standard 7	Single
8	29	Standard 7	Single
9	24	Standard 7	Single
10	28	Standard 7	Single
11	29	Form IV	Single
12	32	Standard 4	Single
13	30	Form IV	Single
14	22	Form IV	Single
15	27	Form IV	Single

TABLE 2: Themes and Sub-Themes

Themes	Sub-themes
Facilitators to PrEP adherence	Adherence to the clinical trial procedures
	Manageable side effects from PrEP
	Setting friendly schedule for taking PrEP
	Engaging in unprotected sex with clients whose HIV status is unknown
	Encasing the PrEP pills in a piece of paper
	Taking PrEP in privacy
Barriers to PrEP adherence	Utilization of distinctive PrEP packaging
	Staying away from home without the pills
	Intentional travelling without carrying the PrEP pills
	Concerns about clients' retention
	Anxiety surrounding the stigma of HIV status
	Non-adherence to PrEP due to forgetfulness
	Feeling hungry when taking PrEP

Another participant complemented this view by saying:

What helped me is my job [sex work]; I like my job and I cannot leave it. So, I think it is better to suffer from the side effects. I will try to fight so that I get money to buy food, ...I should get money to buy food, so I must take the pill on time. (P6, FGD4)

Some participants disclosed that taking PrEP was easy because it did not interfere with alcohol drinking. They said they were taking them daily while taking alcohol, and they never experienced problems.

Setting a Friendly Schedule for Taking PrEP

Setting reminders to take PrEP was important to sustain adherence to the medication regimen. The participants reported that they used various mechanisms to facilitate adherence to the PrEP pills. Some of them said they used reminders that prompted them to take the pills at specified times. After setting the reminder for several days, they began to remember to take the pills without an alarm. They said, setting a specific time to take the pills was useful because it prompted them to consistently take their PrEP. One participant said:

I used to take them [PrEP pills] in the morning ... I used to remember taking them because I carried them with me. My tin used to be in a packet [handbag]... so when the time to take the medicine arrives, you must get the message. (P5, IDI)

Some participants were individually committed to taking PrEP consistently. They said they decided on the right time to take PrEP and made sure they took the pills daily. They strived to overcome the challenges associated with relocation and privacy to ensure PrEP adherence. They narrated:

I find the arrangement is okay because I do not take them at night, I take them in the morning, at 10 AM, just after having breakfast. If I am late, I will take them at 11 AM. That is my timing; I have to take those medicines because I cannot take them in the evening...I see it is okay to take them every day because they are helpful due to our work [sex work]... (P6, IDI)

It was easy for us to take the pills because of the freedom they gave us; we should take them on our own planned time. I mean, they didn't arrange that for us, like when it is nine we should take them. So, a person takes them at her own time, which she has planned, it can be at ten pm. For me, I used to take them at ten pm, after eating and being full, I take them and leave. (P5, FGD 1)

The participants made an effort to take PrEP whenever they were supposed to. The efforts taken included cell phone reminders with unique messages that could only be understood by the phone bearer. They said:

I put an alarm there. Yes, I put the alarm, then I write the letter M. So, if the phone is in my handbag and I don't hear the alarm when I come to look at the cell phone, when I see the letter, I remember the meaning of M, but another person can't understand that. (P11, 1DI)

Engaging in Unprotected Sex with Clients Whose HIV Status is Unknown

Engaging in unprotected sex with individuals whose HIV status is unknown presents significant risks for both parties involved in commercial sex. Due to this situation, the participants reported that they consistently took their PrEP pills out of fear of acquiring HIV because they were providing services to clients whose HIV status was unknown. They subsequently felt motivated to verify negative HIV results whenever they were tested at the vaccine trial clinic:

"I took it every day because of our work; you can't know who is HIV positive and who isn't, and that's why I took it every day. That's why when I came here for the test, I am HIV negative." (P4, IDI)

In addition, they said they were motivated to use the pills because they used to meet clients who disliked using condoms, and they had no confidence that they could ask for an HIV test before engaging in sex.

Encasing the PrEP Pills in a Piece of Paper

Participants shared various scenarios where they had to fight stigma to take their PrEP pills. The sex work and unplanned travel to meet the clients forced the women to improvise the packaging of the PrEP pills so that they could take them secretly to avoid skipping the pills whenever they went out. To avoid leaving the pills at home while they were unsure of when to come back, they would be creative and wrap the pills in an unidentifiable piece of paper. One participant emphasised:

I have travelled three times, I usually take my pills and calculate how many days will I stay there so that I take enough pills for those days, and I also include the extra pills like five and I put them on a piece of paper and put them in my clothes and carry them, when I arrived there I use them secretly and when I came back I continue with the pills as usual. (P7, IDI)

They used different methods to ensure they adhered to PrEP use regardless of the challenges they faced.

