Chapter 2
Study Report on Prevention of Mother-to-Child Transmission for HIV-Infected Pregnant Women in Yunnan Province*

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Introduction

Yunnan Province is the origins and heartland of China's AIDS epidemic. While the epidemic was for many years concentrated among injecting drug users, over the past few years it can be characterized as an epidemic driven as much by sexual transmission. Sixty-four percent of newly identified cases in 2009 are attributable to hetero and homosexual transmission [1]. With increased sexual transmission naturally comes the increased risk of vertical transmission from mother to baby in utero, during labor and delivery, or through breastfeeding. In 2009, 1.5% of newly reported cases were cases of mother-to-child transmission (MTCT) [1]. The national and provincial governments have invested heavily to combat the spread of the AIDS epidemic in Yunnan, initially with a focus on harm reduction programs for drug users and in more recent years extending the work to other populations and transmission routes as well. In 2003, the national prevention of mother-to-child transmission

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Fig. 2.1 Geographic distribution of PMTCT project counties. Figure adapted from: Zhou, Z, Meyers, K, Li, X, et al. (2010). Prevention of mother-to-child transmission of HIV-1 using highly active antiretroviral therapy in rural Yunnan, China. *Journal of Acquired Immune Deficiency Syndromes*, 53(Supplement), S15–S22

(PMTCT) program was piloted in two Yunnan counties. Three years later all 129 counties in Yunnan were covered in the national PMTCT program that recommended and provided azidothymidine (AZT) starting at 28 weeks gestation plus single-dose nevirapine (sdNVP) during labor and delivery for the mother and neonate, a protocol that in combination with safe feeding practices can bring transmission rate as low as 1.8% according to one study [2], although with risks of inducing drug resistance for women who may later require treatment for their own disease. In practice, because many women are identified as HIV infected only when they present at the clinic in labor, the use of sdNVP, associated with a 10.8% transmission rate [3], is still highly prevalent. In the national PMTCT program, infants are diagnosed by antibody test after 18 months of age when maternal antibodies are no longer present in the child's blood. Twelve months of formula feeding are provided as well.

In this context, in 2005 the Aaron Diamond AIDS Research Center (ADARC) in partnership with the Yunnan Province Bureau of Health launched a demonstration project to test the safety, effectiveness, and feasibility of providing highly active antiretroviral therapy (HAART) for HIV-infected pregnant women to interrupt HIV transmission to their infants in 18 counties in Yunnan (Fig. 2.1). The following year

the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) joined these efforts and provided an additional 3 years of support to develop a model of PMTCT that expanded out from the mainly clinical focus to take on a more comprehensive public health approach. The program has since expanded to 132 township and county facilities in eight counties. The provincial AIDS treatment authority, the Yunnan AIDS Care Center and a Kunming-based NGO, the Yunnan AIDS Initiative have been tasked with implementation of the program. Finally, in 2009, with support from Hong Kong's Zeshan Foundation, the program added an additional component to integrate screening and PMTCT of hepatitis B virus (HBV) infection and syphilis with HIV in six counties to explore the feasibility of packaged testing as a part of standard antenatal care (ANC) services.

Program Design

Mobilization of Leaders

Local leadership support and buy-in are critical in the increasingly decentralized system of governance that has developed in China since opening and reform began in 1978. In the context of a complex public health intervention like PMTCT, "local" captures multiple tiers of administration and bureaucracy across multiple sectors. Key leaders include Bureau of Health administrators at the provincial, prefecture, and county levels; administrators of all health facilities participating in the program; administrators from the prefecture and county centers for disease prevention and control (CDC); township and village administrative leaders; and women leaders at all the program sites. The support of all these individuals does not only have to be built at the onset of the program but also must be maintained over time. Over the course of 6 years, leaders often get promoted or demoted, or they change sectors entirely, thereby requiring investment of time and resources by the program team into advocacy across the life of the program.

