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Research article

Review and Update: Pediatric HIV-Preventing and Treating form the Roots of HIV in Newborns

*Yashvi Patel ; Dahrmendra Singh Rajput

Department of Pharmacy Practice, Indubhai Patel College of Pharmacy and Research Centre, Dharmaj, Anand, Gujrat-388430, India

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*Corresponding Author:
Email:
patelyashvi127@gmail.com

ABSTRACT

The review update gives emphasis on the need and points to put light on in challenging prevention, treatment, and management of pediatric HIV. Since the first cases of the human immunodeficiency virus (HIV) infection were identified, the number of children infected with HIV has risen dramatically in developing countries, the result of an increased number of HIV-infected women of childbearing age in these areas. HIV is a retrovirus and can be transmitted vertically, sexually, or via contaminated blood products or IV drug abuse. Vertical HIV infection occurs before birth, during delivery, or after birth. India, the prevention of parent-to-child transmission and antiretroviral therapy services for HIV-infected mothers and children have been rapidly scaled up over the recent years. Despite these advances and initiatives still, a large number of HIV-infected children are born every year. A thorough literature review has been done by retrieving related studies (published from the year 2015 onward); using a Medline search and by extracting recent findings from the official websites of the National AIDS Control Organization, UNAIDS, and World Health Organization. The efforts that are made to control pediatric HIV are challenged by a large range of factors such as low health service utilization, poor drug adherence, delayed infant diagnosis, the discriminatory attitude of health providers, loss of follow-up and poor coordination in managing the continuum of care. These challenges may be addressed by adopting innovative and effective strategies for implementation and awareness and strengthening the existing health system for the prevention and management of the cause of new HIV cases that is the pediatrics HIV population. This would bring about a significant reduction in pediatric HIV incidence and improve the outcomes in children who are HIV infected.

Keywords: Antiretroviral therapy, National AIDS Control Organization, Pediatric HIV, prevention of parent-to-child transmission, Opportunistic infection, Vertical transmission

Introduction

HIV is no longer a sentence of death, it was feared to be many years ago, research and development that has led to positive gains from anti-retroviral treatment parallel to the considerable reduction in the incidence of opportunistic infection among pediatric and child patients. There were 69,220 new HIV infections and 58,960 AIDS related deaths reported in India in 2019.

The 2020 was global target is to achieve reduction in new HIV infections and AIDS deaths below 500,000 in a year (Nov 30, 2020) [10] Significant cause of childhood children <15 years of age who are infected by HIV/AIDS. Children account for 7% of new HIV infections [4]. Over 300 children and adolescents die every day from AIDS-related causes. Only half of children living with HIV have access to life-saving treatment – UNICEF 26 November 2019 [3].

Maternal-to-child transmission (MTCT) accounts of more than 90% of the HIV infections in children [5]. The MTCT rate ranges from 20% to 45% in the developing world out of which 15% to 30% in no breastfeeding populations whereas 30%–45% in countries where breastfeeding is a

norm [6]. This is because breastfeeding has an additional 5%–20% risk of postpartum transmission. MTCT risk can be reduced to < 2% as is seen in the high-income countries with adequate antiretroviral (ARV) prophylaxis combined with other effective measures like avoidance of all breastfeeding and elective caesarean section [7].

However, these approaches are less effective in developing countries like India wherein 95% of cases account of vertical transmission [8].

India has the third largest HIV epidemic in the world 2.3 million PLHIV in India. Nationally, annual new HIV infections have declined only by 37% between 2010 and 2019[that is in 9 years [40]· In 2017, HIV prevalence among adults (aged 15-49) was an estimated 0.2%. This figure is small compared to most other middle-income countries but because of India's huge population (1.3 billion people) this equates to 2.1 million people living with HIV. Although overall, India's HIV epidemic is slowing down. Between 2010 and 2017 new infections declined by 27% and AIDS-related deaths more than halved, falling by 56% [11] and antenatal care (ANC) clinic attendees continues to be at a low level of 0.35%, there is a rising trend of the infection among monogamous pregnant women [9]. Pediatric HIV is thus poised to become another major public health problem especially in a society where child bearing is unavoided compulsion and is given high priority, if the women bearing child is unaware of HIV tests and the consequences may become a medium of contributing to HIV population and may be lead to more untreated HIV vectors in future.