Taking PrEP in Privacy

Given the importance of PrEP in preventing HIV transmission, the participants sought to take PrEP discreetly, ensuring their privacy while maintaining their health. Thus, some participants decided they would hide the pills and take them in the absence of other people to avoid negative perceptions towards them. They chose to be selective and inform the people whom they trusted as friends, but not their clients or their parents.

I have not exposed them [PrEP pills] to anybody because I have been taking them while in my room...My friends see them [PrEP], but not the men [clients]... they [friends] are there in the house because I cannot hide from them...She [mother] has never seen them. (P5, IDI)

In addition, the perceived stigma of HIV around the ARVs forced the participants to take the pills secretly:

"The pill resembles ARV drugs, so we take the pill secretly, and when we go to look for clients, we don't carry them...." (P11, IDI)

Thus, the participants avoided stigma by keeping their PrEP private while striving to adhere to PrEP to maintain their health.

Theme 2: Barriers to PrEP Adherence

This theme was supported by seven sub-themes. The sub-themes underscored the reported reasons that hindered adherence to PrEP.

Utilisation of distinctive PrEP Packaging

The unfriendly packaging of PrEP pills was reported to play a crucial role in non-adherence to the medication regimen. Although many participants supported the daily PrEP use, they were worried that the environment they lived in would not support it. They were cautious about people around them, as they could easily recognise the PrEP package, as it resembles antiretroviral drugs. One participant said:

"I was not in a friendly environment to take PrEP. Unfriendly environment means being surrounded by people, while you have that package [PrEP pills]; you get worried about taking the drugs because you will be laughed at." (P1, IDI)

The participants reported that non-adherence to PrEP happened for several other reasons. Some participants faced problems when they were supposed to take PrEP pills while away from home. Under such circumstances, they were forced to skip the pills to avoid being seen carrying the PrEP package and encountering negative reactions from other people. The living environment deprived many participants of privacy, especially if their room was shared.

When I went to the mourning, many people attended where we were sleeping at night, and there were children. So, I slept with some of the children. Because the children were there and they talked a lot [to others] ... it was difficult for me to pull out my pills and swallow them.... (P1, IDI)

Staying away from home without the pills

In the context of service provision, an extended timeframe

to meet the clients' needs was reported to affect PrEP adherence. In normal circumstances, the FSW appeared to offer services to each client within a short time, and in most circumstances, their time with a client did not extend beyond a day. However, some clients negotiated for an extended service from the FSW for two or more days, and this extension hindered the FSW from taking the PrEP pill as required because the pills were left at home.

They emphasised that the clients were the source of skipping the pills because they did not want them to leave after testing and enjoying the sexual services they were offering. They said that often they demanded to stay with them for more days than the expected time and that they did not dare to tell them that they had to go to take the PrEP pills. Thus, they kept quiet and took the PrEP pills whenever they came back home.

When I was there, my client was happy with the sex that I offered and asked me to sleep over; so, I didn't take my drugs because I believed that I would get back on the same day, so I skipped them" (P3, IDI).

A participant from the FGD complemented:

"That client clings to you and says, "Let us go this way, and locks you in, and he can lock you for a week, and you fail to take your medicines .... (P1, FGD 3)

Many participants recalled those days when they had to go out for their sex business, and the clients they went with expressed love to them. They said, often the kind of clients they met were asking for extended service times. When this decision was reached, the participants were often unprepared in terms of having the pills with them.

Intentional Travelling Without Carrying PrEP Pills

For the PrEP users, one of the reported challenges was the lack of medication while travelling. The FSW reported that they used to move with a small handbag that could only accommodate a mobile phone. Thus, adding the PrEP package was difficult. They also had a habit of inspecting each other's handbags while away, and potentially, a friend could easily recognise what was inside the friend's bag. Thus, the best option was not to carry the PrEP pills with them while going out. The habit of not carrying PrEP during their travels was a big challenge because travelling involved uncertainty about the day they would be returning home to take PrEP. One participant said:

"I leave them at my home, and I can even stay there for two or three days. Until I get back, that is when I will continue taking the pills, and that becomes difficult." (P5, IDI)

Another participant confessed:

On other days when I go out without a bag, I know that I will return, but you can go out and consequently have several clients and fail to get back home, and when you get back, you find that the specific time for taking your medicine has passed. (P12, IDI)

Despite the challenges around travels, self-determination was essential to ensure adherence to PrEP. The FSWs who visited their clients without carrying the pills took the pills when they returned home despite the fact they would have missed the pills for more than three days. Some took pills when they could without considering consistency. Frequent relocation and being away from home contributed a lot to non-adherence. Searching for clients forced some FSW to leave the PrEP pills at home. They were in the habit of not walking with the pills when they left for their business.