Establishment and Strengthening of PMTCT Network

Across most of Yunnan, the county is the lowest level on the administrative hierarchy able to provide HIV/AIDS services from testing to ARV (antiretroviral) treatment, including PMTCT interventions. Administratively this makes sense, as the number of HIV-infected cases distributed in each county is not overwhelmingly large. However, Yunnan's mountainous terrain and underdeveloped road infrastructure make access to county health facilities very challenging for the majority of rural residents. Their most regular point of contact with the health system is at the township and village level.

To address this critical access issue our program sought to build the capacity of township and village level health workers to take over critical elements of PMTCT

services, and to form close vertical linkages with the county-level maternal child health (MCH) clinic. At the same time, the program also stressed the need for strong horizontal referrals between the MCH and the CDC and hospitals for laboratory tests and follow-up of HIV-positive women beyond their perinatal period.

Improving HIV Counseling and Testing

Improving the quality and reach of counseling and testing was a focal point of the program. Yunnan policy demands universal screening of pregnant women and premarital couples and this provides the critical regulatory basis of our work. Our program sought to overcome the implementation challenges in carrying out this directive, and to ensure that the services provided were effective vehicles for promoting HIV prevention education for the 99% of women who remain uninfected. The specific areas we worked on include: expanded coverage of counseling and testing out from county health facilities to township and village level; improved HIV counseling of all pregnant women at ANC and labor and delivery; improved coordination of the MCH with the civil affairs bureau so that all premarital registrants will be counseled and tested for HIV.

Optimal PMTCT Services for HIV Pregnant Women

In the USA and Europe, vertical transmission has been virtually eliminated with HAART-based PMTCT regimens. The effectiveness of perinatal ARV prophylaxis, safe delivery methods, and formula feeding in reducing rate of MTCT from 30% to 40% down to less than 2% has been thoroughly demonstrated [4]. A primary program objective was to demonstrate that even though rural Yunnan is a resource-limited setting, it was possible to deliver interventions according to international standards, and achieve results comparable to developed nations. Together the Yunnan Health Bureau and ADARC set out to demonstrate the feasibility, safety, and efficacy of HAART prophylaxis for PMTCT at our project sites, with the hope that the results can be used to advocate for the adaptation of this project model across China.

Continued Care and Support for HIV-Positive Women and Families

Yunnan HIV/AIDS guidelines state that after pregnancy, HIV-infected women who do not require HAART should be referred to the CDC for follow-up, and women who reach treatment criteria shall be referred to the county comprehensive hospital for

HAART treatment. This program not only provided technical support to the MCH hospitals, but also worked closely with the CDC and the comprehensive hospitals to facilitate the linkage between PMTCT and care and treatment. In addition, we provided support for each program county to establish positive women and family support groups as a platform for women and their families to share their experiences and provide mutual support. Doctors could also use these positive support group meetings as opportunities to reinforce various health knowledge and practices, such as adherence to ARV therapy and infant feeding support.

Method

County and Facility Site Selection

Sites were selected based on HIV-1 prevalence among ANC clients, existing HAART services at the county hospital, and some experience in PMTCT interventions. Among the 18 sites selected, 13 were county-level MCH clinics, 4 were prefectural-level MCH clinics, and 1 was a municipal MCH clinic in the provincial capital of Kunming. HIV prevalence rate among the pregnant women population at the 18 sites ranged from 0.4% to 2% enrollment began at five sites in 2005, nine more in 2006, two in 2008, and two more in 2009. Half of the counties are designated poverty counties by the national and provincial governments, and seven counties have an average per capita income of less than $1 a day.

In addition to selecting geographic sites, we selected specific facilities in which to push services out to the periphery. Specifically, after EGPAF joined the program in 2007, we selected townships with the highest number of cases as focal points in which to invest in the capacity-building of village doctors and township hospitals to identify pregnant women early in gestation, provide basic HIV and PMTCT information, and either provide HIV rapid test to pregnant women in the village, or refer them to the township health center for HIV testing. At the township level, we worked with the MCH system to distribute HIV rapid test kits at all the township health centers and integrate HIV counseling and testing as a routine part of ANC and labor and delivery services.

