

## Factors Associated With the HIV Transmission Rate in 18 To 24 Month-old Children Enrolled in The Prevention of Mother-To-Child Transmission Programme At The City of Tshwane Clinics

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**Abstract:** Mother-to-child transmission (MTCT) of the Human Immunodeficiency Virus (HIV) is the commonest source of HIV infection among children. The prevention of mother-to-child transmission (PMTCT) of HIV programme is one effective strategy to reduce the rate of HIV infection in children. The programme was implemented nationally in South Africa in 2002. An increase in HIV transmission rate at 18 months of age was reported despite the PMTCT interventions. A Quantitative descriptive retrospective correlational study was conducted to identify factors associated with the HIV transmission rate in 18 to 24 month-old children enrolled in the PMTCT programme. Data was collected from 60 mothers and 152 records of children on PMTCT programme and analysed using the SAS/JMP version 10 statistical software package. The study found that the PMTCT guidelines were not properly adhered to by the nurses and the mothers. Prophylactic treatment was not provided as required. The uptake of HIV test at 18 to 24 months was low compared to at 6 weeks. There was no significant difference between HIV transmission rate at six weeks and at 18 to 24 months of age. No factors were associated with the transmission rate.

**Keywords:** Mother-to-child transmission, Prevention, Programme

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### I. Introduction

Mother-to-child transmission (MTCT) of the Human Immunodeficiency Virus (HIV) is the commonest source of HIV infection among children. MTCT can take place in utero, during labour and after birth due to breastfeeding <sup>[1]</sup>. In 2013, 240,000 infants were infected with HIV globally, off which more than 90% of those infants were living in sub-Saharan Africa. In the absence of appropriate and affective Prevention of Mother-to-Child Transmission (PMTCT) programme, about 15% to 34% of infants may be infected with HIV through vertical transmission which may result in more children dying of HIV <sup>[2]</sup>. In South Africa, PMTCT programme was implemented nationally in 2002. At the time, the programme consisted of interventions, including routinely offered voluntary counselling and testing (VCT), counselling on child feeding practices, safe non-invasive obstetric procedures, single-dose Nevirapine (NVP), and the provision of infant formula feeding <sup>[3,4]</sup>. In 2008, the National Department of Health revised the PMTC guidelines to dual therapy, using NVP and Zidovudine (AZT) instead of only NVP in addition to the safe maternal and child practices indicated above <sup>[3,4]</sup>. The last HIV test was done when children were 18 to 24 months <sup>[4]</sup>.

The implementation of the dual therapy managed to lower the mother-to-child transmission rate at 6 weeks of age from 2.9% in 2010 to 2.1% in 2012 <sup>[5]</sup>. Despite the decrease in MTCT rate at 6 weeks, an increase of MTCT from 2.6% at six weeks to 4.3% at 18 months was reported in South Africa, while Nigeria reported an increase from 0.6% in infants younger than six weeks to 16.1% on children aged 18 months <sup>[5,6]</sup>. This study aimed at identifying factors associated with the HIV transmission rate on children aged 18 to 24 months on PMTCT program. The aim is to contribute to nursing knowledge, thereby encouraging nurses to treat patients holistically while assisting health service managers to track the progress on PMTCT implementation and evaluate the extent of service provision and proficiency.

### II. Methodology

A quantitative retrospective descriptive correlational design was applied in the study. The study was conducted in two primary health care facilities in South Africa, Gauteng province, Tshwane district. Study population consisted of mothers bringing their HIV exposed children for child health services like Prevention of Mother-to-Child Transmission of HIV (PMTCT) and the records of all children on PMTCT aged 18 to 24

months old. Only biological mothers were included in the study. Fathers and other relatives were excluded as measure to maintain confidentiality of the mother's HIV status. A non-probability convenience sampling was used to select the sample. Sixty mothers bringing their HIV exposed children for child health services (IMCI, EPI & PMTCT) and 152 records of children aged 18 to 24 months on PMTCT were selected. Data was collected from July to September 2012. Data was collected two phases. In the first phase, data was collected from the mothers of the children on the PMTCT programme aged 18 to 24 months old, using the structured questionnaire. Mothers of exposed children were identified through their children's records, approached and requested to participate as they were queuing for the services and their children's records were also reviewed. In the second phase, the rest of children's clinic records were reviewed, using the data-collection form.