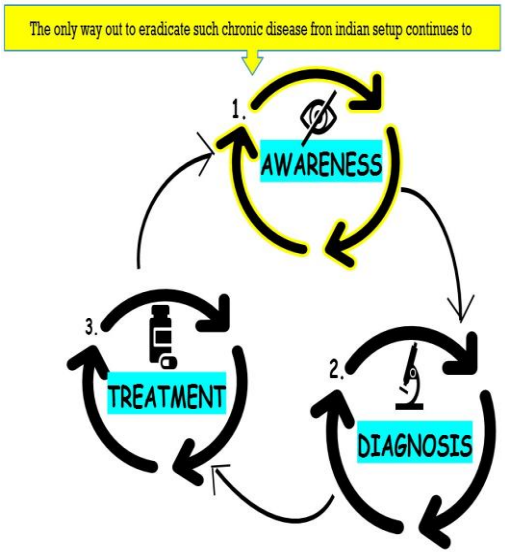


Fig: 1 Chronic Disease Prevention Cycle

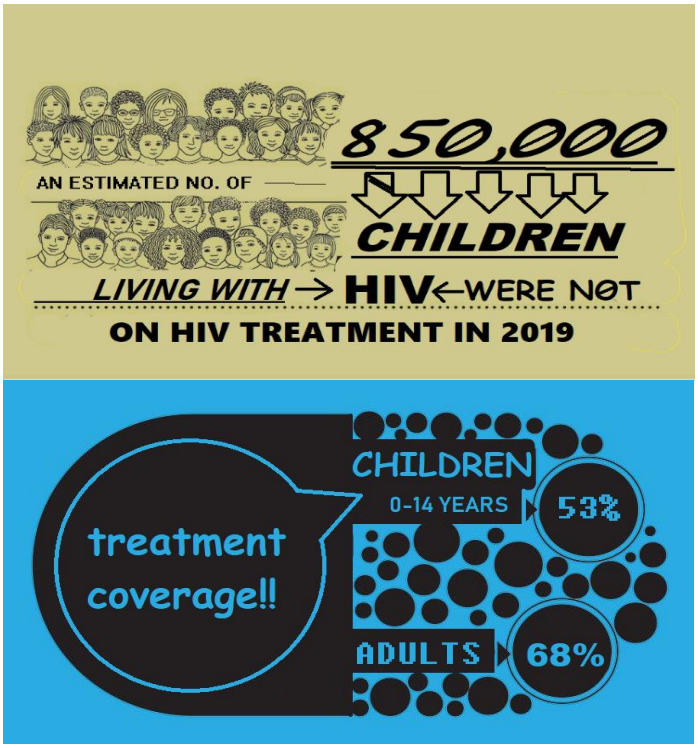


Fig: 2 HIV Treatment Coverage

In 2017, 79% of people living with HIV were aware of their status, of whom 71% were on antiretroviral treatment (ART) but there is not report found who are virally suppressed by ART [12] 86% of new infections in 2017-2018 of India's HIV epidemic is driven by sexual transmission [13], Manipur, Mizoram and Mizoram is the State with the highest HIV prevalence in the country while

Meghalaya and Tripura shows emerging pockets of HIV/AIDS epidemics. Nagaland from the east of the country being three states with the highest HIV prevalence [14:40].

The epidemic is concentrated among key affected populations; however the vulnerabilities that drive the epidemic vary in different parts of the country. A key driver is unprotected sex among key populations and their clients, partners and spouses. However, injecting drug use in the north and northeast of the country is also pushing up HIV prevalence [15].

HIV prevalence is higher among men than women, with 0.25% of men and 0.19% of women living with HIV out of which key populations including men who have sex with men (MSM), migrant workers and men who use drugs in 2017, out of which, sex worker. The coverage of FSWs against the estimated population has increased to 91% in FY 2019-20 from 73% in FY 2017-18 [40] and men who have sex with men population groups have experienced a recent decline in HIV prevalence as of now to much extent [16:17].

However, a number of issues including HIV-related stigma, relatively low levels of status awareness among people living with HIV and weak links between diagnosis and treatment mean progress is not moving as quickly as hoped. A lack of data on key populations and on certain key indicators such as viral suppression rates also makes it difficult for HIV programmes to be designed in ways that effectively meet the needs of those most affected by the country's HIV epidemic [15].

