

VIII. CARE OF CHILDREN BORN TO HIV-INFECTED MOTHERS

TABLE OF CONTENTS

INTRODUCTION	VIII-1
RECOMMENDATIONS FOR MANAGEMENT OF MOTHERS WITH HIV INFECTION	
DURING LABOUR AND DELIVERY	VIII-1
RECOMMENDATIONS REGARDING BREASTFEEDING	VIII-2
RECOMMENDATIONS FOR MANAGEMENT OF INFANTS BORN TO MOTHERS WITH HIV INFECTION	VIII-3
ARV Prophylaxis.....	VIII-3
Diagnosis of HIV Infection in Infants	VIII-3
Prophylaxis against <i>Pneumocystis jiroveci</i> (Formerly <i>Pneumocystis carinii</i>) Pneumonia (PCP)	VIII-4
Immunisations	VIII-4
Growth and Nutrition.....	VIII-5
Follow-Up Care	VIII-5
REFERENCES	VIII-12
APPENDIX A: WHO CLINICAL CASE DEFINITION FOR PAEDIATRIC AIDS	VIII-7
APPENDIX B: WHO STAGING SYSTEM FOR HIV INFECTION AND DISEASE IN CHILDREN	VIII-8
APPENDIX C: 1994 CDC REVISED HUMAN IMMUNODEFICIENCY VIRUS PAEDIATRIC	
CLASSIFICATION SYSTEM: CLINICAL CATEGORIES	VIII-9
APPENDIX D: INTERVENTIONS TO REDUCE THE RISK OF MTCT: SUMMARY OF THE EVIDENCE	VIII-11

VIII: CARE OF CHILDREN BORN TO HIV-INFECTED MOTHERS

INTRODUCTION

The great dichotomy between the various Caribbean countries in their economic development and healthcare resources, as well as the region's varied religious and cultural beliefs, impact greatly on the implementation of prevention of mother-to-child transmission (PMTCT) programmes and on the subsequent care available to HIV-exposed infants. While these guidelines represent the ideal, modifications will need to be made to meet each country's resources. As such, the advent of funding from international agencies, such as The Clinton Foundation and The Global Fund to Fight AIDS, Tuberculosis and Malaria, should encourage the improvement of facilities to meet the challenges of the HIV/AIDS epidemic in the Caribbean. Many Caribbean nations have already commenced national PMTCT programmes, and preliminary results suggest an excellent uptake of interventions and outcomes.¹

RECOMMENDATIONS FOR MANAGEMENT OF MOTHERS WITH HIV INFECTION DURING LABOUR AND DELIVERY

The following specific interventions are recommended to reduce the risk of MTCT as well as the risk of HIV exposure to personnel assisting with the delivery:

- Universal precautions should be followed (e.g. gowns, gloves, boots, and protective eyewear should be worn during the deliveries of all patients).
- Unnecessary invasive procedures should be avoided.
- Episiotomies should be avoided unless clearly indicated.
- Artificial rupturing of the membranes should be avoided.
- Prolonged rupturing of membranes should be avoided, since rupture of membranes for more than four hours is associated with an increased risk of HIV transmission to the infant.
- The use of straight suture needles should be avoided, if possible, to reduce the risk of needle-stick injury.
- Umbilical cords should be clamped and cut immediately after delivery, and, if possible, the use of a scalpel to cut umbilical cords should be avoided.
- Special care in handling placentas should be exercised.
- Infants should be handled with gloves until bathing, and infants should be bathed as soon as possible with soap and water.
- Infants' eyes should be cleaned with sterile swabs.
- Routine post-delivery care should be performed, including weighing and measuring of infants.
- Infants should receive antiretroviral (ARV) prophylaxis as outlined below.
- Examinations of infants by a paediatrician should be performed as soon as possible.

Specific recommendations regarding the administration of antiretroviral therapy (ART) to mothers to reduce the risk of HIV transmission to infants are reviewed in *Chapter VII: Antiretroviral Therapy in Pregnant Women and Prevention of Mother-to-Child Transmission of HIV*. Evidence from clinical trials that forms the basis of these recommendations is summarised in *Appendix D* of this chapter.