### **III. Data Analysis**

Data was analysed using the SAS/JMP version 10 statistical software package. The analysis included descriptive and inferential statistics, such as frequency of distribution, measure of central tendency and measures of variability. The presence or absence of relationships among variables and statistical differences was established using the Chi-square.

### **IV. Ethical Consideration**

The study was approved by Health Studies Research and Ethics Committee of University of South Africa (UNISA) and the Tshwane Research Committee. Permission to conduct the study was granted by the facility managers of the two clinics. Participation was voluntary and all mothers signed an informed consent. Questionnaires and data collection forms were completed anonymously. Privacy was provided during data collection and the data collection tools were kept in locked cupboard for safeguarding. Justice was prompted by including all mothers visiting the clinic for child health services and all records of the children on PMTCT aged 18 to 24 months.

### **V. Validity And Reliability**

To ensure face and content validity of the instruments, literature relevant to the research topic was reviewed in order to ensure that the data-collection form contained the content necessary to measure the factors associated with HIV infection rate in 18 to 24 month-old children on the PMTCT programme. Reliability was ensured by pretesting the data collection form on five records. Supervisor's and statistician's assistance was sought to ensure that the tool was standardised to reduce variation between measures. All the observed shortcomings were addressed during the revision of the instruments. Lack of reliability testing was a drawback in this study.

## **VI. Results**

### **6.1 Findings from the mothers**

#### **6.1.2 Socio-demographic characteristics of mothers**

A total of 60 mothers completed a questionnaire. All were above 18 years old with the mean age of 30 years. Forty (66.7%) were single; 19 (31.7%) were married, while 1 (1.7%) was widowed. Of the mothers, thirty four (55.9%) were unemployed; 5 (8.5%) were self-employed, 20 (33.9%) were permanently employed, while 1 (1.7%) was a student. Majority (57%; n=20) of the unemployed mothers received financial support from their partners and spouses; 20.0% (n=7) from their parents; 5.7% (n=2) from their siblings, while 17.1% (n=6) received financial support from other sources (social grant). Most of the mothers (76.7%; n=46) had 2 or more children and only 23.3% (n=14) had one living child.

#### **6.1.3 Status and adherence to ART**

All mothers were on ART and there was not much difference between mothers (45.8%, n=27) who were on ART before recent pregnancy and mothers (54.2%, n=32) who started ART during the recent pregnancy. According to mothers, 59 (98%) children were administered NVP within 72 hours after birth while only 1 (1.7%) was not. Majority of mothers (96.7%; n=58) were provided with NVP by the nurse/doctor to administer to their children at home after discharge, while 3.3% (n=2) were not. No reason was indicated. All mothers were administering the NVP daily to their children. From the 58 mothers, 42 (72.4%) were provided with NVP at the clinic during their follow-up visits. TABLE 1 revealed an association between respondents' source of financial support and the provision of NVP at follow-up visits. It appeared that the unemployed mothers who were supported by their husbands were more likely to be provided with NVP on follow-up visits as compared to these who received support from others (Chi-square value  $\chi^2=10.534$ ,  $df=4$ ,  $p\text{-value}=0.323$ ). Eighteen (31.6%) stopped administering NVP to their children at 6 weeks, 27.1% (n=16) terminated between 6 weeks and 6 months, and 20.3% (n=12) terminated between 6 and 12 months because they were no longer breastfeeding and their children HIV negative.

**Table 1.** Association between respondents' source of financial support and the provision of NVP at follow-up visits

Unemployed respondents' source of financial support	Provision of NVP at follow-up visits			
	Always		Never	
	n	%	N	%
Husband	11	32.4	0	0.0
Partner	7	20.6	2	5.9
Parents	2	5.9	4	11.8
Siblings	2	5.9	0	0.0
Other	4	11.8	2	5.9

