

Does antiretroviral therapy initiation increase sexual risk taking in Kenyan female sex workers? A retrospective case–control study

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ABSTRACT

Objectives: Although antiretroviral therapy (ART) prolongs life and reduces infectiousness, in some contexts, it has been associated with increased sexual risk taking.

Design: Retrospective case–control study.

Setting: Nairobi-based dedicated female sex worker (FSW) clinic.

Participants: HIV-infected FSWs before and after ART initiation (n=62); HIV-infected and -uninfected control FSWs not starting ART during the same follow-up period (n=40).

Intervention: Initiation of ART.

Primary outcome measures: Self-reported condom use, client numbers and sexually transmitted infection incidence over the study period (before and after ART initiation in cases).

Results: Sexual risk-taking behaviour with casual clients did not increase after ART initiation; condom use increased and sexually transmitted infection incidence decreased in both cases and controls, likely due to successful cohort-wide HIV prevention efforts.

Conclusions: ART provision was not associated with increases in unsafe sex in this FSW population.

Female sex workers (FSWs) play a key role in HIV epidemic spread in sub-Saharan Africa¹ during both early and late epidemic phases² due to multiple partners, high rates of HIV and sexually transmitted infections (STIs), and in many instances, their ability to negotiate safer sex practices are compromised.^{1,3,4} HIV prevention in this group may be the highest impact intervention in developing countries.⁵ Therefore, antiretroviral therapy (ART) programmes targeting FSWs may preserve life and reduce HIV transmission at a population level. However, it will be critical to ensure that sexual disinhibition does not counteract these beneficial effects.

ARTICLE SUMMARY

Article focus

- Impact of starting ART on sexual risk-taking behaviour in FSWs, which could have an important impact on HIV transmission to clients.

Key messages

- ART initiation was not associated with increased risk taking or sexually transmitted infection incidence.
- Both of these declined over time, most likely as a result of risk reduction counselling.

Strengths and limitations of this study

- Strengths include a relevant population, longitudinal follow-up and inclusion of biological measures of risk taking (sexually transmitted infection incidence).
- Limitations include relatively small study groups and limited sampling time points.

ART provision appears to have contradictory effects on HIV transmission. While ART reduces blood and genital tract viral load, and therefore infectiousness,⁶ it has also been associated with reduced safe sex practices^{7–9} and increases in STI incidence in some settings.¹⁰ Reasons for behavioural disinhibition could be several, including a feeling of improved health after ART initiation. Although this increase has not been the experience to date in resource-poor countries,¹¹ it could become an issue as access expands,² and further studies are needed to understand the extent to which these initial observations are generalisable. Mathematical models suggest that if safe sex practices are not maintained, then HIV transmission may increase despite ART-associated reductions in genital tract virus levels.¹² A recent study in Kenyan sex workers

with relatively low rates of partner exchange showed no change in risk taking following ART,¹³ but these findings need to be confirmed in a high partner exchange setting.

In the current study, we assessed the impact of ART on sexual behaviour within an established cohort of FSWs from Nairobi, Kenya, in a retrospective case–control study. Institutional Review Boards at Kenyatta National Hospital and the Universities of Manitoba and Toronto approved the study, and all participants gave written informed consent prior to participation. Each participant completed a standardised questionnaire and physical exam every 6 months. Self-reported risk-taking data included the number of clients (casual and regular) and condoms used per week. Percentage condom use with casual clients was calculated from reported client and condom numbers, with maximum usage arbitrarily set at 98%. Risk reduction services provided to all participants included peer- and clinic-based counselling, provision of free condoms and STI management according to Kenyan guidelines. Non-parametric statistical comparisons between groups and within an individual were performed using PASW Statistics 18.0. Self-reported sexual behaviour data were collected at two time points 6 months apart prior to ART initiation and at two time points after: means of continuous variables were calculated for each period, and changes within an individual compared by using the Wilcoxon signed-rank test. Categorical variables were compared by Mann–Whitney test.

RESULTS

All HIV-infected FSWs initiating ART during 2001–2006 with ≥ 1 year of follow-up were included as cases ($n=62$). Since sexual risk taking may change over time in the cohort as a whole, HIV-infected ART naive and HIV-uninfected FSWs enrolled in the cohort for a similar duration were selected as controls ($n=20$ each). Cases and controls were generally comparable at baseline, but cases reported higher condom use with casual clients (mean 97.8% vs 95.7%, $p=0.01$) and had a trend to a lower number of unprotected sex acts over the past year (23.0 vs 34.1, $p=0.14$, table 1). The proportion of participants reporting a regular client was similar (cases

58% vs controls 65%, $p=0.62$), and condoms were rarely used with regular clients (cases 23.2% vs controls 9.6%, $p=0.13$).

No significant change was seen in casual client numbers during the year after starting ART in cases (19.9/week pre-ART vs 21.9 post-ART, $p=0.17$, table 2), in condom use with casual clients (97.8% both pre-ART and post-ART, $p=0.66$) or in the number of unprotected sex acts with casual clients (23.7/year pre-ART vs 24.7 post-ART, $p=0.26$). Condom use increased in controls (mean 95.7% vs 97.6%, $p=0.14$), so that although casual client numbers increased over the study period from 19.4 to 24.5 per week ($p=0.002$), there was a trend to reduced unprotected sex acts with casual clients during the latter year (34.1 vs 29.5, $p=0.10$).