RECOMMENDATIONS REGARDING BREASTFEEDING

The following specific interventions are recommended to minimise the risk of HIV transmission via breastfeeding:

- Mothers should be counselled about the risks of HIV transmission via breastfeeding and the benefits associated with breastmilk substitutes.
- Mothers should be counselled regarding the increased risk of HIV transmission if breastfeeding and breastmilk substitutes are combined.
- Replacement feeding should be provided to infants of HIV-infected mothers who cannot afford breastmilk substitutes and choose not to breastfeed. Infants require about 150mL of milk/kg per day.
- A source of potable water should be ensured.
- Mothers should be provided with a supply of breastmilk substitutes on their last antenatal visit or prior to discharge from the hospital.
- Infants should be referred to a nutritional clinic for follow-up of growth.
- Mothers should be taught hygienic preparation of replacement feeds prior to and after delivery.
- Mothers should be taught how to cup-feed their infants.
- If mothers choose to breastfeed, they should be taught good breastfeeding techniques to help prevent and treat breast problems that can increase the risk of HIV transmission.

Breastfeeding women with indications for antiretroviral therapy for their own health should receive and continue standard HAART during and after lactation. Thus, if the mother was already on HAART at the time she became pregnant, or if she initiated HAART during pregnancy for her own health needs, then HAART should be continued.

Where feasible and acceptable alternatives exist, efforts should be made to discourage HIV-infected mothers from breastfeeding in order to interrupt this potential route of HIV transmission to infants. However, for many women in resource-limited countries, breastmilk alternatives are not acceptable, feasible, affordable, sustainable, and safe. If an infant is breastfed, exclusive breastfeeding is recommended, with weaning as soon as possible (e.g. at age three to six months). Exclusive breastfeeding means giving infants only breastmilk and no water, other liquids, or solid foods except prescribed medicines. While the use of expressed and heat-treated breastmilk has been suggested, data are limited on the efficacy of heat treatment in reducing HIV in breastmilk and on the effect of such heat treatment on constituents of breastmilk (including immune constituents) that are important for the infant's health. Therefore, the use of heat-treated breastmilk cannot be generally recommended at this time, although further research on this approach is warranted.

In developing countries in which clean water and formula-feeding knowledge are limited, the balance of risks (infectious diseases and malnutrition) and benefits (health and survival benefits to infants and contraceptive, economic, and social benefits to mothers) could be shifted.² Thus, in 1987 and 1992, WHO's Global Programme on AIDS recommended that in regions where infectious diseases and malnutrition are the primary causes of infant mortality, women should breastfeed irrespective of their HIV status.³

RECOMMENDATIONS FOR MANAGEMENT OF INFANTS BORN TO MOTHERS WITH HIV INFECTION

ARV PROPHYLAXIS

Infants should be administered antiretroviral prophylaxis to reduce the risk of MTCT. Typical options include:

- single-dose (SD) nevirapine (NVP); or
- zidovudine (AZT) for one week;* or
- SD NVP plus AZT for one week.*

The exact ARV prophylaxis regimen and timing of administration depends in part on what therapy (if any) mothers received during antenatal care and during labour and delivery. These regimens are summarised in *Chapter VII: Antiretroviral Therapy in Pregnant Women and Prevention of Mother-to-Child Transmission of HIV*.

DIAGNOSIS OF HIV INFECTION IN INFANTS

HIV DNA PCR (polymerase chain reaction) should be performed at age six to eight weeks followed by serial DNA PCRs. Two consecutive positive DNA PCRs are considered diagnostic of HIV infection.

If this is not available, then all children should have HIV ELISA done at age eighteen months. Prior to diagnosis, all children are to be monitored clinically for any signs or symptoms of HIV infection.

The early diagnosis of HIV infection in infants is challenging in resource-constrained countries, both from a diagnostic and therapeutic perspective. Tests for antibodies to HIV do not establish the presence of HIV infection in infants due to the transfer of maternal antibodies; therefore, a virologic test is required. PCR-based techniques that directly detect the existence of HIV in the plasma allow diagnosis by age one month. Approximately 30% of infants with HIV infection will have a positive DNA PCR result from samples obtained before age forty-eight hours, 93% are detectable by age two weeks, and almost all are positive by age one month. A single DNA PCR has a sensitivity of 95% and a specificity of 97% on samples collected after age one month.