Long-term impact of COVID-19 on people with HIV

People living with HIV are already at increased risk of contracting COVID-19. If we talk about the impact of COVID-19 on the food security and nutrition of people living with HIV then its multi-fold. Production capacities are affected; access to food is compromised due to loss of livelihoods and decreased purchasing power; limited dietary diversity due to a shift in diets to more shelf-stable and pre-packaged foods; the lack of consumption of micro and macro nutrients can result in malnutrition; stability is compromised as the markets themselves are highly unstable leading to a great degree of uncertainty. In the longer run, people who have lost jobs and are unable to get back at it or at the same level then the risk will increase.

HIV prevention programmes in India

Several programmes are active in India for the prevention of HIV transmission to infants and its treatment. National Aids Control Organisation under the Ministry of Health and family as well implemented India's National Aids Control Programme (NACP) with the objective of understanding the burden of HIV and its epidemiological trends. In addition, the Prevention to Parent to Child Transmission (PPTCT) programme for a daily an age was initiated offering HIV testing to all pregnant women .As per WHO guidelines this programmes aim to provide antiretroviral treatment for all pregnant and breastfeeding women living with HIV regardless to CD4 count all stage of HIV infection During the initial years single dose Nevirapine was the drug of choice for anti retroviral prophylaxis to prevent PTCT and was offered to the HIV infected pregnant women during childbirth and to the newborn .Nowadays, WHO recommends option be In Word live long and retroviral therapies using the triple drug regimen is used for all pregnant and breastfeeding women living with HIV regardless to city poor count although who clinical stage this benefits their own health and also prevents critical HIV transmission this

programmes have made significant progress in reducing HIV transmission and promote ERP coverage however more efforts are needed to reduce new infections and mortality in children with HIV. In 2017, 88,000 people in India were newly infected with HIV. The majority were men, who accounted for 50,000 new infections. There were 34,000 new infections among women and around 3,700 among children (aged 0-14 years) [47].

NACO is the body responsible for formulating policy and implementing programmes for the prevention and control of the HIV epidemic in India. Its most recent programme, NACP-IV (2012-2017, extended to 2020), aims to halve annual new HIV infections by 2020 by providing comprehensive HIV treatment, education, care and support for the general population, along with targeted interventions for key affected groups at high risk of HIV transmission [48].

A key goal of the NACP-IV is to reach 80% of key affected populations with targeted interventions.49 Targeted interventions are implemented on the premise that prevention of HIV transmission among key affected populations will also lower HIV transmission among the general population. For example, targeting interventions towards female sex workers and their male clients will help reduce the risk of clients transmitting HIV to their regular sexual partners.

Preventing mother-to-child transmission (PMTCT)

The Indian government is committed to eliminating new HIV infections among children. The country's Prevention of Parent to Child Transmission of HIV/AIDS (PPTCT) programme started in 2002. As of 2017 almost 30,000 sites were offering PPTCT services [60].

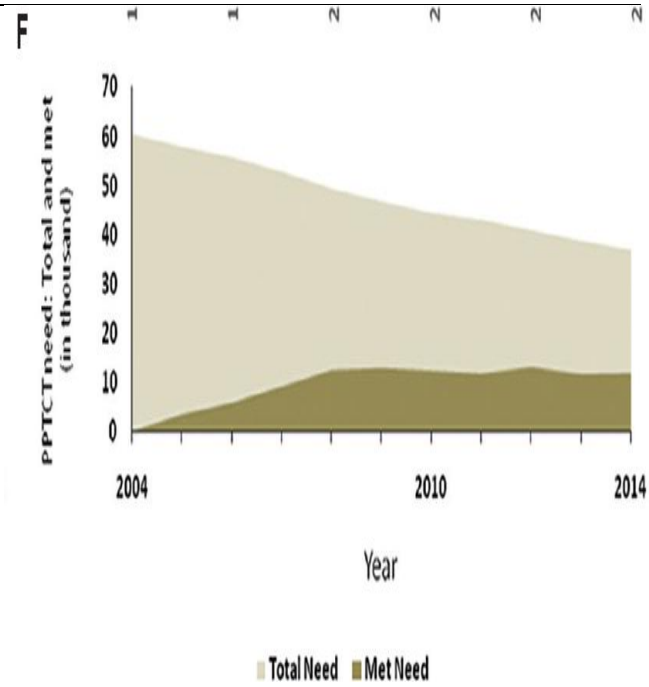


Fig: 3 Preventing Mother to Child Transmission

Based on 2013 WHO Guidelines, the programme initiates lifelong antiretroviral treatment for all pregnant and breastfeeding women living with HIV regardless of CD4 count or stage of HIV infection [61]. In 2017, 60% of pregnant women living with HIV received PPTCT services, a 20% increase from 2016.6263 During 2018/19, out of 13,760 babies exposed to HIV, 86% were initiated on antiretroviral (ARV) prophylaxis to prevent transmission [64]. However, only 23% of babies born to mothers enrolled in PPTCT programmes were tested for HIV before eight weeks of age to confirm whether transmission had been prevented [65]. In addition, only 20% of HIV positive mothers are thought to breastfeed exclusively in the first six months of their baby's life, despite this being likely to decrease the risk of HIV transmission by between three- and four-fold [66].