Concerns About Clients' Retention

Many participants were concerned about retaining their clients in the context of PrEP utilisation. They feared that once their clients became aware that they were using PrEP, they would chase them away without paying them, and thus they would lose the business. Thus, they insisted that they skipped PrEP because they were afraid of losing clients.

I failed to take them for one week. I travelled and left my pills at home, but when I got back, I continued taking them. ... It was not accidental; the person who wanted me to travel with was a bit troublesome, that is why I left my pills at home. (P8, IDI)

They suspected that if the clients came across the container containing PrEP, they would open it. They imagined the reactions thereafter would be negative. Some participants were not ready to face the argument with their clients because they had taken the pills. They reasoned that some clients were brutal in the sense that they could harm them if they realised that they were taking PrEP pills.

I stopped using them because I got a client and we went to Zanzibar with him, and I didn't carry my pills with me, and I cannot carry those pills with me; another client can beat you and think badly about you. (P10, IDI)

Anxiety Surrounding the Stigma of HIV Status

Many people may be concerned about other people's reactions if they associate them with an HIV-positive status. The participants expressed fear of taking the PrEP pills in public because other people would perceive that they were taking ARVs that are meant for people living with HIV. In this matter, they even feared disclosing to their relatives that they are using PrEP. The anticipated negative reactions from other people made them choose not to expose the PrEP to anybody. Many participants narrated the following:

If you take your pills with you when a person sees them, he cannot understand you because the pill looks like an ARV drug. You find me that I don't have them with me and I cannot leave from there, so I mess up the dose, I fail to take the pill...It can happen three times in a month.... (P11, IDI)

You can travel and go to a place where you are a guest, and you are afraid to carry the pills with you because some people do not understand. Even when you explain to them, you will be unhappy there, and they will tell you that you are HIV positive. (P8, IDI)

Another participant from FGD emphasized:

I skipped them for one week. I went to my activities. When I arrived there, I didn't like to think about using my pills, and when I looked around, money was there, and I was afraid that when he sees the tin he would think that I am HIV positive! No! I decide to skip them for a week. (P7, FGD 2)

Therefore, stigma surrounding HIV forced the FSW to

use various means to protect their identity as healthy individuals in front of their clients.

Non-adherence to PrEP Due to Forgetfulness

One of the commonly reported reasons for non-adherence to PrEP was forgetfulness. The participants reported that sometimes they took the PrEP pills twice a day or completely forgot to take the pills due to their busy schedules.

There is forgetting, sometimes you ask yourself, did I take them? Did I? I have taken them. So, you can think that you have taken them, but you have not. Or you think that you have not taken them, but you did! To be honest, it [forgetfulness] is going out here in town. (P1, IDI)

Many participants reported that they forgot to take their pills, primarily when travelling. Others explained that, as they moved from one place to another, they sometimes unintentionally left their pills behind when switching handbags. As one participant noted:

"I forget a lot, I travelled for a month, and I didn't take my pills for that entire period. I came here and informed them about that ... I travelled and forgot to carry the pills with me." (P9, IDI)

Participants reported that sex work was frequently accompanied by alcohol consumption and extended social engagements with clients, which undermined adherence to their PrEP regimen. Many indicated that they typically left their PrEP medication at home when going out to meet clients. Consequently, they often returned home late at night while intoxicated and either forgot to take their medication or missed the appropriate dosing time.

Some participants reported intentionally skipping their PrEP dose even when they remembered it, citing concerns about potential side effects associated with taking the medication while intoxicated. Participants perceived leaving their PrEP medication at home as a significant barrier to adherence, as the demands of their work and alcohol use often resulted in missed doses. Similar experiences were expressed by several participants, as illustrated in the quotation below:

"I remembered that I was supposed to take medicine, but I was drunk. I said no, I will not take them, so it has happened like four or five times…." (P2, IDI)

On some days, you come back very drunk, and you forget to take the pill ... You are heavily drunk ...First of all, when you come back drunk, you would not be able to take the pill in the morning. You are drunk, how can you take the pill while you have been drinking alcohol until the morning? (P5, FGD4)

You become drunk, and when you arrive home, you fail to take the pills at the required time until you wake up and find food, you eat, and then you remember to take your pill while the required time has passed. (P4, FGD4)

Feeling Hungry When Taking PrEP

The participants reported that experiencing hunger affected their PrEP adherence. They lamented that PrEP pills exacerbated hunger. They reported this heightened urge to eat to be problematic because it was accompanied by nausea or dizziness. These disturbances made them uncomfortable about continuing to take PrEP.

