

Original Article

Evaluating the impact of triple elimination program for mother-to-child transmission of HIV, syphilis, and hepatitis B in Indonesia

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Abstract

Indonesian government launched a triple elimination program to eliminate mother-to-child transmission (MTCT) of human immunodeficiency virus (HIV), syphilis, and hepatitis B in 2018, aiming to increase screening uptake among pregnant women during antenatal visits and to reduce the rates of these infections in children less than 50 per 100,000 live births. Despite this initiative, a thorough assessment of its effectiveness, particularly in Bandung, the capital city of West Java, as one of the most densely populated cities in Indonesia with a high HIV incidence, has yet to be conducted. The aim of this study was to analyze the impact of this triple elimination program in Bandung by assessing the data between 2017 and 2020. Monthly data was obtained from the Health Office of Bandung for four years, including number of screenings done for HIV, syphilis, and hepatitis B, number of confirmed cases and number of pregnant women treated for those infections. Additionally, data on children under 24 months old afflicted by these infections were also collected. Our data indicated an increase in screening coverage for HIV, syphilis, and HBV among pregnant women; however, it remained below the national set benchmarks for screening coverage. Only 59.5% of HIV-positive pregnant women received anti-retroviral therapy in 2020, while merely 25% of syphilis-positive cases were administered benzathine penicillin G. Syphilis screening was correlated with an increase in positive cases among children, suggesting missed opportunities in managing syphilis-positive pregnant women. Furthermore, management of HIV- and syphilis-positive cases had suboptimal outcomes. Data on hepatitis B was not evaluated since it was not available. To achieve the triple elimination program goals, comprehensive coordination among all relevant stakeholders is required, as is continuous monitoring and evaluation.

Keywords: HIV, syphilis, hepatitis B, mother-to-child transmission, triple elimination

Introduction

Human immunodeficiency virus (HIV), syphilis, and hepatitis B are among eight pathogens linked to the most significant incidence of sexually transmitted infections (STIs) [1]. Individuals may have more than one infection at the same time and often do not cause symptoms or may have long asymptomatic period [1]. These infections can be vertically transmitted to newborns from expectant mothers during pregnancy, labor, and breastfeeding. Infection in neonates can result in morbidity, disability, and even mortality, reducing the child's quality of life [2]. Globally, 39 million (33.1–45.7 million) people were living with HIV at the end of 2022, half of them were women and around 1.5 million were children under the age of 15 years-old [3]. The presence of cases in children under the age of four suggests that mother-to-child transmission (MTCT)



persists [3]. According to the World Health Organization (WHO) data, 7.1 million adults were newly infected with syphilis in 2020 and an average of 3.2% of prenatal care participants tested positive for syphilis in 2019 [4]. Pregnancy-related syphilis is the second greatest cause of intrauterine fetal death worldwide, as well as causes of prematurity, low birth weight, neonatal death, and infection in newborns [4]. In 2019, 296 million people were living with chronic hepatitis B virus (HBV) infection with 1.5 million new infections each year [5]. Perinatal transmission is the leading cause of new infections in newborns that progresses to chronic hepatitis B [5].

In Indonesia, the rates of pregnant women with HIV, syphilis, and HBV infection were 0.3%, 1.7%, and 2.5%, respectively in 2017 [6]. Efforts to prevent infection are critical since vertical transmission from pregnant women causes more than 90% of HIV, syphilis, and HBV infections in children [6]. MTCT can be effectively prevented with simple interventions such as antenatal screening, treatment for the child's parents, birth planning, early management of newborns, and infant immunization. In Indonesia, these preventive efforts are delivered through integrated reproductive and health services for pregnant women, neonates, and children as part of a triple elimination program that launched in 2018 [7]. This program targets to eliminate transmission by 2022, with a target of ≤ 50 new pediatric HIV, syphilis, and HBV infections per 100,000 live births [6,7]. However, a thorough assessment of the effectiveness of this program is not available. The aim of this study was to analyze the impact of the triple elimination program in Bandung, West Java as one of the most densely populated cities with a high HIV incidence in Indonesia.