Serial qualitative DNA PCR is currently the accepted standard for diagnosis of HIV infection. Two positive assays drawn at separate time points are considered diagnostic of infection.⁴ Assays that detect HIV RNA in plasma appear to be as sensitive as HIV DNA PCR, with sensitivities of 90% to 100% by age two to three months. Specificity is also comparable. Some clinicians choose to use an HIV RNA assay as the confirmatory test for infants testing HIV DNA PCR-positive. HIV culture can also be used for diagnosis but is more complex and expensive to perform, and definitive results are not available for four weeks. The use of p24 antigen testing alone is not recommended because of the high frequency of false-positive assays.⁵

Although breastfeeding is discouraged in HIV-exposed infants in the Caribbean, if mothers still choose to breastfeed, it should be noted that the risk of HIV infection continues throughout the entire duration of breastfeeding. Therefore, a negative virologic test in early infancy does not negate the possibility of infection occurring subsequently if breastfeeding continues.

Ideally, prenatal HIV testing would identify infants born to infected mothers, and DNA PCR of these infants would identify those who are HIV-infected in early infancy. However, within the developing world, such as the Caribbean, tests that directly measure the presence of HIV itself (e.g. p24 antigen, or DNA or RNA PCR testing) are expensive and inaccessible to many. When early diagnosis is not possible, clinical parameters are used to assess the possibility of HIV infection. The most common signs

*Consider an extended course (four to six weeks) of AZT therapy for the infant if the mother received less than four weeks of partum ART.

of HIV infection in infants include failure to thrive, hepatosplenomegaly, and diffuse adenopathy. HIV-infected children may also present with frequent or chronic diarrhoea, frequent minor bacterial infections such as otitis media and sinusitis, refractory thrush, and severe refractory non-infectious skin manifestations.

The WHO has formulated both a case definition and a staging system for AIDS, given the challenges in resource-poor settings regarding diagnosing HIV infection in children prior to age eighteen months (see *Appendix A* and *Appendix B*).⁶ The WHO recognises that the current staging system for HIV infection in children has its limitations, and is currently revising its staging system, since many of the clinical symptoms in the paediatric stages are not specific for HIV infection and may overlap those seen in children without HIV infection in resource-limited settings.⁷ The U.S. Centers for Disease Control and Prevention (CDC) has also developed a surveillance definition for AIDS without laboratory evidence of HIV infection, as summarised in *Appendix C*.⁸ Despite the possible overlap with other infections, until a definitive diagnosis can be made, the use of these clinical classifications can be useful in helping to define the parameters for initiation of HAART.

PROPHYLAXIS AGAINST PNEUMOCYSTIS JIROVECI (FORMERLY PNEUMOCYSTIS CARINII) PNEUMONIA (PCP)

The majority of paediatric PCP cases occur during the first year of life and may occur before HIV infection is documented or a decline in the CD4+ T cell count is observed. PCP prophylaxis is therefore recommended for all HIV-infected infants as well as for those whose HIV status is indeterminate.⁹ Prophylaxis is initiated at age four to six weeks, following the completion of AZT prophylaxis, and continued until it is established that the child is not HIV-infected.

Trimethoprim-sulfamethoxazole (TMP-SMX; co-trimoxazole) is the agent of choice. Several dosing options can be recommended:

- TMP-SMX, 5mg/kg/day of the TMP component administered orally in divided doses twice daily and administered seven days per week;
- TMP-SMX, 5mg/kg/day of the TMP component administered orally divided twice daily and administered three times per week on alternate days (e.g. Monday-Wednesday-Friday);
- TMP-SMX, 5mg/kg/day of the TMP component administered orally in divided doses twice daily and administered three times per week on consecutive days (e.g. Monday-Tuesday-Wednesday);
- TMP-SMX, 5mg/kg/day of the TMP component administered orally as a single daily dose and administered three times per week on consecutive days (e.g. Monday-Tuesday-Wednesday).

No data from randomised clinical trials exist to guide the clinician in deciding between daily versus thrice-weekly dosing of TMP-SMX. Theoretically, daily dosing has the added advantage of offering the infant more protection against other pathogens such as *T. gondii* and some bacterial infections. However, daily TMP-SMX dosing may result in a higher incidence of bone marrow toxicity than thrice-weekly dosing. United States treatment guidelines endorse the thrice-weekly regimen as the preferred dosing schedule, whereas the WHO generally recommends daily dosing. Current practices in the Caribbean vary as well: the Bahamas uses thrice-weekly dosing, whereas Jamaica reports excellent outcomes using daily dosing (personal communications, P. McNeil and C. Christie).