If they were feeling too unwell to do their sex work, they could not earn an income to buy food. In the absence of food, they skipped taking the pills because it was difficult to take them on an empty stomach. Many participants lamented:

"You have stayed until the night without getting something to eat; until the time to take the pill arrives, and you have not eaten, in that case, you can skip your pill…." (P2, IDI)

You can find that you don't have money to buy food. You cannot take the pills while you are advised to eat and be full before taking the pill, so on some days, you don't take the pill. But when you have money to buy food, you take the pill so that it tallies with health and food.... (P4, FGD4)

Overall, the findings from both IDIs and FGDs shed light on the reasons for PrEP adherence and non-adherence.

DISCUSSION

The purpose of this study was to explore the facilitators and barriers to PrEP adherence among the FSW participating in an HIV vaccine trial. The clinical trial requirements about PrEP adherence, the perceived benefits of PrEP, manageable PrEP side effects, a manageable schedule for taking PrEP, feeling protected with clients whose HIV status is unknown and taking PrEP in private emerged as facilitators to PrEP adherence. On the other hand, utilisation of distinctive PrEP packaging, spending time away from home without taking the pills, intentional travelling without PrEP for fear of being seen, concerns about client retention, anxiety surrounding the stigma of HIV status, forgetfulness, and feeling hungry when taking PrEP hindered medication adherence.

The findings of this study have shed light into the enablers and challenges to oral PrEP adherence among FSW who were participating in the PrEPVacc trial in Tanzania. The fact that study participants were motivated to adhere to PrEP due to its benefits suggests that the counselling messages, including clear information about HIV prevention strategies, were effectively implemented per study protocol during the PrEPVacc trial. This may differ from routine PrEP delivery, which lacks well-structured follow-up and monitoring. In the present trial conduct, establishing a consistent routine for taking PrEP was essential for maximising its effectiveness in preventing HIV. The WHO recommends that using PrEP according to the dosing schedule during periods of HIV risk is important to prevent HIV acquisition, and the decision to use it should always be made by the individual.[2] A previous study among FSW in Tanzania showed that more than half of the participants considered PrEP to be a worthy undertaking at the personal level.[19] In Uganda, the key and vulnerable populations were more willing to take PrEP because of being at a very high risk of HIV acquisition.[20] Similarly, high perceived HIV risk in South Africa was a motivator for restarting to take PrEP.[21]

The side effects were deemed manageable, which motivated participants to adhere to PrEP. This implies that the participants who understand the benefits of PrEP are less affected by its side effects because they can manage them. In Peru, some of the participants who were using PrEP reported that the physical side effects resolved within one to three weeks of PrEP initiation, and these side effects did not impact their continuation

with PrEP.[22] The WHO cites dizziness and gastrointestinal symptoms, including nausea, as possible side effects of oral PrEP.[2] Similarly, these side effects were mentioned by some of our participants, but these side effects tend to resolve within the first month of use among daily users or become milder over time for periodic users. Nonetheless, in a previous study, PrEP discontinuation was linked to experienced side effects.[21] Similarly, in Uganda, non-adherence to PrEP was affected by the experienced side effects,[23] and nausea and dizziness did affect some women in our study population.

In the present study, the use of reminders and setting a manageable schedule to take medication shows that many of the participants were committed to adhering to their medication. The FSW understood the importance of self-protection against HIV as they were engaging in risky sexual practices with clients of unknown HIV status. The WHO notes that successful PrEP users often find their solutions to support effective use.[2] However, the tendency to forget taking long-term prescriptions is common. The present study participants reported forgetfulness as a hindrance to taking PrEP. A previous study in Uganda indicated that forgetfulness and a busy schedule were among other reasons that impacted FSW adherence to PrEP.[24] From the present findings, the daily lives of the FSW were characterised by frequent movement in which relocation affected PrEP adherence. A previous study confirmed that sex work was characterised by spontaneous short-term and long-term trips away from home, often with no time to pack a bag.[19] Also, excessive alcohol consumption affects judgement and decision-making, which may affect the FSW's ability to adhere to PrEP regimen. Alcohol consumption may also interfere with memory as well as medication interactions in the body and eventually affect PrEP adherence among FSW.[24]