Methods

Study design and variables

An ecological study was conducted to analyze the impact of triple elimination program in Bandung, Indonesia, using four years data, from 2017 to 2020. Participation data and outcomes of antenatal screening were collected from electronic databases: Information System of HIV/AIDS and STIs (SIHA) and Information System of Hepatitis (SIHEPI). The study variables included the triple elimination MTCT program coverage, number of pregnant women tested and infected with HIV (diagnose with rapid HIV test), syphilis (diagnose with rapid treponema pallidum (TP) test), and HBV (diagnosed by rapid HBsAg test), as well as children under 24 months old infected with HIV (diagnosed by early infant diagnosis and antibody HIV test), syphilis (diagnosed by rapid plasma reagin (RPR) titer test), and HBV (diagnosed by HBsAg test) in Bandung.

Data collections

Data from triple elimination was collected from each program. The data of HIV/AIDS and STIs program were collected from Indonesian Ministry of Health web-based reporting system SIHA. The data hepatitis B were collected from SIHEPI, a web-based reporting system of Ministry of Health. The pooled data were collected from the program coordinator in monthly basis.

Evaluation was performed on the data, information on screening uptake and general screening outcomes. Screening outcomes were reported based on laboratory-confirmed positive tests. Screening coverage was calculated by dividing the number of women screened by the number of pregnancies each year. Since the number of pregnancies each year was unavailable, an estimation was made by the Bandung government by multiplying the crude birth rate with number of population in the same year and 1.10 x; this estimation available in the database.

Statistical analysis

The Spearman's rank correlation was used to assess the correlations between screening coverage for HIV, syphilis, and HBV infection in pregnant women and number of children aged less than 24 months infected with HIV, syphilis, and HBV. This test selection was based on the data normality tested using the Shapiro-Wilk test analysis. The correlation coefficients (r) were classified as very low ($0 < r < 0.2$), low (< 0.4), moderate (< 0.6), high (< 0.8) and very high correlation ($0.8-1$). A value of $p < 0.05$ was considered significant. All analyses were conducted

using SPSS version 28.0 (IBM SPSS, New York, United States). Data from triple elimination program and its comparison on the national and program targets was analyzed descriptively.

Results

HIV, syphilis, and HBV screening coverages in pregnant women

Throughout the four-year period (2017–2020), the number of pregnant women participating in HIV, syphilis, and hepatitis B screenings has increased significantly, with HIV from 11,988 in 2017 to 20,446 in 2020, syphilis from 279 to 2,919, and hepatitis B from 1,484 to 15,381 (**Figure 1A**). However, there was a decline trend in screening participation from year 2019 to 2020 (**Figure 1A**). HIV screening coverage doubled from 2017 (26.5%) to 2019 (54.2%), while syphilis and HBV screening coverage increased more than tenfold from 3.3% in 2017 to 39.8% in 2019 for HBV and 0.5% in 2017 to 6.4% in 2019 for syphilis. Despite the fact, screening coverage among pregnant women in Bandung have not yet met the specified targets of 60% in 2018, 70% in 2019, and 80% in 2020 (**Figure 1B**).