If TMP-SMX is not tolerated, children age one month or older can be given dapsone, dosed at 2mg/kg (max 100mg) by mouth daily or 4g/kg (max 200mg) by mouth weekly.

IMMUNISATIONS

Immunisations for children who are HIV-infected (or HIV-exposed with unknown status) differ from those who are not immunocompromised. The section entitled *Recommendations for Use of Specific*

Vaccines in HIV-Infected Individuals in Chapter VI: Recommendations for Adult and Paediatric Opportunistic Infections Prophylaxis summarises the vaccination schedule for HIV-infected and HIV-exposed infants. Live vaccines are generally contra-indicated with the following exceptions: the measles, mumps and rubella (MMR) vaccine is recommended if the child is not severely immunocompromised; the varicella (VZV) vaccine should be considered if the CD4+ T cell percentage is $\geq 25\%$;¹⁰ and the oral polio vaccine (OPV) may be used for asymptomatic children if the inactivated polio vaccine (IPV) is not available.

GROWTH AND NUTRITION

Growth failure is a prominent feature of HIV infection; hence, nutritional assessment is important both as a diagnostic marker (when HIV status is unknown) and to maximise growth in infected children.¹¹

FOLLOW-UP CARE

Close monitoring of HIV-exposed and -infected infants is critical.

Prior to Discharge from Hospital

- Infants should be reviewed prior to discharge by a paediatrician or the most senior available clinician.
- Infants should be docketed and clinic follow-up ensured.
- Mothers should be taught how to administer ARV prophylaxis to their infants.
- Any issues that may prevent adherence to ARVs or to prophylactic medications should be investigated and addressed.
- A supply of replacement feeds should be provided to mothers and a date for an appointment with the nutritionist established.

Follow-Up in One to Two Weeks

- Routine physical examination of infants should be performed, including growth parameters.
- Adherence to ARV prophylaxis should be ensured.
- Any evidence of side effects of ARV prophylaxis should be monitored.
- Mothers should be advised to continue formula feeds and ensure hygienic preparation of same.
- Any concerns of the parents should be accessed and addressed.

Follow-Up at Six Weeks to Two Months

- Routine physical examination of infants should be performed.
- Growth and development should be assessed.
- ARV prophylaxis should be discontinued.
- TMP-SMX prophylaxis should be commenced, using one of the dosing options outlined on page VIII-5. TMP-SMX prophylaxis should be continued until it is established that the child is HIV-negative.
- Iron and vitamin supplementation should also be commenced.
- Blood samples for HIV DNA PCR testing should be drawn.
- Blood samples for other tests should be drawn, e.g. CBC and differential, TORCH screen, VDRL, and Hepatitis BsAg and HTLV-1 serology, as appropriate.
- Vaccination with pentavalent (DPT, Hib, and Hepatitis B (HBV)) and polio should be started. IPV is preferred, but if IPV is not available, OPV may be administered to asymptomatic infants.

- Continuation of formula feeds should be advised.
- Any medical problems should be treated.
- Any concerns of the parents should be accessed and addressed.

Follow-Up at Four Months

- Routine physical examination of infants should be performed.
- Growth and development should be assessed.
- Second dose of vaccinations should be given.
- Blood sample for second HIV DNA PCR testing should be drawn.
- TMP-SMX prophylaxis should be continued.
- Iron and vitamin supplementation should be continued.
- Continuation of formula feeds should be advised.
- Any medical problems should be treated.
- Any concerns of the parents should be accessed and addressed.

Follow-Up beyond Four Months

Ideally, HIV-exposed children should be followed up by a comprehensive team of paediatricians, nurses, and nutritionists. The routine follow-up schedule is similar to that of children who are not exposed to HIV. Subsequent to the four-month visit, patients should be seen again at age six months, then at three-month intervals or more frequently if indicated.

At Each Visit:

- Routine physical examination of infants should be performed.
- Growth and development should be assessed.
- Appropriate diet should be ensured.
- Adequate vaccination coverage should be ensured.
- TMP-SMX prophylaxis should be continued.
- Iron and vitamin supplementation should be continued.
- Any evidence of HIV or opportunistic infections (OIs) should be monitored.
- Any medical problems should be treated.
- Any concerns of the parents should be accessed and addressed.

Baseline follow-up physical examinations include temperature; measurement of weight, height, and head circumference (monitor on growth charts); and examination for thrush, adenopathy, skin eruptions, ear, nose, and throat infections, chest infections, abdominal organ enlargement, and neurological and developmental abnormalities.