Enrollment into Clinical Program

Eligibility criteria for pregnant women to be enrolled into the program to receive HAART prophylaxis were the following: they planned to deliver their babies; they were able to give written informed consent; and they did not intend to move outside the county during the pregnancy period. Women not enrolled met one or more of the following exclusion criteria: serious opportunistic infection or AIDS-related tumor; abnormal liver or renal function; co-infected with hepatitis B or C virus;

severe anemia, thrombocytopenia, and leukopenia; serious risk of other pregnancy complication; acute or chronic pancreatitis; alcohol or drug addiction; and serious psychiatric illness. Those who did not meet the qualifications were enrolled into the government PMTCT program.

Intervention

All women received HAART, beginning as early as the 14th week of pregnancy. Planned C-sections were recommended if the duration of HAART was short or viral load late in pregnancy was high. Neonates were given sdNVP within 24 h of birth and 1 week of AZT if the mother had been on treatment for more than 4 weeks at the time of labor. Otherwise, neonates were given 4 weeks of AZT. Parents were counseled to formula-feed their baby exclusively, and follow-up visits were scheduled at 1 week, 1 month and once a month thereafter, and immediately in the event of any health problems.

Dry blood spots (DBS) from HIV-exposed infants were collected in each project county. Samples were shipped through the postal service at room temperature to the Yunnan AIDS Care Center laboratory, which has been certified to perform DNA PCR. Genomic DNA was isolated from DBS by extraction using a polyvalent cationic resin, chelex 100 (Biorad, Marnes-la-Coquette, Paris, France). HIV-1 DNA (gag, pol and env gp41 regions) was detected by two rounds of PCR amplification.

Women with CD4 counts above 350/mm^3 at enrollment discontinued treatment after delivery, unless their CD4 had fallen below 350/mm^3. These women were referred to the county CDC for regular follow-up. Women with CD4 counts below 350/mm^3 at enrollment were referred to the local government-designated ARV treatment hospital 6 weeks postdelivery to continue treatment.

Key Lessons and Results

Sustained Advocacy at Multiple Levels

Our leadership advocacy efforts focused first on the Yunnan Provincial Bureau of Health. At this level, it was beneficial to have internationally well-known experts such as Dr. David Ho, Director of the Aaron Diamond AIDS Research Center, at meetings with provincial Bureau of Health leadership to explain the significance of the program, and its potential contribution to overall HIV/AIDS prevention and treatment in Yunnan. The provincial Bureau of Health recognized the significance of the program very quickly and at program initiation gathered all the heads of prefecture to sign official program responsibility documents.

The next step was the integration of a leadership advocacy component into our trainings at each level. In addition to the health providers who directly provide PMTCT

services, we required county Bureau of Health, MCH and hospital administrators to attend nontechnical parts of the trainings designed to raise their awareness of the importance of PMTCT, and empower them to take on responsibility of local PMTCT work from a management perspective. Even though the government had designated HIV prevention and treatment work, including PMTCT, as a priority, many local leaders did not see HIV as a significant concern in their area. Many of them confessed to coming into our training with the intention of sleeping through it. However, through our continued effort, these leaders grew to appreciate the significance of PMTCT in the context of HIV and women and children's health, and to see the program as an opportunity to strengthen their local health system.

Finally, leadership advocacy requires sustained efforts. Throughout the program, we maintained close communication with county administrators whenever we traveled to counties on site visits. The administrators were invited to program conferences so they could be updated on program progress and participate in planning and implementation of next steps. Leadership changes occurred frequently throughout the life of the program. It was critical to learn of these changes as quickly as possible so that we could inform the new administrators of the program and secure their support.

Improved Quality and Coverage of HIV Counseling and Testing

While the efficacy of interventions to reduce the rate of vertical transmission is extremely high, the critical first step is the identification of HIV-positive pregnant women. Expanding counseling and testing coverage to capture women who are not seen at county health facilities was therefore an instrumental component of our program strategy.