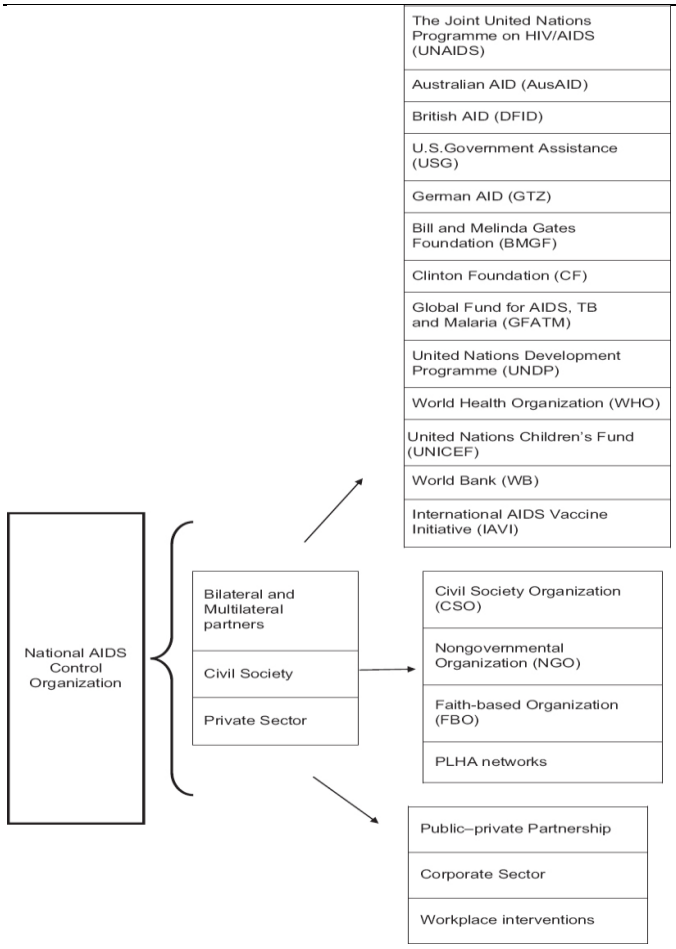


Fig: 4 National AIDS Control Organizations

1. Pathophysiology

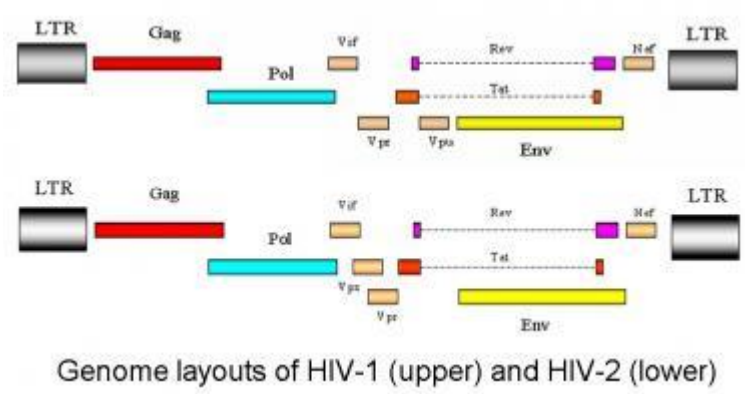
HIV can be transmitted vertically, sexually, or via contaminated blood products or IV drug abuse. Vertical HIV infection occurs before birth, during delivery, or after birth. With infection before birth (period 1), the fetus can be hematologically infected by means of transmission across the placenta or across the amniotic membranes, especially if the membranes are inflamed or infected.

Most vertical infections occur during delivery (period 2), and many factors affect the risk of infection during this period (see Deterrence/Prevention). In general, the longer and the greater amount of contact the neonate has with infected maternal blood and cervicovaginal secretions, the greater the risk of vertical transmission. Premature and low-birthweight neonates appear to have an increased risk of infection during delivery because of their reduced skin barrier and immunologic defences.

