PrEP Counseling Based on a Tenofovir Urine Assay Decreases Overall Non-Adherence Among Kenyan Women

Monica Gandhi,[1] David V. Glidden,[1] Matthew S. Spinelli,[1] Charlene Biwott,[2] Gakuo Maina,[2] Irene Njeru,[2] Peter Mogere [2], Catherine Kiptinness,[2] Phelix Okello,[2] Purba Chatterjee, [1]Guohong Wang,[3] Vallery Ogello,[1] Hideaki Okochi,[1] Deepalika Chakravarty,[1] Nelly Mugo,[2] Kenneth Ngure[4]

[1]University of California, San Francisco (UCSF), SF, CA; [2]Kenya Medical Research Institute (KEMRI), Thika, Kenya; [3]Abbott Laboratories, Research and Development; Jomo Kenyatta University (JKUAT), Nairobi, Kenya

1113

Background

- Adherence challenges with oral tenofovir-based pre-exposure prophylaxis (PrEP) are common.
- Our group (UCSF Hair Analytical Laboratory) along with other laboratories have analyzed PrEP drug levels in a variety of matrices using liquid chromatography/tandem mass spectrometry (LC-MS/MS) to interpret PrEP studies but an objective metric of adherence that is point-of-care (POC) will allow for adherence interventions to be applied in real-time
- Our group recently developed a POC urine assay to objectively assess tenofovir (TFV) in urine using a highly selective antibody to TFV[1-4]
- We performed a pilot trial examining the impact of targeted counseling using the urine TFV assay on long-term PrEP adherence (assessed via hair levels of TFV) among women in Kenya
- **Intervention arm** was called **P**oint-of-Care **U**rine **M**onitoring for **A**dherence (PUMA)

Methods

- From March 2021-January 2022, we randomized 100 women not in serodiscordant couples (SDC) three months after PrEP initiation to standard-of-care (SOC) adherence counseling versus counseling informed by the urine assay every 3 months for 12 months (PUMA) (**Figure 1**)
- In the SOC arm, urine samples were tested at study end, without providing results to participants or staff. Hair samples at month 12 were analyzed for TFV to assess PUMA's impact on long-term pill-taking, with undetectable levels defining long-term nonadherence.
- In the PUMA arm, the POC urine TFV test informed the adherence counseling performed by staff, Examples of the tailored counseling messages delivered in the PUMA arm, based on the urine test result, shown in **Figure 2**
- Primary **effectiveness outcomes** were the impacts of PUMA on urine TFV test results, a marker of short-term adherence, and on hair TFV concentrations, a biomarker of long-term adherence (measured using validated methods), 12 months after randomization
- Surveys assessed acceptability of assay

In a pilot randomized trial, a low-cost point-of-care urine tenofovir assay to inform PrEP counseling increased both short-term and long-term metrics of adherence among women on PrEP in Kenya. No evidence of "white-coat" adherence was seen. The urine tenofovir assay may have a role in improving long-term PrEP adherence.

Figure 1: Study Design of PUMA trial

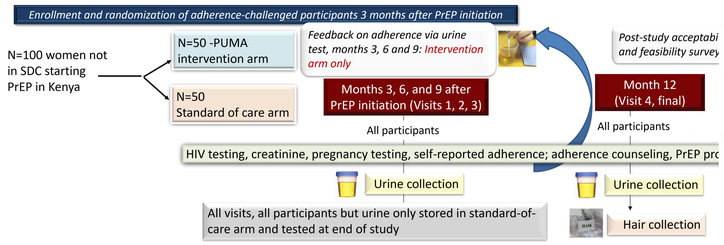
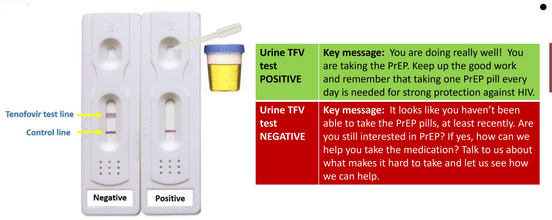


Figure 2: Picture of urine TFV assay and counseling messages based on results



Urine TFV test POSITIVE	**Key message:** You are doing really well! You are taking the PrEP. Keep up the good work and remember that taking one PrEP pill every day is needed for strong protection against HIV.
Urine TFV test NEGATIVE	**Key message:** It looks like you haven't been able to take the PrEP pills, at least recently. Are you still interested in PrEP? If yes, how can we help you take the medication? Talk to us about what makes it hard to take and let us see how we can help.

Figure 3: Proportion of urine TFV assays which were positive in each arm by visit

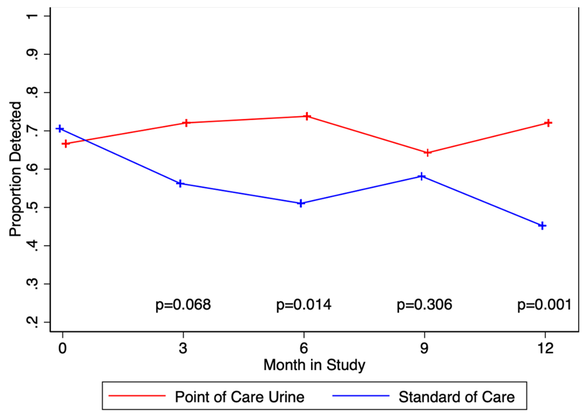


Figure 4: Percent with long-term nonadherence (via hair levels) in PUMA vs SOC arm, stratified by urine test result at month 12

Percent with long-term nonadherence (hair levels) in the PUMA arm vs the SOC arm, stratified by the result of the urine point-of-care tenofovir assay at month 12 of the study. Even when the urine assay was negative, rates of hair tenofovir level detectability was higher in the PUMA arm (arguing against white-coat adherence explaining these results)

Results

- The trial enrolled 49 women in the PUMA arm and 51 in the SOC arm; retention was 89%.
- At baseline, pre-intervention, urine TFV was detectable in equal rates in the two arms (67% PUMA; 72% SOC, p 0.68)
- In contrast, the proportion of urine tests positive for TFV was significantly higher in the PUMA arm at 12 months compared to the SOC arm (72% vs 45%, p 0.001) (**Figure 3**)
- The relative odds of long-term non-adherence in the SOC arm (defined by undetectable hair TFV levels) compared to PUMA was 3.53 (95% CI 1.03-12.03, p 0.04)
- Feedback from the urine assay seemed to decrease long-term non-adherence at 12 months, even when urine assays were negative, arguing against white-coat adherence (**Figure 4**)
- At 12 months, 93% liked the urine adherence & 88% would want to use the test outside of a study.
- 1 seroconversion occurred in the SOC arm.

Conclusion

- Scalable low-cost adherence interventions to increase pill-taking with oral PrEP are needed
- Our group developed and validated one of the first point-of-care urine-based immunoassays to assess adherence to TFV-based ART and PrEP
- This was the first trial to study the ability of the urine TFV assay to increase long-term adherence to PrEP
- Counseling informed by the urine TFV assay increased both short-term and long-term metrics of adherence in this trial of women in Kenya on PrEP
- As in other studies, the test was highly acceptable to participants
- The urine TFV test is low-cost, easy-to-perform, scalable and could increase PrEP adherence

References: 1. Spinelli MA JAIDS 2020;84(2):149-152; 2. Gandhi M. EClinicalMedicine. 2018;2-3:22-28; 3. Gandhi M. JAIDS; 2019;81(1):72-77; 4. Gandhi M. AIDS. 2020;34(2):255-260

Acknowledgements: We would like to gratefully thank the participants of the PUMA trial. Funded by NIAID/NIH R01AI143340