The first challenge was to build up capacity of township and village health workers to provide high-quality counseling and testing services. We developed a training curriculum targeted to rural community level health workers. Most township and village doctors have no higher than a vocational high school education. While most of them had heard about HIV/AIDS through the media and through half-day training sessions administered by government health agencies, these trainings were pedagogically uninspired: usually monotonous in both style and method, with one person lecturing in front to a hall full of attendees. Our training curriculum was adapted from the USCDC PMTCT curriculum, with a strong emphasis on HIV counseling, as that was the area we felt community health workers would be most directly involved. Each of our training workshops was limited to 40 people to facilitate the use of participatory training and learning methods. Workshops were usually 2 days in length, and we used a mixture of training methods including slide presentations, demonstrations, role-plays, games and activities, discussion groups, and videos. This integrated approach was not only effective in knowledge transfer but also facilitated the acquisition of practical skills, and promoted attitudinal change. For most village and township health workers, our training was a completely novel experience.

Trainees expressed that they had never known that trainings could be so informative and yet fun at the same time. Through our trainings, health providers noted that they became more confident at providing HIV counseling and testing. They also embraced participatory training methods that they have now adapted for use in public education events in their townships and villages.

Through these trainings, the program successfully increased coverage of HIV counseling and testing in rural areas. The number of pregnant women who received counseling and testing at township health centers more than doubled from 16,057 in 2007 to 36,791 in 2009. Also, 249 village doctors trained by our program have started to provide HIV rapid testing at their village clinics, which is unique in all of China. The expansion of counseling and testing services out to the peripheral areas has translated directly into increase in coverage rates for HIV testing of pregnant women. HIV testing coverage increased from 46% of all pregnant women in 2005 to 95% of pregnant women at all the sites in 2009.

The program also supported HIV counseling and testing of premarital couples. Marriage licensing is under the jurisdiction of the Civil Affairs Bureau, while the responsibility for HIV counseling and testing in this population lies with the MCH. In our project counties, the MCH coordinated with the local Civil Affairs Department either to set up counseling and testing windows at the marriage registration office, or to set up a referral system to the MCH for registrants. Gradually, HIV counseling and testing for premarital couples has also expanded out to the township health clinics in order to reach those rural couples who do not go to the county for registration.

Improved Clinical Services for PMTCT

An ARV regimen for HIV-infected pregnant women represents a critical component of comprehensive PMTCT interventions. Our work to improve early testing of pregnant women and early identification of positive women allowed our program to start more women on complex regimens earlier during their pregnancy.

When our program first started, health workers within the MCH lacked both knowledge and experience in the administration of ARVs, which were the purview of infectious disease doctors at specifically designated hospitals. Given the novelty of PMTCT in China in 2005, often the first advice given to HIV-infected pregnant women was to terminate their pregnancy. For those who chose to continue their pregnancy, it was common for providers to only prescribe sdNVP during labor and delivery, even if the woman was identified as HIV-infected earlier in her pregnancy. Gradually some MCH doctors began to provide scAZT prophylaxis during pregnancy, which marked a significant step forward. However, most MCH health providers neither had sufficient understanding of the importance of CD4 testing and clinical staging, nor the capacity to perform CD4 test or staging at the MCH hospital. The most they could do was to refer patients to the CDC for further testing; however in the early years of China's PMTCT program very few referrals were completed, thus missing a great opportunity to link up PMTCT with care and treatment.

Technical support has focused on two areas to bolster the effectiveness and safety of optimal prophylactic intervention. One is to link up the MCH and its doctors with the ARV treatment system, both with the local comprehensive hospital's infectious disease clinic and with the provincial body responsible for overseeing treatment, the Yunnan provincial AIDS Care Center (YACC). At the same time, we provided training and continuous support to the MCH obstetricians and pediatricians themselves to raise their confidence and skill levels in managing HAART prophylaxis for HIV-infected pregnant women.

Process indicators collected suggest that over time, implementation of the project has improved. First, the pace of enrollment of women into the HAART regimen in each county increased over the years. During the first 3 years of enrollment, a total of 88 women received HAART; in 2008 and 2009, 181 women who delivered during these 2 years received HAART prophylaxis; and in 2010 alone, 121 women have been enrolled. Discussions with project staff and doctors reveal that they attribute this increase in enrollment to earlier identification of HIV-infected pregnant women and greater confidence in their own skills. The early reluctance in treating HIV-infected pregnant women with HAART has been turned into firm belief in HAART prophylaxis as the best option for PMTCT. As they learn to manage HAART for women, and more and more HIV-free babies are born to HIV-positive mothers under their care, not only have they become more confident in themselves but also HIV-positive women come to trust that they can lead healthy lives and have healthy babies under the doctors' care. Many doctors recalled how difficult it was to follow-up with women in the first years of the program, but now most women actively seek the doctor's counsel, and adhere well to their follow-up schedule.