There was some evidence to suggest an increase in condom use with regular clients in both cases (3.91 vs 3.98, $p=0.06$) and controls (3.80 vs 3.93, $p=0.05$). The mean number of regular clients remained unchanged in cases (0.64 vs 0.43, $p=0.13$) and controls (0.55 vs 0.60, $p=0.25$), although controls had more regular partners during follow-up (0.60 vs 0.43, $p=0.04$). It should be noted that condom use with regular partners remained infrequent in all groups; specific interventions to increase this in FSW populations could have important public health benefits.

Social desirability or fear of being taken off ART could associate with false reporting of sexual behaviour by FSWs, and so STI rates were also examined. Combining *Trichomonas vaginalis* and *Neisseria gonorrhoea* data in all participants, 12/102 FSWs were STI positive during the year pre-ART compared with 8/102 post-ART ($p=0.346$). This included 6/62 cases and 6/40 controls pre-ART and 4/62 cases and 4/40 controls post-ART. The period prevalence of *N gonorrhoea* declined from 4.6% to 1.1% in the periods before and after ART initiation ($p=0.02$, Wilcoxon test); this decrease was apparent in both cases (6/78, 7.7%, pre-ART vs 1/76, 1.3%, post-ART) and controls (3/116, 2.6%, pre-ART vs 1/110, 0.9%, post-ART).

In summary, we found no increase in sexual risk taking in FSWs who initiated ART, using either self-reported behaviour or STI rates. This was in the context of clinic- and peer-based risk reduction services offered to all

Table 1 Baseline characteristics of study groups

| Characteristic (median, range) | Cases starting ART (N=62) | HIV-infected controls (N=20) | HIV-uninfected controls (N=20) |
|----------------------------------|---------------------------|------------------------------|--------------------------------|
| Age (years) | 41 (26–61) | 38 (27–48) | 41 (27–61) |
| Duration of sex work (years) | 14 (2–41) | 13 (1–28) | 11 (2–33) |
| Clients per week | 16 (4–80) | 20 (3–51) | 19 (2–45) |
| Condom use (%) | 98 (86–98)* | 98 (75–98) | 98 (50–98) |
| Unprotected sex acts (past year) | 16 (4–160) | 21 (3–195) | 24 (4–171) |
| Regular partner (proportion) | 36/62 (58%) | 12/20 (60%) | 14/20 (70%) |
| Condom with regular partner (%) | 23 | 8 | 11 |
| CD4 T cell count | 205 (70–1028)* | 557 (243–1082) | 1100 (631–1692) |

*Mann–Whitney $p \leq 0.01$ for cases versus controls. ART, antiretroviral therapy.

Table 2 Longitudinal assessment of risk taking and sexually transmitted infection prevalence in female sex workers over time

| Variable | Before ART | After ART | p Value |
|--|------------|-----------|---------|
| Cases | | | |
| No. unprotected acts with casual partners/year | 23.05 | 24.72 | 0.57 |
| Condom use with casual clients (scale 1–4) | 3.91 | 3.98 | 0.06 |
| Condom use with regular clients (scale 1–4) | 0.24 | 0.39 | 0.16 |
| Mean number of casual clients per day | 3.93 | 4.12 | 0.13 |
| Mean number of regular clients per day | 0.64 | 0.43 | 0.13 |
| NG/TV period prevalence (%) | 9.7% | 6.5% | 0.53 |
| NG period prevalence (%) | 7.7% | 1.3% | 0.03 |
| Controls | | | |
| No. unprotected acts with casual partners/year | 34.08 | 29.49 | 0.62 |
| Condom use with casual clients (scale 1–4) | 3.80 | 3.93 | 0.05 |
| Condom use with regular clients (scale 1–4) | 0.12 | 0.13 | 0.79 |
| Mean number of casual clients per day | 4.11 | 4.43 | 0.43 |
| Mean number of regular clients per day | 0.55 | 0.60 | 0.26 |
| NG/TV period prevalence (%) | 15% | 10% | 0.48 |
| NG period prevalence (%) | 2.6% | 0.9% | 0.32 |

ART, antiretroviral therapy; NG, *Neisseria gonorrhoea*; TV, *Trichomonas vaginalis*.

participants. The latter may be important since studies in Uganda¹⁴ and Kenya^{13 15} showed increases in safe sex practices following ART initiation in conjunction with risk reduction services, while in Cote d'Ivoire, there was an increase in unprotected sex post-ART in their absence.¹⁶ This suggests that ART should be combined with risk reduction services where possible. A prior Kenyan FSW study also reported no increased risk after ART initiation,^{13 15} although in that cohort less than a third of participants reported more than one partner over the past week compared with a mean of >20 casual clients in our study.

Several factors may potentially impact sexual practices in FSW participants, including nationwide HIV education campaigns that could be associated with national declines in HIV prevalence^{17 18} and a cohort-wide risk reduction programme.¹⁹ Although we found no change in HIV risk behaviour after starting ART, these factors could have masked increases in risk relative to other cohort participants after ART initiation. To rule out this possibility, we assessed a control group of 40 FSWs followed over a similar time span, both HIV-infected ART naive and HIV-uninfected FSWs, and found no evidence that this was the case.

In conclusion, we found no evidence for alterations in sexual behaviour after starting ART in Kenyan FSWs with very high partner exchange rates. FSWs through their profession may act as an important core HIV transmission group in the region. Since ART has been shown to reduce HIV transmission,^{20 21} ART provision for FSWs in conjunction with risk reduction services should be considered an important strategy to reduce HIV transmission at a population level.

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Competing interests None.

Patient consent Obtained.

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