Postnatal vertical transmission (period 3) occurs with the ingestion of HIV in the breast milk.

2. HIV Virology

HIV is a retrovirus. Structurally, a lipid bilayer envelope surrounds the cylindrical core of HIV, which contains the RNA genetic information and the machinery that promotes viral replication and integration during initial cellular infection. From the outside, the virion appears spherical, with a diameter of 110 nm.HIV has a variety of structural and nonstructural proteins that determine the interaction of the virus with the host's immune system and cellular components. The genome layouts of HIV-1 and HIV type 2 (HIV-2) are shown in the image below.



Genome layout of human immunodeficiency virus HIV–1 and HIV-2.

The HIV virus attaches to the host cell by the association of a surface glycoprotein to the CD4 molecule; therefore, it primarily infects $CD4^+$ lymphocytes and macrophages.

After HIV enters a host, trimeric gp120 glycoproteins that protrude from its lipoprotein bilayer envelope bind to CD4 cell-surface receptors and CCR5 or CXCR4 chemokine co-receptors. Juxtaposition co-receptors are needed for viral infection. The V3 region of the gp120 glycoprotein

determines cellular tropism, and tropism is involved in syncytial formation. M-tropic (nonsyncytial) strains prefer the CCR5 co-receptor and are the primary causes of infection. Upon entering the cell, the protease enzyme produces the reverse transcriptase and ribonuclease (RNAse) H enzymes responsible for synthesizing the single-stranded DNA (ssDNA) molecules and primers necessary to produce the complementary DNA strand. Because reverse transcriptase lacks proofreading capacity, considerable base-to-base variability results. The high mutation rate, combined with the high reproductive rate, results in substantial evolution and subsequent resistance to treatment. Once the virus core enters the cell cytoplasm of the host, viral reverse transcriptase copies viral RNA to the DNA of the host. The viral DNA is then transported into the nucleus and incorporated into the DNA of that cell. If activated, viral expression can result in new viral RNA and proteins. New viral core proteins, enzymes, and viral RNA molecules can induce budding, with additional cell infection [18]. Vertical transmission of HIV from mother to child is the main route by which childhood HIV infection is acquired; the risk of perinatal acquisition is 25%.

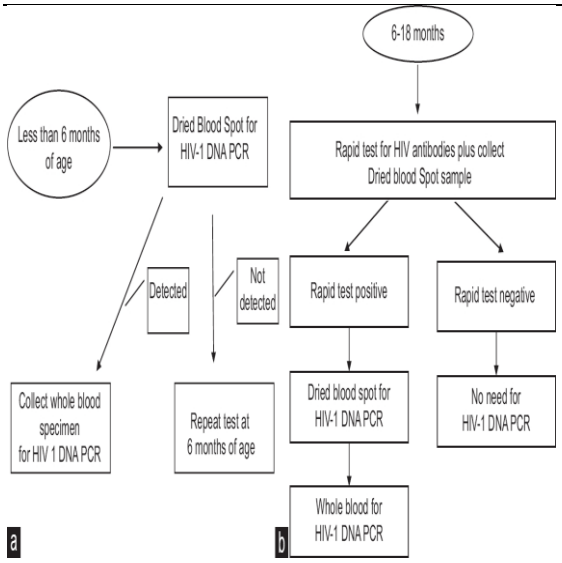
Approach Considerations

Prompt diagnosis of human immunodeficiency virus (HIV) infection is critical. As such, the Centers for Disease Control and Prevention (CDC) recommends routine prenatal HIV testing as the standard of care for all pregnant women in the United States, with repeat screening in the third trimester recommended in certain jurisdictions with elevated rates of HIV infection among pregnant women [19]. However, routine late pregnancy testing at 36-37 weeks' gestation in all women is recommended by many experts because infection during pregnancy now makes up a significant percentage of children with AIDS.

The American College of Obstetricians and Gynecologists updated their guidelines on HIV testing during pregnancy [20:21].

The new guidelines include the following:

- Women should be tested for HIV during routine prenatal testing, on an opt-out basis where possible Women at high risk for HIV, including injection drug users and women with multiple sex partners during their pregnancy, should be tested again in their third trimester.
- Women who have not been tested should be offered rapid screening when in labor, and if the rapid test is positive, they should start antiretroviral therapy while waiting for results from a confirmatory test.
- All pregnant women should be screened for HIV infection as early as possible during each pregnancy using the opt-out approach where allowed.
- Repeat HIV testing in the third trimester is recommended for women in areas with high HIV incidence or prevalence and for women known to be at risk of acquiring HIV infection.
- Women who were not tested earlier in pregnancy or whose HIV status is otherwise undocumented should be offered rapid screening on labor and delivery using the opt-out approach where allowed.
- If a rapid HIV test result in labor is reactive, antiretroviral prophylaxis should be immediately initiated while waiting for supplemental test results.
- If the diagnosis of HIV infection is established, the woman should be linked into ongoing care with a specialist in HIV care for co management [22].