The 390 women who have received HAART prophylaxis gave birth to 395 babies, including five sets of twins. A total of three babies have become infected with HIV-1 in this cohort, an infection rate of 0.76%.

In addition to our technical guidance to strengthen linkages between PMTCT and treatment, and our training of health providers at the MCH system, the financial support provided through the program fills resource gaps for necessary examinations and tests to closely monitor the health of the women on HAART. Our program ensured that standard blood work and physical examination were performed for the women at start of HAART and at regular intervals throughout their pregnancy. In addition, blood was drawn to measure CD4 counts and viral loads at the start of treatment, at labor and delivery, and at 1, 3, 6, and 12 months after initiation of HAART. Sixty-five percent of the women had an undetectable viral load at the time of delivery, demonstrating the effectiveness of HAART as a prophylaxis. We also closely monitored for adverse effects in the women using HAART prophylaxis. While 37% of women reported some type of adverse reaction, most were short-term, light adverse reactions. Twelve women switched to an alternate regimen, no women discontinued treatment due to side effects, and all mothers in the cohort remain alive.

Overall, 49% of the women had CD4 counts less than 350/mm^3 at the start of HAART prophylaxis and continued on treatment after delivery. This underscores another important advantage of starting women on HAART for PMTCT: linkage to treatment can be established using PMTCT as an entry point.

Introduction of Early Infant Diagnostics

Standard practice in China for infant diagnostics is ELISA testing of HIV-exposed infants at 12 months, followed by another ELISA confirmation at 18 months. With technical support from ADARC, we developed the capacity of the laboratory at Yunnan AIDS Care Center to perform DNA-PCR for HIV-exposed infants as early as 6 weeks. As the laboratory technique became reliable, more and more exposed infants were tested using DNA-PCR. Since we introduced early infant diagnostics (EID) at our program site in 2006, 428 HIV-exposed infants were tested using EID, which included not only infants of mothers enrolled into HAART prophylaxis, but of mothers enrolled into the national program as well. We have seen that the age of the babies for when the blood sample for DBS was collected has been significantly reduced as the program progresses. Among the 22 babies for whom we have test date in 2006 and 2007, the mean age of babies at blood draw was 109 days. Among 95 babies tested in 2008 and 2009, the mean age of babies was 59 days.

Strengthened Health Network

The significant results we achieved in expanding early screening of pregnant women and improving PMTCT prophylaxis to reduce the rate of MTCT would not have been possible without strengthening the local health network as a whole. In order to strengthen health system networks, it was necessary to first raise local health workers' and administrators' awareness on the importance of close collaboration between the sectors. When PMTCT work first started, many health providers held a rather limited view of PMTCT as providing prophylaxis for HIV-positive women who desired to have the baby, delivering babies by C-section, and providing them with formula provided by the government. Through the program, we gradually introduced a more comprehensive approach to PMTCT. Using the WHO (World Health Organization) PMTCT 4 components as a basis, we advocated for a comprehensive approach of PMTCT using "three preventions and one care"; that is, primary prevention, secondary prevention, prevention of MTCT, and care and treatment for positive women and families.

At the project's inception many health administrators and providers were concerned about the feasibility and necessity of implementing PMTCT services in such a comprehensive way. They understood that if a HIV-positive woman wanted to have the baby, then it was their responsibility to provide her and her baby with prophylaxis, deliver her baby at the hospital, and provide formula to feed the baby. But the idea of providing HIV counseling to every woman at ANC and labor and delivery, expanding counseling and testing service out to the township and village level where many doctors had nothing higher than a high school degree and no previous experience, giving HAART to women which would require close clinical and lab monitoring throughout the pregnancy, was daunting. There was also widespread concern that if the MCH was going to lead such a systematic effort, the

stigma associated with AIDS would negatively impact the overall operation of the hospital. Fortunately, such fears turned out to be unfounded.