**6.1.4 Provision and adherence of Cotrimoxazole treatment**

According to mothers, forty four (73.3%) children were initiated on Cotrimoxazole (CTX) treatment at 6 weeks after birth; 3.3% (n=2) were initiated after 6 weeks, while 23.3% (n=14) were never on treatment. No reason was given for those that were never started on treatment and those that were initiated later than 6 weeks of age. Thirty four (56.7%) mothers always received the CTX treatment on their follow-up clinic visits, 3.3% (n=2) only received it sometimes, while 40% (n=24) never received it at all during all their follow-up visits. No reason was indicated for not receiving it always. TABLE 2 an association between unemployed respondents' source of financial support and administration of CTX treatment revealed. It appeared that the unemployed mothers who were financially supported by husbands and partners started their children on CTX treatment at 6 weeks compared to those financially supported by their parents, siblings or others (Chi-square value  $\chi^2=21.409$ ,  $df=8$ ,  $p$ -value=0.0061). Twenty nine (48.3%) mothers terminated the treatment when the children were between 6 weeks and 6 months old; 26.7% (n=16) did so at between 6 and 12 months; 1.7% (n=1) did so when the child was 12 to 18 months old.

**Table 2:** Association between unemployed respondents' source of financial support and administration of CTX treatment

Source of financial support for the unemployed respondents	Age at which CTX treatment was started					
	At 6 weeks		After 6 weeks		Never	
	n	%	n	%	N	%
Husband	10	90.9	0	0.0	1	9.1
Partner	6	66.7	0	0.0	3	33.3
Parents	4	57.1	0	0.0	3	42.9
Siblings	1	50.0	1	50.0	0	0.0
Other	3	50.0	0	0.0	3	50.0

**6.1.5 Mothers' breast conditions while breastfeeding**

Only 9.0% (n=3) of mother experienced engorged/full and painful breast while breastfeeding, while 91% (n=30) of mothers did not.

**Findings from children's clinical records**

**6.2.1 Demographic information**

Hundred and fifty two records were reviewed. Twelve (7.9%) children were 18 months old; 33 (31.7%) were 19-20 months old; 44 (28.9%) were 21-22 months old, while 63 (41.4%) were aged 23-24 months. The mean age of the children was 22 months. Eighty (53.9%) of the children were males and 70 (46.1%) were females.

**6.2.2 Provision of PMTCT prophylactic treatment (NVP and CTX)**

According to the records, all the children (100.0%; N=152) were born in a health care facility and all were provided with NVP treatment within 72 hours of birth. Ninety nine (66.0%) were not provided with NVP at follow-up visits, while 34.0% (n=51) were provided with NVP at all visits for the duration of breastfeeding. Of the children who were not provided with NVP at follow-up visits, 18.1% (n=18) were breastfed beyond 6 months and stopped before they reached 15 months. Seventy one (47.3%) stopped NVP at 6 weeks; 27 (18.0%) stopped between 6 weeks and 6 months; 20 (13.3%) stopped between 6 and 12 months; 4 (2.7%) stopped between 12 and 18 months Majority 98.6% (n=150) of the children were started on CTX treatment at 6 weeks and 1.3% (n=2) children were never started on treatment. It appeared from the records that less than half (33.0%; n=50) of the children were provided with CTX treatment to take home at follow-up visits, while 67.0% (n=102) were not. Of the children who were not provided with CTX at their follow-up visits, 12.7% (n=13) were breastfed beyond 6 weeks of age. Majority (79.0%; n=120) of the children stopped the CTX treatment between 6 weeks and 6 months; 16.4% (n=25) stopped between 6-12 months; 3.3% (n=5) stopped between 12-18 months, and 1.3% (n=2) were never put on the treatment.

### 6.2.3 Duration of breastfeeding

More than half (53.6%; n=81) of the children were never breastfed; from those (46.3%; n=7) who were breastfed, 5.3% (n=8) stopped breastfeeding at 6 weeks; 23.8% (n=36) stopped between 6 weeks and 6 months; 10.6% (n=16) stopped between 6 and 9 months; 5.3% (n=8) stopped between 9 and 12 months, while 1.3% (n=2) stopped between 12 and 15 months. An association was found between the duration of breastfeeding and age at which NVP was stopped. Children who were not breastfed either stopped NVP at 6 weeks or did not administer NVP at all (Chi-square value  $\chi^2=199.332$ ,  $df=20$ ,  $p\text{-value}<.0001$ ).