1. TREATMENT OF PEDIATRIC HIV

2. CDC Guidelines

The Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection, developed by the HHS Panel on Antiretroviral Therapy Medical Management of HIV-Infected Children, were updated in April 2020 [1].

Significant changes to guidelines

Cobicistat (protease inhibitor [PI] booster) is now approved for pediatric use and regimens boosted by ritonavir or cobicistat may be used in children. Atazanavir boosted with cobicistat (ATV/c) is now an option for children, as is darunavir boosted with cobicistat (DRV/c).

Updates since the prior (September 2019) version are as follows:

- Fixed-dose combination (FDC) bictegravir/emtricitabine/tenofovir alafenamide (Biktarvy) is now the preferred initial integrase strand transfer inhibitor (INSTI) in children older than 12 years who weigh 25 kg or more and an alternative in children older than 6 years who weigh 25 kg or more.
- The recommendation for dosing of dolutegravir has been revised to allow use in children who weigh 20 kg or more, although the FDA approval still applies only to children who weigh 30 kg or more.
- A safety concern about possible neural tube defects in infants whose mothers were receiving dolutegravir was also added to the guidelines and should be considered when prescribing in adolescent girls.

When to initiate treatment

Antiretroviral treatment (ART) consisting of three drugs from at least two classes should be initiated in all treatment-naive infants and children with HIV infection. Delayed treatment for HIV infection is no longer recommended.

Rapid treatment initiation (within 1-2 weeks of diagnosis) is recommended in all HIV-infected children older than 6 weeks but younger than 12 weeks. This rapid initiation must include a discussion concerning the importance of adherence.

If ART initiation in a child is not possible for any reason, he or she should be closely monitored virologically (HIV viral load) and immunologically (CD4+ T cells) until treatment is started.

Historically, some older medications had more toxicity and were associated with easier resistance development. Because of this, withholding therapy was once commonly recommended in various age groups and early-stage HIV infection. This is no longer the case, and all children with HIV infection should undergo treatment to avoid disease progression, to avoid infections, to ensure growth and sexual maturation, to avoid neurocognitive consequences

of HIV infection, to assist with achieving a normal lifespan, and to eventually avoid further HIV transmission (treatment as prevention).

Special considerations when initiating ART in children

Infants and young children require liquid medications.
Toddlers and children require liquid or chewable medication.

These restrictions greatly limit options.

Therapy in term and preterm newborns

There are sufficient data on dosing for zidovudine (ZDV), lamivudine (3TC) and nevirapine (NVP).

Therapy in term newborns

For term infants, there are also sufficient data on dosing for emtricitabine and raltegravir.

For term infants older than 2 weeks (but not preterm infants), there are sufficient dosing data for lopinavir/ritonavir (LPV/r).

Based on newer data concerning earlier treatments and earlier results of nucleic acid testing, triple therapy may be initiated in some high risks infant.

Preferred initial therapy in treatment-naïve infants and children

Preferred initial therapy in treatment-naïve infants and children consists of a two–nucleoside reverse transcriptase inhibitor (NRTI) backbone plus an INSTI or nonnucleoside reverse transcriptase inhibitor (NNRTI) or PI (boosted).

NRTI backbone options include the following:

- Birth to younger than 3 months: ZDV plus 3TC or emtricitabine (FTC)
- Children aged 3 months to younger than 6 years: ZDV plus 3TC or FTC OR abacavir (ABC) (with pre-testing to ensure HLAB*5701-negative status) plus 3TC or FTC
- Children 6 years or older: ABC plus 3TC or FTC

Although ZDV is not a preferred ART agent in children older than 6 years, it may be continued rather than changed to another ART agent if it is effectively suppressing the viral load. It is also an alternative choice for initial therapy.