The fact that hunger was linked to non-adherence to PrEP among the FSW is worth noting. In the low-middle-income countries, taking HIV therapies has been linked to food insecurity. A previous study in Uganda revealed that ARVs increased appetite and led to intolerable hunger in the absence of food among the individuals living with HIV/AIDS. Furthermore, side effects of ARVs appeared exacerbated in the absence of food, and the participants believed they should skip doses if they could not afford food.[25] Food insecurity has been challenging among PrEP users as well. A study in Brazil showed that moderate/severe food insecurity was associated with poor adherence amongst people using oral PrEP. In addition, food insecurity was common among young people with less education and low income.[26] Similarly, our study population was characterised by less educated young females with unreliable income, which may affect both food security and PrEP adherence.

In the present study, stigma appeared to be associated with both commercial sex work and HIV prevention methods, particularly PrEP. Even though PrEP is a highly effective HIV prevention medication, the utilisation of distinctive PrEP packaging, avoiding travelling with the pills, and concerns about client retention were linked to stigma. This implies that FSWs are often expected to encounter stigma if their clients suspect that they are using HIV medication or PrEP. Similarly, previous studies in East Africa revealed that the most common anticipated barrier to taking PrEP, among others, was stigma.[23] For many years, stigma has been linked to both HIV and the persons taking ARVs. A scoping review of studies done in Africa showed that perceived stigma is an important hindrance to PrEP use.[27,28] In Tanzania, FSW feared that if clients found their PrEP pills, they would have mistaken them for treatment and assume they are living with HIV and may accuse them.[19] Also, the FSWs in Tanzania fear of violence from their clients if suspected to be infected with HIV.[29]

Strengths and Limitations

The strengths of this study are as follows; a conduct of three IDIs with each participant ensured the collection of comprehensive information on the same questions from the same participants. The FGDs corresponded to the IDIs in the sense that different views were debated upon while enriching each source of information. The use of data collectors who were not connected to the trial team encouraged the freedom of expression of interviewees. The use of multiple analysts ensured the credibility of the qualitative data. The inherent limitation of qualitative studies, often seen to lie in the context-specific information that can only be transferred to similar contexts. However, our findings do suggest broad lessons on PrEP adherence beyond urban Tanzania. The participants might have overreported the adherence to PrEP because of close monitoring of the trial procedures. Nevertheless, the information was collected at three time points from different individuals, and this approach might have minimized the social desirability bias.

CONCLUSION

The present findings underscore the reasons behind adherence and non-adherence to oral PrEP among FSW who participate in the HIV intervention trial. Many participants were motivated to take PrEP for self-protection and supportive trial procedures, but the surrounding community, including the clients, hindered uptake and sustained PrEP use. Understanding the underlying facilitators and barriers to oral PrEP adherence among the FSW is crucial for developing effective strategies that can enhance the uptake and consistent use of this medicine among populations at high risk for HIV infection in a Tanzanian context. Thus, to control HIV infection among FSW, innovative approaches are required, and this should be informed by the FSW's own strategies for overcoming the existing barriers towards PrEP use.

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Peer Reviewed

Acknowledgments: This study would not have been possible without the participants who willingly took part and shared their reasons for following or not following PrEP during the HIV vaccine study. We thank everyone who assisted with data collection, transcriptions, and translation. The PrEPVacc team is also acknowledged for its contribution to this study.

Competing Interests: Authors declare no competing interests.

Funding: The PrEPVacc study was funded by The Second European & Developing Countries Clinical Trials Partnership (EDCTP2) (Grant reference: RIA2016 -1644). The American people also supported this study through the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) via the United States Agency for International Development (USAID). We thank Gilead for additional funding support (CO-UK-412-5430). The funder had no role in the design, data collection, analysis, manuscript preparation, or publication of this study.

Received: 10 September 2025 ; **Accepted:** 06 June 2026

Cite this article as Tarimo, E.A.M; Iseselo MK., Ambikile J.S, Lukumay G, Munseri P, Bakari M, Lyamuya E, Aboud S, Kawuma R, Seeley J. Facilitators and Barriers to Pre-Exposure Prophylaxis (PrEP) Adherence Among Female Sex Workers in Urban Tanzania: A Descriptive Qualitative Study. *East Afr Health Res J*. 2026: 8(2): 89-98. https://doi.org/10.24248/eahrj.v10i1.873.

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