**Table 3:** Association between the duration of breastfeeding and age at which NVP was stopped

Duration of breastfeeding	Age at which NVP was stopped									
	6 weeks		6 weeks-6 months		6-12 months		12-18 months		N/A	
	N	%	N	%	n	%	n	%	n	%
Never	56	70.0	4	5.0	0	0.0	0	0.0	20	25.0
6 weeks	3	37.5	3	37.5	0	0.0	0	0.0	2	25.0
6 weeks-6 months	10	28.6	18	51.4	3	8.6	0	0.0	4	11.4
6-9 months	0	0.0	1	6.3	14	87.5	0	0.0	1	6.3
9-12 months	2	25.0	1	12.5	2	25.0	3	37.5	0	0.0
12-15 months	0	0.0	0	0.0	0	0.0	1	50.0	1	50.0

An association was also found between the duration of breastfeeding and receiving CTX to take home at follow-up visits. Most children who were not breastfed did not appear to receive CTX to take home at follow-up visits (Chi-square value  $\chi^2=69.153$ ,  $df=5$ ,  $p\text{-value}<.0001$ ).

**Table 4:** Association between the duration of breastfeeding and receiving CTX to take home at follow-up visits

Duration of breastfeeding	Receiving CTX to take home			
	Yes		No	
	N	%	N	%
Never	4	4.9	77	95.1
6 weeks	2	25.0	6	75.0
6 weeks-6 months	24	68.6	11	31.4
6-9 months	11	68.8	5	31.3
9-12 months	6	75.0	2	25.0
12-15 months	2	100.0	0	0.0

### 6.2.4 Frequency of follow-up visits

Eighty (52.6%) children were brought to the clinic for follow-up visits at least once a month in the first 12 months of age, while 47.4% (n=72) were loss to follow-up before 12 months. Children who attended follow-up visits at least once a month were more likely to receive CTX to take home than those who attended less frequently (Chi-square value  $\chi^2=12.665$ ,  $N=151$ ,  $df=2$ ,  $p\text{-value}=0.0018$ ). Only 23.7% (n=36) attended their follow-up appointments as arranged with the nurse at the clinic, while (76.3%; n=116) did not comply. Children who attended follow-up visits significantly more regularly as arranged with the clinic nurse stopped NVP treatment when they were between 12 and 18 months old (Chi-square value  $\chi^2=11.597$ ,  $N=152$ ,  $df=4$ ,  $p\text{-value}=0.0206$ ).

### 6.2.5 Treatment of Oral thrush

According to the records only 13 (8.6%) children treated for mouth thrush/sores, 7.7% (n=1) were treated before 6 weeks; 69.2% (n=9) were treated between 6 weeks and 6 months; 15.4% (n=2) were treated between 6 and 12 months, while 7.7% (n=1) were treated between 12 and 18 months.

### 6.2.6 Children's HIV test results

The HIV PCR testing rate was 99.3% (n=151) at six weeks, and 24.3% (n=37) at six weeks post cessation of breastfeeding. The rapid HIV testing rate was 37.5% (n=57) at 18 months. The HIV transmission rate was 1.3% (n=2) at 6 weeks; 8.1% (n=3) at 6 weeks post-cessation of breastfeeding, and 1.8% (n=1) at 18 months. Cumulative transmission rate from 6 weeks post-cessation of breastfeeding to 24 months was 3.8%. No factors were associated with the MTCT rate.

## VII. Discussions

### 7.1 Findings from mothers

In this study, maternal age and parity status were not associated with HIV transmission rate. Lack of association between maternal age and HIV transmission rate was also reported in South Africa<sup>[7]</sup>. In contrast, the study in Rwanda reported a high transmission rate of 6.8% was among children born to young mothers (15 to 24 years) as compared to 1.5% transmission rate among children born to mothers aged 35 to 39 years<sup>[8]</sup>. The findings in this study implies that the age and parity status of the mother does not predispose the child to HIV transmission. All mothers were on ante-retroviral treatment (ART). Some mothers (28% [n=17]) started ART before the recent pregnancy, while others (72% [n=43]) started during pregnancy. No association was found between mothers who were already on ART before pregnancy and those who started ART during the recent pregnancy with the HIV transmission rate on these children. These findings implies that starting ART prior pregnancy is as effective as starting during pregnancy in reducing the transmission rate. Children born to mothers who started ART before or during pregnancy are less likely to be infected compared to those whose mothers were not on ART during pregnancy<sup>[8]</sup>. In addition to the mother being on ART, giving birth in a health care institution offered an opportunity for HIV exposed children to receive NVP treatment within 72 hours after birth. The study found a high NVP adherence level (98% [n=59]) within 72 hour after birth, in contrast to 67.8% and 78% level of adherence found in Ethiopia and Nigeria respectively<sup>[6,9]</sup>. Irrespective of the high adherence level found in the study, it is of concern that not all mothers (3.3%; n=2) were given NVP to administer to their children at home. It is clear that there were some inconsistencies in the implementation of the PMTCT guidelines. Some children were given NVP treatment according to the recommendations on the guidelines, while some were not. Despite the inconsistencies, more than two-thirds (72.4%; n=42) of the children, were provided with NVP at the clinic during their follow-up visits. All these children stopped the treatment because mothers were on lifelong ART (31.6%; n=18), while others were HIV negative and no longer exposed (68.4%; n=39).