Instead, PMTCT program support for the county MCH enabled them to strengthen its network at the township hospital and village level, and led to improvements in rates of hospital deliveries, and strengthening of child immunization coverage. The various components worked in synergy: government-supported initiatives such as the new rural cooperative medical scheme assisted our efforts to improve PMTCT service provision, and our project also facilitated implementation of government-supported work in improving women and children's health. In fact, after a couple of years of our program, we could see that many of our MCH hospital sites showed significant increase in their in-hospital delivery rates each year. Many of the health administrators at the county MCH hospitals expressed that the biggest asset of the program was that it enabled them to strengthen their connection to the township level health centers and bolster their ties with the county hospital and CDC. With those strengthened networks, they will be able to provide better services in the future even without program support.

Integrating Screening and Prophylaxis for Multiple Vertically Transmitted Diseases

Building upon the foundation of the HIV PMTCT program, we saw an opportunity and the need to integrate HBV and syphilis screening with HIV screening at ANC and labor and delivery. Between January and August 2009, over 13,000 pregnant women received HIV, HBV, and syphilis counseling and testing at 12 prefecture and county-level health facilities in a pilot project. Of all the infants born of HBV surface antigen-positive mothers, 266 were immunized according to Chinese Medical Association guidelines (three shots over first 6 months of life), with an additional single hepatitis B immunoglobulin (HBIG) shot within 24 h of birth. Thirty-four syphilis-positive women received benzathine penicillin treatment regimen before their delivery. In addition, partners of HBV- or syphilis-infected women were also offered counseling, testing, and follow-up services.

Our pilot project demonstrated that the acceptance rate for testing and intervention was quite high. Packaging the three tests greatly improves the cost-effectiveness of ANC services and should be beneficial for a country like China, where prevalence of HBV is 7.2% among the general population and syphilis infection rate has risen steadily in recent years [5, 6].

Positive Support Groups

Mood disorders among PLWHA (people living with HIV/AIDS) such as anxiety and depression have been well documented in the literature [7, 8]. Psychosocial

care and support is important for HIV-positive women to help them overcome their feelings of anxiety, fear, and despair. To meet their needs, our program developed psychosocial support groups for HIV-positive women and their families at all of our county MCH clinics. The meetings of the groups have served as venues for women to provide each other with mutual support, and for doctors to reinforce medical information and provide referrals to other resources available in the community.

Since 2007, 13 support groups from our sites have met close to 200 times. Spouses and other family members also actively participated in the support group meetings. Participants express some measure of relief from the isolation and loneliness they feel in their daily lives. The group meetings offer a forum for women to articulate their thoughts and concerns to others who have gone through or are going through similar experiences and emotions. Whenever possible we have tried to build the capacity of one or two women in the group to act as peer facilitators, as it seems that women more readily accept and absorb information shared by a peer rather than by a healthcare provider.

Support groups, with the patient's consent, have made specific efforts to involve partners and other family members. Support from family members is important for any person living with HIV, especially for HIV-infected pregnant women, where spousal support for treatment during pregnancy and infant feeding is critical. In rural China, where many young married couples live with the parents of the husband, the involvement of the mother-in-law in the support groups has proven especially beneficial. Through their participation these older women learn about HIV generally, and more importantly, witness the health and vitality of mothers and infants who have undergone the PMTCT intervention. Partners' and family members' support can contribute to a more supportive and harmonious atmosphere in the home. Overall, our support groups serve as a platform for providing HIV-infected women psychosocial support, promoting improved relationship with their family members, and acting as a complimentary force to clinical treatment.

Challenges and Next Steps

Infant Feeding Practices for HIV-Exposed Babies

High mortality rates among HIV-exposed, uninfected children have been observed and studied in a diverse range of settings [9–13]. Many of these deaths are associated with infant feeding practices [9–13]. The national and provincial PMTCT program in China generously provide 12 months of infant formula to all HIV-exposed babies with the assumption that as long as the formula is made available, babies will be protected from exposure to HIV through breast milk and will survive and thrive.

