

Low rates of early mother-to-child HIV transmission in a routine programmatic setting in Lilongwe, Malawi



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Introduction

Data on PMTCT effectiveness within routine healthcare delivery in resource-constrained settings is limited. We sought to evaluate the impact of PMTCT delivery and maternal CD4 count on early HIV transmission within the *Tingathe* program in Lilongwe, Malawi. *Tingathe* utilizes community health workers to ensure mother-infant pairs receive all PMTCT services

Materials and methods

Brief Description of Program Services:

The *Tingathe* PMTCT program has been described in detail elsewhere [Kim]. In brief, a *Tingathe* community health worker (CHW) was assigned to an HIV-infected woman upon diagnosis or enrollment into antenatal care. The CHW ensured that mother-infant pairs received all appropriate PMTCT services, including CD4 count measurement, delivery of CD4 count results, enrollment into ART clinic if eligible, delivery of PMTCT prophylaxis to mother and infants, and DNA PCR testing of the infant. They followed their clients at their homes and health centers, from initial diagnosis up until confirmation of definitive HIV-uninfected status after cessation of breastfeeding or successful ART initiation for HIV-infected infants. Receipt of PMTCT was recorded only upon confirmation with the mother after delivery to verify that medication had actually been ingested, not just dispensed. Registers, mastercards, and an electronic database were developed to monitor CHW activities.



Figure 1. CHW providing same day pre-ART counseling to expedite ART initiation for eligible pregnant mothers.



Figure 2. CHW on home visit with HIV-infected mother. Providing counseling on medication adherence and infant feeding.

Study Design and Analysis

We reviewed clinical records of 1687 HIV-infected pregnant women enrolled into the *Tingathe* PMTCT program and clinical records of all 1088 mother-infant pairs enrolled March 2009-March 2011 who completed follow up to first DNA PCR. The CD4 cutoff for ART eligibility changed from 250 to 350 in August 2010. Women on ART at enrollment did not receive CD4 testing. The recommended PMTCT regimen for women ineligible for ART was complete combination prophylaxis- mother: AZT for at least 6 weeks+sdNVP+combivir tail, and infant: sdNVP+AZT. Incomplete combination prophylaxis was defined as non-completion of any component of complete combination prophylaxis. Early ART was defined as ART for >14 weeks prior to delivery. We determined transmission rates with confidence intervals and compared these rates using global chi-square tests, followed by post-hoc pairwise testing to evaluate differences between multiple proportions. Only pairwise comparisons with $p < \text{adjusted alpha}$ were considered significant.

Table 1a: Description and Explanations of PMTCT medication regimen categories used for analysis

	PMTCT Regimen Description		Explanation of Regimen Category
	Mom PMTCT	Infant PMCT	
None/Unknown/sd-NVP	None/Unknown or sdNVP*	None/Unknown or sdNVP or AZT for 7 days+sdNVP	Due to low patient numbers in each individual category, these suboptimal interventions were grouped together.
Incomplete combination prophylaxis	AZT after 28 weeks of gestation and sdNVP	None or unknown or sdNVP or AZT for 7 days+sdNVP	If ANY aspect of the combination regimen was omitted for either mom or infant they were grouped here.
Complete combination prophylaxis	AZT at or before 28 weeks gestation and sdNVP	AZT for 7 days+sdNVP	Patients were grouped here ONLY if mother and child received the complete and correct regimen**.
Late ART	ART <14 weeks before infant DOB	none or unknown or sdNVP or AZT for 7 days+sdNVP	During this time ART was only given if warranted for the health of the mother and consisted of triple therapy with stavudine, lamivudine, and nevirapine.
Early ART	ART ≥14 weeks before infant DOB	none or unknown or sdNVP or AZT for 7 days+sdNVP	

Results

From March 2009 to March 2011, 1687 HIV-infected pregnant women were enrolled into the *Tingathe* PMTCT program. Of these 1088 mother-infant pairs completed follow up to first DNA PCR.

- Overall MTCT rate at first PCR was 4.1%.
- **Early ART was associated with reduced transmission, compared to all other treatment groups ($p < 0.005$).**
- Mother-infant pairs whose first HIV DNA PCR was positive were less likely to be receiving ART at enrollment (7.5% vs 25.8%, $p = 0.008$), were more likely to receive sdNVP or no/unknown medication (15.6% vs 4.9%, $p = 0.002$), and were less likely to have started ART early (0.0% vs 28.5%, $p < 0.001$), compared to those with negative initial HIV DNA PCR tests

Table 1b: Early Transmission Rates by PMTCT medication regimen

	Total PCR results available N=1088	First PCR negative (still exposed through breastfeeding) N=1043	First PCR positive (Infected) N=45	Early MTCT Rate*
None/Unknown/sd-NVP	59	52	7	11.9 (5.6 – 22.8)%
Incomplete combination prophylaxis	73	66	7	9.6 (4.5 – 18.8)%
Complete combination prophylaxis	472	448	24	5.1 (3.4 – 7.5)%
Late ART	187	180	7	3.7 (1.7 – 7.7)%
Early ART	297	297	0	0.0 (0.0 – 1.5)%

HIV transmission by baseline CD4 count

- CD4 counts were only drawn on women not on ART at program initiation. Of the 827 women not on ART, 804 (97.2%) had recorded maternal CD4 counts at program registration. Amongst these 798 (99.1%) received either maternal ART during pregnancy 236 (29.4%) or PMTCT prophylaxis 562 (70.4%).
- **No difference in MTCT rate was detected according to CD4 level at enrollment ($p = 0.308$).** (Table 2).

Table 2: Early Transmission Rates By Maternal CD4 count for women not on ART at program enrollment

CD4 cells/mm ³	Total PCR results available* N=804	First PCR negative (still exposed through breastfeeding) N=767	First PCR positive (Infected) N=37	Early MTCT Rate**
0-<99, n	35	34	1	2.9 (<0.01 – 15.8)%
100- 199, n	100	97	3	3.0 (0.7 – 8.8)%
200-349***, n	206	192	14	6.8 (4.0 – 11.1)%
350-499, n	225	213	12	5.3 (3.0 – 9.2)%
≥500, n	238	231	7	2.9 (1.3 – 6.1)%

Conclusions

These results provide reassurance that low HIV transmission rates can be achieved even in resource-limited settings. Maximum benefit is received from ART started at least 14 weeks prior to delivery for eligible women versus other regimens. Furthermore, baseline CD4 does not impact transmission among women in the setting of appropriate provision of maternal ART and PMTCT prophylaxis. Efforts to improve timely initiation of ART and PMTCT prophylaxis are needed.

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