NNRTI options include the following:

- Children older than 14 days to age 3 years: NVP
- Children aged 3 years or older: NVP preferred, alternatively efavirenz (EFV)

PI options include the following:

- Children younger than 14 days to age 3 years: LPV/r
- Children older than 3 years and less than 25 kg: Atazanavir plus ritonavir (ATV/r) or darunavir/r (DRV/r-twice daily)
- Cobicistat (PI booster) is now approved for pediatric use, and regimens boosted by ritonavir or cobicistat may be used as an alternative to ritonavir boosting in children. Atazanavir boosted with cobicistat (ATV/c) is now an alternative for children, as is darunavir boosted with cobicistat (DRV/c).

INSTI options include the following:

- Children aged 14 days to 3 years (≥2 kg): Raltegravir (RAL) (oral suspension or chewable)
- Children aged 3 years or older (< 25 kg): RAL

- Children aged 3 years or older (≥25 kg): Elvitegravir/cobicistat (EVG/c)
- Children aged 3 years or older (≥25 kg): Elvitegravir/cobicistat/emtricitabine/tenofovir alafenamide (EVG/c/FTC/TAF) is a fixed-dose combination option.
- Children aged 6 years or older (≥30 kg): Dolutegravir
- Children aged 12 years or older (≥25 kg): Bictegravir (BIC) in fixed dose combination (FDC)
- Fixed-dose combination (FDC) bictegravir/emtricitabine/tenofovir alafenamide (Biktarvy) is now the preferred initial INSTI in children older than 12 years who weigh 25 kg or more and an alternative in children older than 6 years who weigh 25 kg or more [41].

Table: 1 Drugs and Doses for Opportunistic Infections-prophylaxis Antibiotic.

Drug	Dose
Azithromycin	20 mg/kg/dose (1.2 g maximum) PO qwk or 5 mg/kg/dose (250 mg maximum) PO qd
Clarithromycin	7.5 mg/kg/dose (500 mg maximum) PO bid
Clindamycin	20-30 mg/kg/d PO qid
Dapsone	1-2 mg/kg/d (100 mg maximum) PO qd
Ethambutol	15 mg/kg/dose (900 mg maximum) PO qd
Isoniazid	10-15 mg/kg/dose (300 mg maximum) PO/IM qd
Leucovorin	5 mg PO 3 times/wk
Pentamidine	4 mg/kg/dose monthly
Pyrimethamine	15 mg/m2/dose (25 mg maximum) PO qd
Rifabutin	5 mg/kg/dose (300 mg maximum) PO qd
Rifampin	10-20 mg/kg (600 mg maximum) PO/IV qd
Sulfadiazine	85-120 mg/kg/d PO bid
Trimethoprim-sulfamethoxazole	150/750 mg/m2/d PO bid
Abbreviations: bid = twice daily; PO = by mouth; qd = every day; qwk = every week.	

The risk of vertical transmission may be reduced. Most children are infected by means of vertical transmission. Proper treatment of the mother during pregnancy and delivery and proper treatment of the neonate can reduce the risk of vertical transmission.

The CDC has approved the following regimen to reduce vertical HIV transmission:

- Antepartum: Administer zidovudine 300 mg orally (PO) twice a day and other appropriate ART, usually the addition of lamivudine and lopinavir/ritonavir. For women who present during the prenatal period, zidovudine should be started regardless of the use of other antiretroviral agents and a history of zidovudine resistance
- Intrapartum: Continuously infuse zidovudine intravenously (IV) at a rate of 1 mg/kg/hour for women who present in labor

- Neonates: Give zidovudine, starting within the first 6-12 hours of life and continuing until the patient is 6 weeks old [45].

Barriers to the HIV response in India

3. **Societal level**
4. **Stigma and discrimination**

India's NACP-IV has made the elimination of stigma and discrimination a major focus. In 2018, implementation on the HIV AIDS (Prevention and Control) Act 2014 began stating a law that criminalises discrimination against people with HIV and AIDS, including within employment, healthcare, education, and in all public setups as well as protecting property and insurance rights [23:24:25].

Despite this, people living with HIV continue to experience high levels of discrimination. In 2016, a third of adults demonstrated a discriminatory attitude towards people living with HIV. This is a similar level recorded a decade earlier in 2006, suggesting stigma-reduction activities are not working as to referring to negligible of little change in stigma and discrimination [25:26]. Although now there is much better response in boycotting stigma and discrimination towards HIV patient but when we talk about unaware and uneducated people the things aren't same hesitation or lack of knowledge still prevails.