Although there were inconsistencies regarding the implementation of PMTCT program, majority (73.3%) of the children were initiated on CTX at six weeks of age as compared to 33% initiation rate found KwaZulu- Natal, South Africa<sup>[10]</sup>. All the children in this study were no longer on CTX at 18 to 24 months. The treatment was stopped because the children tested HIV negative and were no longer breastfeeding. In this regard, nurses did follow the PMTCT guidelines regarding the termination of CTX treatment. HIV-exposed children should stop CTX treatment only if they tested HIV negative and are no longer breastfeeding<sup>[11]</sup>. Being supported financially by the spouse or partner was found to be a positive contributory factor to adherence to medication. Because unemployed mothers who were financially supported by their husbands were found to be more likely to be provided with NVP on follow-up visits; and they started their children on CTX on the correct time (at six weeks) as compared to those who were financial supported by their parents, sibling or others. No association was found between adherence to prophylactic treatment (NVP and CTX) and HIV transmission rate. Engorged/full painful breast was the only breast condition experienced by 6.0% (n=2) of mothers. In this study breast conditions or clinical mastitis was not associated with HIV transmission rate. In contrast, the study conducted in Zimbabwe reported an association between clinical mastitis and HIV transmission<sup>[12]</sup>.

### 7.2 Findings from children's clinical records

From clinical records, the study found high level (100%; N=152) of adherence to NVP treatment within 72 hours of birth, mainly because all children were born in a health care facility. Similarly, a study in Zimbabwe reported an association between place of birth and adherence to NVP treatment within 72 hours of birth where non-adherence was associated with home deliveries<sup>[13]</sup>. These findings implies that giving birth in a health care setting increases the chances of the child receiving NVP treatment. Despite 100% adherence within 72 hours of birth, it was evident that not all children (18.1%) received NVP on follow-up visit and not all (12.7%) were initiated no CTX treatment at six weeks of age, even though the children were still breastfed and mothers not on lifelong ART. The findings indicate non-compliance to PMTCT guidelines. All HIV-exposed children who were breastfed should be on NVP and CTX treatment until they stopped breastfeeding and tested HIV negative<sup>[11]</sup>. All children were no longer on CTX treatment at 18 to 24 months. Majority (79.0%; n=120) stopped the treatment before 6 months. In South Africa, continuing or discontinuing of CTX treatment after 6 months was associated with the availability of the children's HIV test results. A larger proportion of children with unknown HIV status were continuing with CTX treatment regardless of their age<sup>[10]</sup>. This implies that when the child is tested HIV negative and is no longer breastfed, the CTX treatment will be discontinued; where else if the status is unknown the treatment will be continued regardless of the feeding practice and the age. In this study no association was found between the adherence to prophylactic treatment (NVP and CTX) and the HIV transmission rate.

The duration of breastfeeding was shorter in this study compared to the study in Tanzania where 72% of the children were breastfed beyond 12 months<sup>[14]</sup>. Many of the children in this study stopped breastfeeding

prior to the recommended 12 months period <sup>[11]</sup>. No association was found between the duration of breastfeeding and HIV transmission rate. An association between the feeding practice and the administration of prophylactic treatment was found. NVP and CTX treatment was not issued at follow-up visits to 95% of those children who never breastfed. Children who are not breastfed received NVP treatment for the first 6 weeks, while they only got CTX once at 6 weeks. The findings were congruent with the recommendations of PMTCT guidelines.