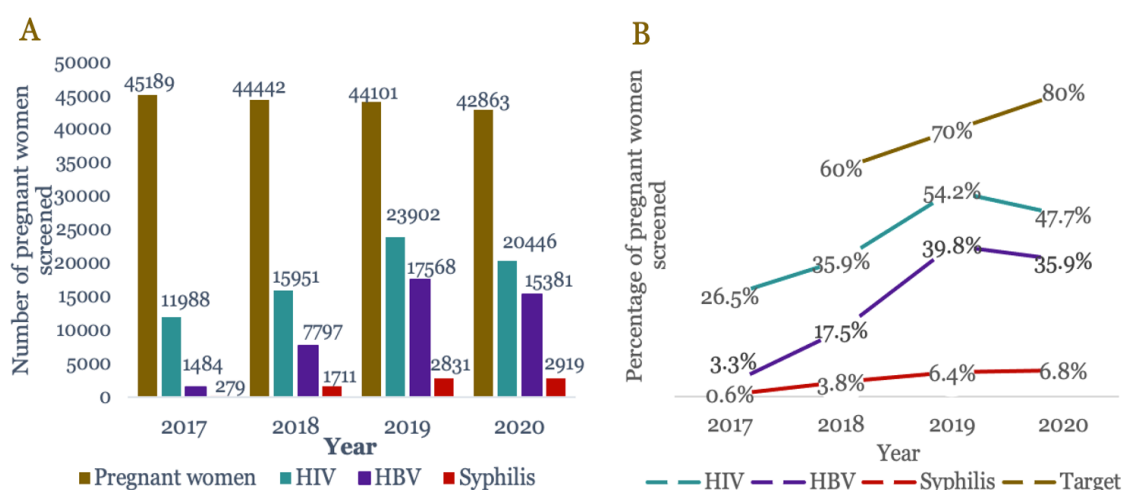


Figure 1. Number and coverage of pregnant women screened for HIV, syphilis, and hepatitis B virus (HBV) during triple elimination program in Bandung, Indonesia, 2017–2020. (A) Number of pregnant women screened for HIV, syphilis, and HBV. (B) Coverage of pregnant women screened for HIV, syphilis, and HBV.

Trend of HIV, syphilis, and HBV positive in pregnant women

HIV positive rates in pregnant women were steady, ranging from 0.1% to 0.3% (**Figure 2A**). Considering syphilis screening in pregnant women was limited to specific populations in 2017, the positivity rate was relatively high, reaching 14.3% (**Figure 2B**). Following all pregnant women were obligated to be screened for syphilis, it declined to 1.2% by 2020 (**Figure 2B**). The positive rates of hepatitis B in pregnant women has increased from 0.7% in 2017 to 1.5% in 2020 (**Figure 2C**) since the implementation of triple elimination program.

HIV, syphilis, and HBV treatment in pregnant women

In 2020, the percentage of pregnant women receiving treatment decreased to 59.5%, from 87.5% in 2019 (**Figure 3A**). Treatment for pregnant women with syphilis has increased significantly at 16.1% from 2018 to 2020 (**Figure 3B**). There was no data on treatment for HBV positive pregnant women because they were all referred to an internal medicine specialist for further evaluation.