APPENDIX A: WHO CLINICAL CASE DEFINITION FOR PAEDIATRIC AIDS

The presence of any **two major** and any **two minor** signs from those listed below, in the absence of other known causes of immunodeficiency:

Major Signs

- √ weight loss or abnormally slow growth
- √ chronic diarrhoea for more than one month
- √ prolonged or intermittent fever for more than one month

Minor Signs

- √ generalised lymph node enlargement
- √ oropharyngeal candidiasis (oral thrush)
- √ recurrent common infections
- √ persistent cough
- √ generalised dermatitis
- √ confirmed maternal HIV infection

APPENDIX B: WHO STAGING SYSTEM FOR HIV INFECTION AND DISEASE IN CHILDREN

Clinical Stage I:

- Asymptomatic
- Generalised lymphadenopathy

Clinical Stage II:

- Chronic diarrhoea for more than thirty days' duration in absence of known aetiology
- Severe persistent or recurrent candidiasis outside the neonatal period
- Weight loss or failure to thrive in the absence of known aetiology
- Persistent fever for more than thirty days' duration in the absence of known aetiology
- Recurrent severe bacterial infections other than septicaemia or meningitis (e.g. osteomyelitis, bacterial (non-TB) pneumonia, abscesses)

Clinical Stage III:

- AIDS-defining opportunistic infections
- Severe failure to thrive in the absence of known aetiology
- Progressive encephalopathy
- Malignancy
- Recurrent septicaemia or meningitis

APPENDIX C: 1994 CDC REVISED HUMAN IMMUNODEFICIENCY VIRUS PAEDIATRIC CLASSIFICATION SYSTEM: CLINICAL CATEGORIES

CATEGORY N: Not Symptomatic

Children who have no signs or symptoms considered to be the result of HIV infection or who have only one of the conditions listed in Category A.

CATEGORY A: Mildly Symptomatic

Children with **2** or more of the following conditions but none of the conditions listed in Categories B and C:

- Lymphadenopathy (>0.5cm at >2 sites; bilateral = 1 site)
- Hepatomegaly
- Splenomegaly
- Dermatitis
- Parotitis
- Recurrent or persistent upper respiratory infection, sinusitis, or otitis media

CATEGORY B: Moderately Symptomatic

Children who have symptomatic conditions, other than those listed for Category A or Category C, which are attributed to HIV infection. Examples of conditions in clinical Category B include, but are not limited to, the following:

- Anaemia (<8gm/dL), neutropaenia (<1,000/mm³), or thrombocytopaenia (<100,000/mm³) persisting >30 days
- Bacterial meningitis, pneumonia, or sepsis (single episode)
- Candidiasis, oropharyngeal (e.g. thrush) persisting for >2 months in children age >6 months
- Cardiomyopathy
- Cytomegalovirus (CMV) infection with onset before age 1 month
- Diarrhoea, recurrent or chronic
- Hepatitis
- Herpes simplex virus (HSV) stomatitis, recurrent (e.g. >2 episodes within 1 year)
- HSV bronchitis, pneumonitis, or oesophagitis with onset before age 1 month
- Herpes zoster (e.g. shingles) involving at least 2 distinct episodes or more than 1 dermatome
- Leiomyosarcoma
- Lymphoid interstitial pneumonia (LIP) or pulmonary lymphoid hyperplasia complex
- Nephropathy
- Nocardiosis
- Fever lasting >1 month
- Toxoplasmosis with onset before age 1 month
- Varicella, disseminated (e.g. complicated chickenpox)