In 2008, we began to gather preliminary evidence of deaths among HIV-exposed babies in six counties. The data suggested higher mortality rates in HIV-exposed infants compared to the general population of infants in the same geographic areas.

Analyzing the causes of death, we found that up to 53% of them were potentially related to feeding or nutrition issues like diarrhea and malnutrition.

Sharing these preliminary findings with our county sites, we worked together to adapt a WHO/PATH (Program for Appropriate Technology in Health) curriculum on infant feeding and follow-up and used the curriculum in a training of prefecture and county-level physicians. The curriculum included the most up-to-date research on infant feeding practices, including studies that demonstrated the benefits of breastfeeding even for babies of HIV-infected mothers [14]. Through this awareness-building and skills-building exercise, health providers realized that in many rural areas environmental barriers to safe feeding practices are very high, even if free formula is being provided. They also admit that continued feeding counseling and support is a weak area in their work that can be improved upon.

Even though many doctors still find recommending and supporting of exclusive breastfeeding of HIV-exposed infants extremely challenging, they expressed willingness to explore this feeding option, as they had already been concerned with the sustainability of long-term government provision of 12 months of infant formula, as well as the safety issues of infant formula as exposed by the melamine scandal in recent years.

Our program is planning a pilot project in which we will strive to strengthen feeding counseling and support to HIV-positive mothers, regardless of the feeding option, at the same time explore breastfeeding for positive mothers who cannot meet safety requirements for formula feeding. We hope that health workers may gain experience and confidence in recommending exclusive breastfeeding while using ARV prophylaxis as a safe, viable option, and be able to provide effective support to these who choose to breastfeed.

Expansion of Program Model Still Needs Outside Support

We have demonstrated that a HAART regimen for PMTCT in a remote, resource-limited setting in China is feasible, and have achieved a reduction in MTCT rate comparable to that achieved in developed nations. We hold the conviction that from a standpoint of reducing MTCT and maximizing the mother's health, HAART is the best and the only choice for PMTCT and are heartened that the revised WHO guideline for PMTCT lists HAART prophylaxis as one option [15].

Even though rural China still lags in development compared to large metropolitan areas, given the vast rise in economic power of China on the world stage, and given the still very low overall prevalence of HIV, providing HAART for all pregnant woman and virtual elimination of MTCT should be an achievable and worthy goal. We hope our program efforts and results are only the beginning of nationwide effort to build up health infrastructure to provide comprehensive PMTCT services and to promote the use of optimal therapy for PMTCT intervention. In this regard, international organizations' participation in national-level advocacy, technical and financial assistance in systematic capacity building will remain critical.

Ongoing Capacity Building and Systems Strengthening Required

Through our project, we have helped the local health systems build a team of health providers capable of carrying out PMTCT services. However, rural health facility staffing remains very limited in general. There is no clear division between administrative and clinical responsibilities so that workloads for most doctors are heavy. While our program has promoted the integration of all PMTCT services into routine MCH work and we have seen significant progress in this regard, there are still many counties in which two or three doctors at the county level have sole or majority responsibility for all PMTCT services. We recommend the systematic distribution of PMTCT services should be further improved at health facilities, so that this work truly becomes a routine part of ANC, labor and delivery, and follow-up services and not the purview of one or two individual doctors.

Looking into the future regarding sustained implementation of PMTCT services at the community level, we feel that it will be critical to maintain training of health workers in order to reinforce the knowledge and skills, and to keep them updated on new information related to PMTCT.

Conclusion

While the primary endpoint of our PMTCT program has been achieved—fewer than 1% of HIV-exposed babies in our cohort have become infected in our program counties—the next step is to ensure that these results can be translated into a sustainable, province-wide model that can replicate these results and maximize HIV-free survival of exposed infants.

Nationally, the vertical transmission rate remains above 10% [16]. It is our hope that our experiences, as summarized in this chapter, may serve as building blocks from which the provincial and national PMTCT programs can extract key lessons and move toward decreased rates of MTCT and a generation of babies born free of HIV and surviving to lead productive, healthy lives.

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