1. **Gender inequality** Gender inequality is also an issue. Women, particularly in rural areas, have little or no say over important aspects of their lives. Intimate-partner violence, including sexual violence, is relatively widespread, with around one in five women in relationships likely to experience violence from their male partner, a level that has remained unchanged for the past decade. The power imbalance between men and women means women are often unable to negotiate condom use or protect themselves from risk of HIV infection in other ways. Women living with HIV are reluctant to access healthcare for fear of discrimination and marginalisation, leading to a disproportionate death rate in HIV among women [26:27].

Maternal nondisclosures of HIV status

Women are hesitate to disclose their HIV status with the fear that it could lead to stigmatization and social ostracism [29:30]. Stigma acts as a barrier toward accessing PPTCT services at the time of pegnance and HIV diagnosis [31], some mothers tend to hide their HIV serostatus at the time of delivery for fear of discrimination, abuse, and thus denial of services [32:33].

Disclosure of HIV diagnosis to children

The proportion of children who are not aware about their HIV status is fairly high, being reported as 59.6% and 86% in different study settings. Most parents and caregivers feel hesitate to disclose their child's HIV status for fear of stigma, discrimination, and mental trauma. However, research studies demonstrate that the disclosure of HIV status to infected children influences their compliance with ART and sense of responsibility of one's own health. India is also home to arguably the largest number children orphaned by AIDS. These children endure stigma and face

an impenetrable barrier; this situation encourages children and their guardians to hide HIV and discourages access to essential treatment services (if available) in Indian society [28:34:35:36:37].

Lack of awareness about prevention of parent-to-child transmission services. High rates of HIV transmission could be attributed to low awareness about MTCT preventive strategies. The awareness levels are shown to be as low as 37.6% among antenatal women attending a tertiary hospital and 48% among those attending a rural antenatal clinic in South India. Likewise, in a periurban area of Punjab, only 28.5% of women knew about the availability of HIV testing facility [38].

Utilization of antiretroviral therapy services

Most of the free ART centres are located in urban settings and this requires long distance travel to avail of these services. An analysis of routinely collected program data showed that as many as 63% of patients receiving ART were living outside the treatment district. Women quote multiple reasons for not visiting the ART center on time; these include nonavailability of childcare, sickness, financial crisis, distance, and lack of transport [38].

Practical level Delayed infant diagnosis about half of HIV-infected children are reported to die undiagnosed before their second birthday.

Early diagnosis and initiation of ART in children <2 years of age is highly significant since failure any delay can result in rapid progression and early mortality. According to the national protocol, for children <18 months, a DNA polymerase chain reaction (PCR) testing using dried blood spots which detects viral DNA is recommended, while for children >18 months, diagnosis is to be done by means of ELISA test . If positive, then a confirmatory test is done on whole blood sample DNA PCR before initiating ART. At the practical level, delayed infant diagnosis and delayed treatment, poor health of mother, lack of intranasal testing for HIV infection and loss of follow-up are still needed to be more in our attention [43:38].

1. **Maternal antiretroviral therapy/antiretroviral adherence**

   Nonadherence is shown to be associated with side effects, illiteracy, burden to taking too many medications, and depression **Adherence to ART/ARV by the mother is crucial for the successful prevention of mother-to-child transmission of HIV. The treatment is considered to be successful if adherence is more than 95%. Poor adherence results in emergence of drug-resistant viral strains [39:38].**

Antiretroviral therapy adherence among children

It is currently recommended that all HIV-infected children <2 years of age should receive ART, while in older children, the indications are based on clinical and/or immunological criteria to aid comorbidities if any [42]. Some caregivers have even expressed doubt over the quality of drugs that are being freely distributed at ART centers. Data from studies done in the Indian pediatric population report low adherence rates. Factors shown to influence adherence include side effects, palatability, formulation, regime, poor access, cost of transport, and time spent in travelling [38].

Management Issues

Data issues and Lack of follow up:

The loss to follow-up (LTF) of mothers and their children challenges the potential effectiveness of the PPTCT program. Even though PPTCT programs report reduced rates of infection among infants tested at 2 months of age, there is limited priority on retention of HIV-exposed infants in care [44]. There is a need for greater access,

analysis and applied use of data within the national HIV response. This is due to a lack of integrated quality data systems, which limit availability and use, plus a lack of structure for case-based reporting, a lack of district HIV and key population size estimates, and inadequately trained staff to monitor the epidemic. There are also challenges associated with tracking people through the continuum of HIV diagnosis to care and treatment due to a lack of unique patient identifier records and different monitoring and reporting systems used within facilities.

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