CATEGORY C: Severely Symptomatic

- Serious bacterial infections, multiple or recurrent (e.g. any combination of at least 2 culture-confirmed infections within a 2-year period), of the following types: septicaemia, pneumonia, meningitis, bone or joint infection, or abscess of an internal organ or body cavity (excluding otitis media, superficial skin or mucosal abscesses, and indwelling catheter-related infections)
- Candidiasis, oesophageal or pulmonary (bronchi, trachea, lungs)
- Coccidioidomycosis, disseminated (at site other than or in addition to lungs or cervical or hilar lymph nodes)
- Cryptococcosis, extrapulmonary
- Cryptosporidiosis or isosporiasis with diarrhoea persisting >1 month
- CMV disease with onset of symptoms at age >1 month (at a site other than liver, spleen, or lymph nodes)
- Encephalopathy (at least 1 of the following progressive findings present for at least 2 months in the absence of a concurrent illness other than HIV infection that could explain the findings): a) failure to attain or loss of developmental milestones or loss of intellectual ability, verified by standard developmental scale or neuropsychological tests; b) impaired brain growth or acquired microcephaly demonstrated by head circumference measurements or brain atrophy demonstrated by CT or MRI (serial imaging is required for children age <2 years); c) acquired symmetric motor deficit manifested by 2 or more of the following: paresis, pathologic reflexes, ataxia, or gait disturbance; d) HSV infection causing a mucocutaneous ulcer that persists for >1 month; or e) bronchitis, pneumonitis, or oesophagitis for any duration affecting a child age >1 month
- Histoplasmosis, disseminated (at a site other than or in addition to lungs or cervical or hilar lymph nodes)
- Kaposi's sarcoma (KS)
- Lymphoma, primary, in brain
- Lymphoma, small, noncleaved cell (Burkitt's), or immunoblastic or large cell lymphoma of B-cell or unknown immunologic phenotype
- *Mycobacterium tuberculosis*, disseminated or extrapulmonary *Mycobacterium*, other species or unidentified species, disseminated (at a site other than or in addition to lungs, skin, or cervical or hilar lymph nodes)
- *Mycobacterium avium* complex or *Mycobacterium kansasii*, disseminated (at site other than or in addition to lungs, skin, or cervical or hilar lymph nodes)
- *Pneumocystis carinii* pneumonia (PCP)
- Progressive multifocal leukoencephalopathy (PML)
- *Salmonella* (nontyphoid) septicaemia, recurrent
- Toxoplasmosis of the brain with onset at age >1 month
- Wasting syndrome in the absence of a concurrent illness other than HIV infection that could explain the following findings: a) persistent weight loss >10% of baseline; OR b) downward crossing of at least 2 of the following percentile lines on the weight-for-age chart (e.g. 95th, 75th, 50th, 25th, 5th) in a child age ≥1 year; OR c) <5th percentile on weight-for-height chart on 2 consecutive measurements, ≥30 days apart PLUS a) chronic diarrhoea (e.g. at least 2 loose stools/day for >30 days); OR b) documented fever (for ≥30 days, intermittent or constant)

APPENDIX D: INTERVENTIONS TO REDUCE THE RISK OF MOTHER TO CHILD TRANSMISSION: SUMMARY OF THE EVIDENCE

HIV transmission from an HIV-infected mother to her infant occurs in 25% to 45% of cases without intervention. Primary prevention of Mother-to-Child Transmission (pMTCT) strategies include prevention of women becoming infected and counselling those who are HIV-positive on making informed choices about their reproductive health. With antiretroviral prophylaxis and nutritional supplementation, the risk of MTCT can be reduced to less than 5%.

In 1994, results of the Paediatric AIDS Clinical Trials Group study 076 (PACTG 076) showed a two-thirds reduction in perinatal transmission from HIV-infected women who received a complex regimen of AZT.¹² In developing countries, simplified AZT regimens in Thailand and Côte d'Ivoire have demonstrated transmission reductions of one-third in breastfeeding populations and one-half in non-breastfeeding populations.¹³ A trial in Uganda (HIVNET 012) of single-dose nevirapine (SD NVP) given to mother and neonate showed a reduction of approximately 50% in a breastfeeding population.¹⁴ More recently, short-course therapy with AZT plus 3TC decreased the transmission rate to between 6% and 15% in a breastfeeding population, and to 3% if breastmilk substitutes were implemented.¹⁵ In the United States, with the use of HAART, Caesarean delivery, and breastmilk substitution, transmission rates are less than 2%,¹⁶ and similar successes have been reported in Europe.¹⁷ In various Caribbean islands, PMTCT with AZT prophylaxis has reduced transmission rates from 27% to 44% to 5.5% to 9%.¹⁸ More recently, a Thai trial using AZT initiated during the second trimester plus SD NVP during labour followed by SD NVP plus one week of AZT for the infant resulted in a transmission rate of less than 2% in a non-breastfeeding population.¹⁹