Incidence of mouth thrush were less in this study (8.6%; n=13) and was not associated with HIV transmission, though oral thrush was found to be a risk factor for HIV transmission through breastfeeding <sup>[15]</sup>. Instead CTX administration was found to be associated with development of mouth thrush. Children (9.3%) who were given CTX daily were less prone to develop mouth sores/thrush compared to those (25%) who were not given CTX. The effects of CTX in the prevention of opportunistic infections, in this case mouth sores/thrush was evident from the fact that only a few of the children who received CTX developed mouth sores/thrush <sup>[10]</sup>. All (100%; n=152) were brought to the clinic at least once within 6 weeks of age as compared to 76% and 52% South Africa and Ethiopia respectively <sup>[16,17]</sup>. In this study bringing the children to the clinic at 6 weeks of age gave an opportunity for conducting first HIV PCR test on all of them. Non-compliance of follow-up visits as arranged with the clinic nurse was evident (76.3%; n=116) once the child was older than 6 weeks. Just below half (47.0%; n=72) of the children were lost to follow-up before 24 months. It has been found that when children test HIV negative, mothers decide that is no longer necessary for them to come for follow-up visits <sup>[18]</sup>.

The HIV testing rate was high (99.3%; n=151) at six weeks, decreasing to 24.3% (n=37) at six weeks post cessation of breastfeeding and 37.5% (n=57) at 18 months to 24 months of age. The HIV transmission rate was 1.3% at 6 weeks, which was lower than 4.9% found in the study conducted in Gauteng, South Africa <sup>[7]</sup>. An increase in transmission rate to 8.1% at six weeks post cessation of breastfeeding was evident, followed by a decrease to 1.8% at 18 months. The 8.1% transmission rate at 6 weeks post-cessation of breastfeeding seemed high possibly because of the low uptake of the test, while the transmission rate at six weeks and 18 months was consistent with the target of <2% transmission rate set by NDoH <sup>[19]</sup>. Regardless of the 1.8% transmission rate at 18 to 24 months which seem to be low, it is of importance to consider cumulative transmission rate (3.8%) from 6 weeks post-cessation of breastfeeding to 24 months. As it reflects an increase in transmission rate on breastfed children. The increase indicates the need to test breastfed children on continuous or regular bases as a measure to effectively monitor the transmission rate. Testing children for HIV at 6 weeks was acceptable, while testing at 6 weeks post-cessation of breastfeeding and at 18 to 24 months appeared to be a problem. Mothers who never breastfed their children often consider the 6 weeks test as final because their children are not exposed to their breast milk and tend not to return for further testing <sup>[17]</sup>. No factors were found to be associated with the HIV transmission rate at 18 to 24 months.

One of the limitations in this study is the small maternal sample. Maternal factors like duration of ART during pregnancy and adherence to pediatric prophylaxis was only accessed on 60 mothers who brought their 18 to 24 months old children for PMTCT follow-up and other child health services.

## **VIII. Recommendations**

### **8.1 In light with the findings from the study, the following recommendations are proposed.**

1. Nurses should be trained on HIV management and PMTCT and follow National Department of Health guidelines at all times when offering health care services.
2. Mothers should be educated and counseled individually at all clinic visits about the importance of compliance to PMTCT prophylactic treatment; and of bringing their children to the clinic for follow-up as recommended by the nurses.
3. Further health education on HIV and PMTCT to all people through mass media could assist in reducing the level of stigma around HIV and in turn increasing adherence to medication and compliance to follow-up visits.
4. Emphasis should be made on the importance of testing the children for HIV to all mothers, especially at 6 weeks post-cessation of breastfeeding and at 18 months. As this is the only measure utilized to assess the effectiveness of the programme by the department.
5. The Department of Health should come up with the strategy for testing all HIV exposed children at regular or periodic basis, especially those that are breastfeeding.

## **IX. Conclusion**

Even though no factors were associated with the HIV transmission rate in 18 to 24 month-old children, association among other factors indicate the need for health care providers and mothers to consider all factors affecting compliance PMTCT requirements. The reduction of vertical HIV transmission depends on effective administration and implementation of the PMTCT programme by all stakeholders. All health care workers should comply with the PMTCT guidelines while providing service to ensure that all patients get the correct

treatment. Health education and counselling is essential to help patients and communities understand HIV and the PMTCT programme. This should, in time help facilitate and foster adherence to medication and other health information.

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