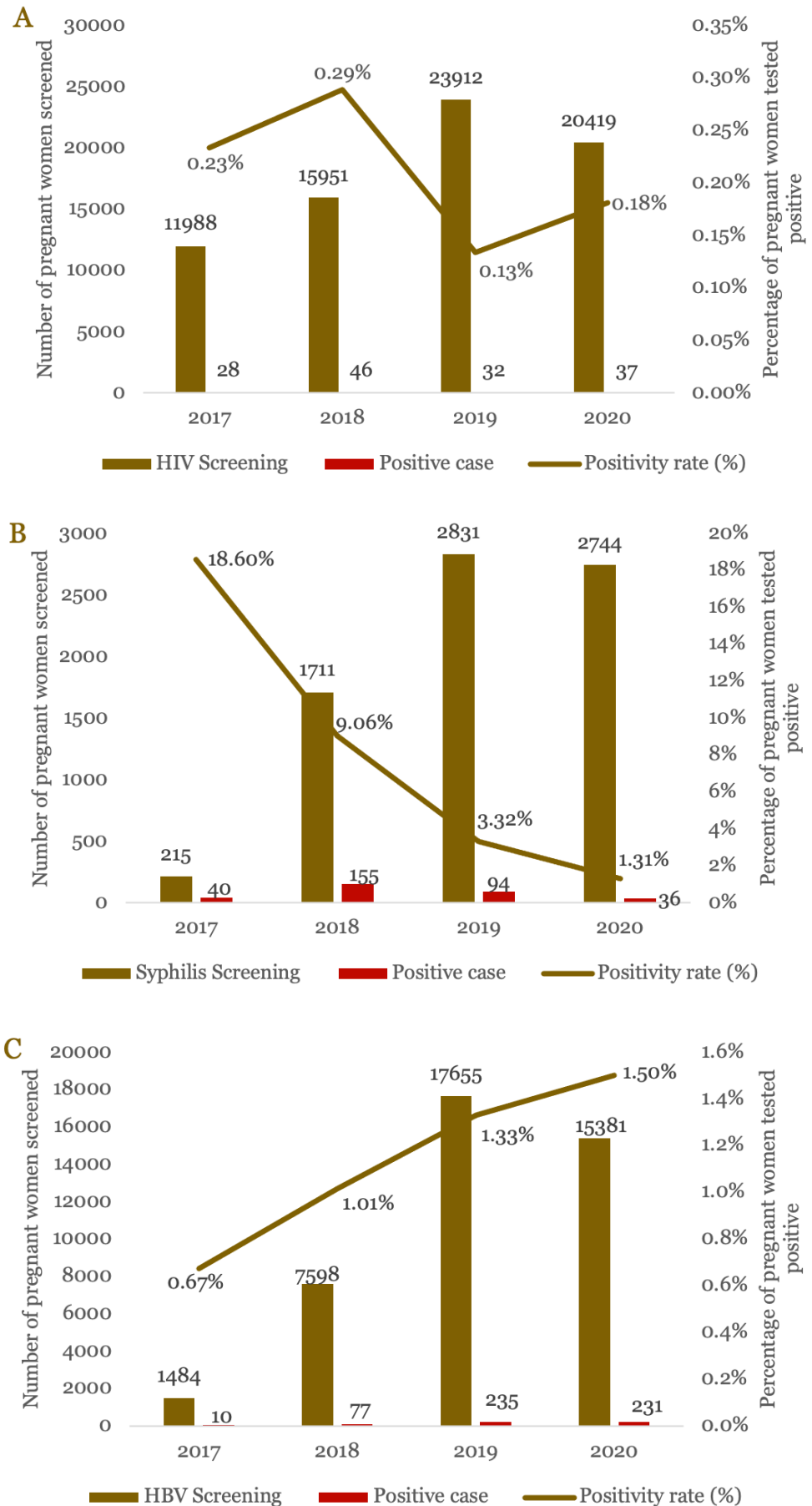


Figure 2. Number pregnant women screened and positive rate for (A) HIV, (B) syphilis, and (C) hepatitis B virus (HBV) during triple elimination program in Bandung, Indonesia, 2017–2020.