The frequency of breastmilk transmission during acute maternal infection is estimated to be at 29%, and for women with established infection, the additional risk of transmission is estimated at 14%.²⁰ In a randomised clinical trial in Nairobi, the frequency of breastmilk transmission of HIV was 16.2%, and the majority of infections occurred early during breastfeeding. The use of breastmilk substitutes prevented 44% of infant infections and was associated with significantly improved HIV-free survival, which is a similar magnitude to the short-course regimens of AZT.²¹ A study on the influence of feeding patterns in MTCT showed that at age three months, 18.8% of infants who were not breastfed were estimated to be HIV-infected compared with 21.3% of those who were breastfed. The estimated proportion of infants HIV-infected by three months was significantly lower for those who exclusively breastfed than in those who received mixed feeding (14.6% versus 24.1%) and had a similar risk of transmission to no breastfeeding.²²

Additional information on the efficacy of interventions to reduce the risk of MTCT can be found in *Chapter VII: Antiretroviral Therapy in Pregnant Women and Prevention of Mother-to-Child Transmission of HIV* and in *Appendix A* of that chapter.

REFERENCES

- ¹St. John A. Reduction in perinatal transmission and mortality from human immunodeficiency virus after intervention with zidovudine in Barbados. *Pediatr Infect Dis J* 2003;22(5):422-5 **and** Jack N, Edwards J, et al. Reduction of perinatal HIV transmission in Trinidad and Tobago: a pilot study (Abstract ThPeC5304). *International Conference on AIDS*, 2000:13 **and** Gomez MP, Bain RM, et al. Zidovudine reduces vertical transmission of HIV in the Bahamas: a conference on global strategies for the prevention of HIV transmission from mothers to infants, Washington, DC, 3-6 September 1997 **and** Christie CDC. "A paediatric and perinatal HIV/AIDS leadership initiative in Kingston, Jamaica"; Funded by the Elizabeth Glaser Paediatric AIDS Foundation, International Leadership Award 1-ILA-11-01. University of the West Indies Medical Alumni Association, 7th International Conference, Nov 6-8, 2003, Nassau, platform presentation. *West Ind Med Jour* 52(Suppl. 5):abstr 5-7;2003 **and** Steel-Duncan J, Pierre R, et al. Outcomes of infants born to women with HIV infection in Greater Kingston, 2002-2003: a preliminary report of the Kingston paediatric and perinatal HIV/AIDS (KPAIDS) program. Annual Research Day, faculty of Medical Sciences, Nov 2003, *West Ind Med Jour* 52:(Suppl. 6):abstr P-5;2003 **and** Ministry of Health, Jamaica, National HIV/STI Programme. Prevention of mother-to-child transmission of HIV (PMTCT): implementation guidelines for health care workers. January 2003 **and** Harvey K, Figueroa JP, et al. An assessment of mother-to-child human immunodeficiency virus transmission prevention in sixteen pilot antenatal clinics in Jamaica. *West Ind Med Jour* 52:(Suppl. 6):abstr O-25;2003 **and** Maternal and Child Health Department and the National AIDS Programme Secretariat, Ministry of Health, Guyana. Prevention of mother to child transmission of HIV: a manual for health care providers. Aug 2001 **and** Perez-Then E, Pena R, et al. Preventing mother-to-child HIV transmission in a developing country: the Dominican Republic experience. *J Acquir Immune Defic Syndr* 2003;34(5):506-11.
- ²Mofenson L. Tale of two epidemics-the continuing challenge of preventing mother-to-child transmission of human immunodeficiency virus. Editorial. *J Infect Dis* 2003;187:721-4.
- ³WHO Special Programme on AIDS. Statement from the Consultation on Breast-feeding/Breast Milk and Human Immunodeficiency Virus (HIV). Geneva: WHO, 1987 **and** WHO Global Programme on AIDS. Consensus statement from the WHO/UNICEF consultation on HIV transmission and breast-feeding. *Wkly Epidemiol Rec* 1992;67:177-179.
- ⁴AAP. 2000. 2000 Red Book: Committee on Infectious Diseases, 25th Edition. Elk Grove Village, IL: American Academy of Pediatrics **and** The Working Group on Antiretroviral Therapy and Medical Management of HIV-Infected Children. Guidelines for the use of antiretroviral agents in paediatric HIV infection. November 26, 2003. Available at: <http://AIDSinfo.nih.gov>. Accessed 2004.
- ⁵The Working Group on Antiretroviral Therapy and Medical Management of HIV-Infected Children, 2003.
- ⁶Pan American Health Organisation. Case definition: acquired immune deficiency syndrome (AIDS) *Epidemiological Bulletin* June 2001;22(2):about 2p. Available at: <<http://www.paho.org/English/DD/AIS/beindexe.htm>>. **and** World Health Organisation. Scaling up antiretroviral therapy in resource-limited settings: treatment guidelines for a public health approach: 2003 revision. Geneva: World Health Organisation, 2003.
- ⁷WHO, 2003.
- ⁸PAHO, 2001.
- ⁹Pavia A. Primary Care of Infants and Children with HIV. In *HIV InSite Knowledge Base*, 1 Peiperl, P Volberding (eds.). Online textbook of HIV disease from the University of California San Francisco and San Francisco General Hospital. July 2001. Available at <http://hivinsite.ucsf.edu/InSite.jsp?doc=kb-03-01-14> **and** Working Group on PCP Prophylaxis for Children. 1995 revised guidelines for prophylaxis against *Pneumocystis carinii* pneumonia for children infected with or perinatally exposed