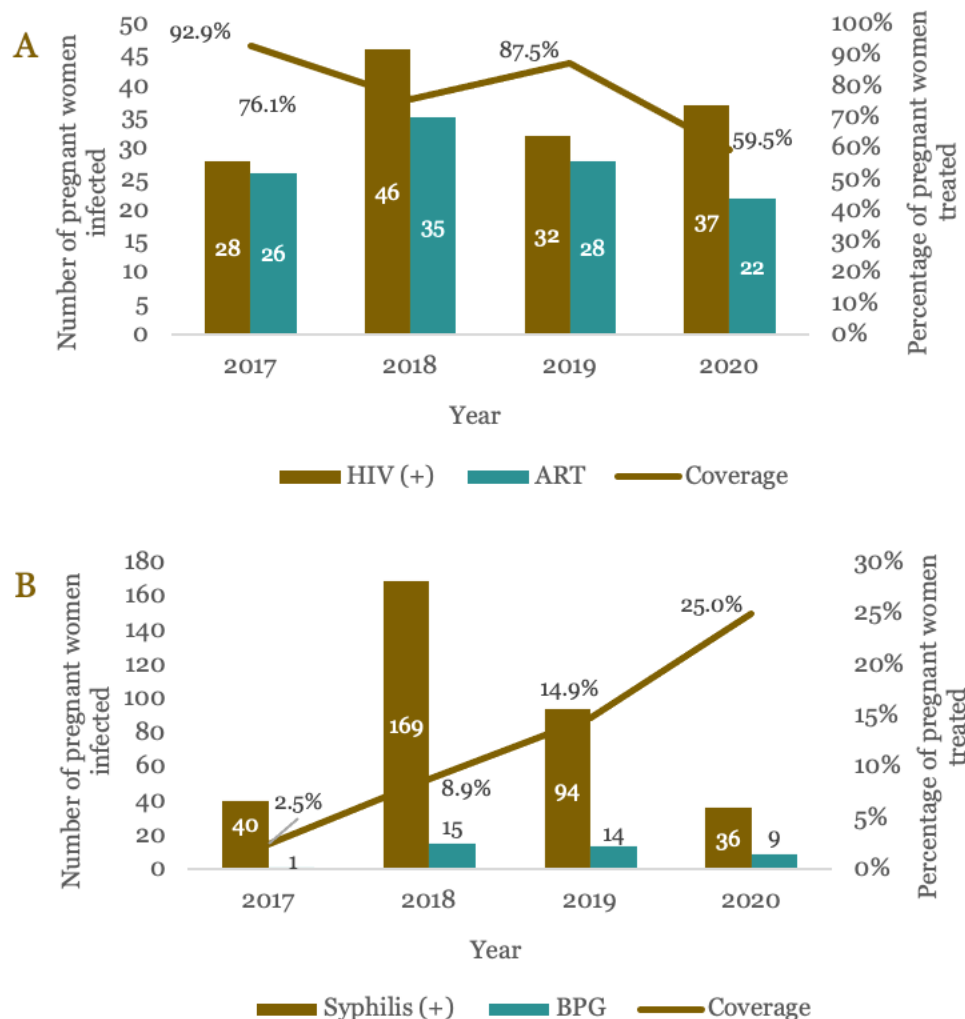


Figure 3. Number and percentage of HIV (A) and syphilis (B) positive pregnant women that were treated during triple elimination program in Bandung, Indonesia, 2017–2020.

Children under 24 months old infected with HIV, syphilis, and HBV

Records on children tested for HBV surface antigen (HBsAg) and had positive results begun in 2020 and were only included in the reporting format (Table 1). There were 90 children tested for HBsAg and, one was positive. The number of HIV-infected child under 24 months old detected per year was one in 2017, five in 2019, and one in 2020. There were no HIV-positive children reported in 2018. Since the start of triple elimination initiative, number of children diagnosed with syphilis has increased by one each year (Table 1).

Table 1. Incidence rate of HIV, syphilis, and hepatitis B in children under 24 months old

Year	Live birth rate	HIV		Syphilis		Hepatitis B	
		Frequency	%	Frequency	%	Frequency	%
2017	No data	1	-	2	-	No data	No data
2018	41,001	0	0%	3	0.005%	No data	No data
2019	41,834	5	0.012%	4	0.010%	No data	No data
2020	34,366	1	0.003%	5	0.015%	1	0.003%

The Spearman correlation test results found that there was no correlation between the number of pregnant women who had screened for HIV and the number of HIV infected children ($p=0.074$) (Table 2). However, there was a positive correlation between the number of pregnant women who had screened for syphilis and the number of syphilis infected children ($r=0.293$, $p=0.043$) (Table 2). Data on HBV infection was not evaluated since it was not available in the database.