to human immunodeficiency virus. *MMWR Wkly* [serial on the Internet] 28 Apr 1995 [cited 2004] 44(RR-4):1-11. Available at <<http://wonder.cdc.gov/wonder/prevguid/m0037275/m0037275.asp>>.

¹⁰AAP, 2000.

¹¹Pavia, 2001.

¹²Connor EM, Sperling RS, et al. Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. *N Engl J Med* 1994;331:1173-1180.

¹³Shaffer N, Chuachoowong R, et al. Short-course zidovudine for perinatal HIV-1 transmission in Bangkok, Thailand: a randomised controlled trial. *Lancet* 1999;353:773-80 **and** Wiktor SZ, Ekpini E, et al. Short-course oral zidovudine for prevention of mother-to-child transmission of HIV-1 in Abidjan, Cote d'Ivoire: a randomised trial. *Lancet* 1999;353:781-85 **and** Dabis F, Msellati P, et al. 6-month efficacy, tolerance, and acceptability of a short regimen of oral zidovudine to reduce vertical transmission of HIV in breastfed children in Cote d'Ivoire and Burkina Faso: a double-blinded placebo-controlled multicentre trial. *Lancet* 1999;353:786-92.

¹⁴Guay LA, Musoke P, et al. Intrapartum and neonatal single-dose nevirapine compared with zidovudine for prevention of mother-to-child transmission of HIV-1 in Kampala, Uganda: HIVNET 012 randomised trial. *Lancet* 1999;354:795-802.

¹⁵The Petra Study Team. Efficacy of three short-course regimens of zidovudine and lamivudine in preventing early and late transmission of HIV-1 from mother to child in Tanzania, South Africa, and Uganda (Petra Study): a randomised, double-blind, placebo-controlled trial. *Lancet* 2002;359:1178-86 **and** Chaisilwattana P, Chokephaibulkit K, et al. Short-course therapy with zidovudine plus lamivudine for prevention of mother-to-child transmission of human immunodeficiency virus type 1 in Thailand. *Clin Infect Dis* 2002;35:1405-1413.

¹⁶Cooper ER, Charurat M, et al. Combination antiretroviral strategies for treatment of pregnant HIV-1-infected women and prevention of perinatal HIV-1 transmission. *J Acquir Immune Defic Synd* 2002;29:484-94.

¹⁷European Collaborative Study. HIV-infected pregnant women and vertical transmission in Europe since 1986. *AIDS* 2002;15:761-70.

¹⁸St. John A et al., 2003 **and** Jack N et al., 2000 **and** Gomez MP et al., 1997.

¹⁹Lallemant M, Jourdain G, et al. Single-dose perinatal nevirapine plus standard zidovudine to prevent mother-to-child transmission of HIV-1 in Thailand. *N Engl J Med* 2004;351:217-28.

²⁰Dunn DT, Newell ML, et al. Risk of human immunodeficiency virus type I transmission through breastfeeding. *Lancet* 1992;340:585-88.

²¹Nduati R, John G, et al. Effect of breastfeeding and formula feeding on transmission of HIV-1: a randomised clinical trial. *JAMA* 2000;283:1167-1174.

²²Coutsoudis A, et al. Influence of infant-feeding patterns on early mother-to-child transmission of HIV-1 in Durban, South Africa: a prospective cohort study. *Lancet* 1999;354:471-76.