Table 2. Spearman correlation test assessing the correlation between the pregnant women screened and number of infected children for HIV and syphilis

	Coefficient correlation (<i>r</i>)	<i>p</i> -value
HIV	0.261	0.074
Syphilis	0.293	0.043

Discussion

Vertical transmissions are responsible for more than 90% of HIV, syphilis, and HBV infections in children [6]. Antenatal screening and proper treatment of pregnant women, together with early neonatal management, can prevent MTCT of the diseases [7]. In 2018, WHO launched the regional framework for the triple elimination of MTCT of HIV, hepatitis B, and syphilis in Asia and the Pacific 2018–2030 [2]. The goal of this triple elimination program was to reach MTCT rates of <2% for HIV, <0.1% for hepatitis B, and <0.05% for syphilis [2]. Thailand, Malaysia, and Sri Lanka are among the Asian countries that have validated prevention of HIV and syphilis MTCT. To date, no country has achieved the target numbers of the triple elimination program [8]. One of the possible reasons was coronavirus disease 2019 (COVID-19) pandemic, which began in 2019 has disrupted global health systems and access to care [9]. Services associated to triple elimination program, such as prenatal care and routine immunization, have been compromised in several countries. A report also claimed that access to HIV care and antiretroviral (ARV) medications has been affected [10]. These disruptions were likely to impair the success of the triple elimination initiatives around the world, particularly in Indonesia.

Since 2007, Indonesia has implemented vertical programs to prevent MCTC of HIV. In 2010, syphilis testing for pregnant women was included in the national prevention of MTCT program, however, the target is more focused on key populations (community groups at risk of HIV/AIDS and other STIs) [11]. Hepatitis B screening and treatment has been included in the prenatal care programs since 2016 [12]. The Indonesian Ministry of Health began a national triple elimination initiative in 2018 to attain universal health coverage (UHC), zero elimination by 2030 [7]. With the program implementation, it is expected that HIV, syphilis, and hepatitis B screening tests for pregnant women will be performed concurrently during the first antenatal visit in early pregnancy (first trimester), as opposed to the previous MTCT program, which did not integrate these three diseases. However, the program has not been successfully implemented, as evidenced by data acquired in this study, which demonstrated that number of pregnant women getting tested for HIV, syphilis, and HBV infections were not even.

The screening goal for the triple elimination program was 60% of all pregnant women served by integrated antenatal care (ANC) in 2018, 70% in 2019, 80% in 2020, 90% in 2021, and 100% in 2022 [7]. The results of this study demonstrated that pregnant women in Bandung had not met these goals. A study revealed similar findings in 2018 at a tertiary hospital in Eastern Indonesia, particularly that only 14.1% of pregnant women were tested for HIV, syphilis, and HBV infections [13]. When the triple elimination program began in 2018, screening coverage for pregnant women in Bandung increased compared to previous years. These findings fell short of Vietnam's successes, which increased coverage from 50.2% to 98% following the trial adoption of an HIV, syphilis and HPV infection screening program during ANC [14].

The positivity rate is determined by number of pregnant women tested for HIV, syphilis, and HBV infections. According to this study, HIV-positive rates among pregnant women in Bandung ranged between 0.1% and 0.3%, similar to the 0.3% prevalence of HIV infections in Indonesia [15]. According to the Indonesian Health Profile in 2020, 0.25% of pregnant women in West Java were HIV positive [16]. Prior to the initiation of the triple elimination program, syphilis screening in pregnant women was typically limited to a target demographic, mainly female commercial sex workers [11]. WHO classifies Indonesia as having a medium to high endemicity for hepatitis B, with a prevalence of roughly 2.5% [15]. According to Indonesia Health Profile, as many as 1.68% of pregnant women were found to be HBsAg reactive in 2020, with West Java accounting for 1.3% [16], similar to this study's results in Bandung with 1.5% in the same year.

The aim of the triple elimination MTCT program to screen pregnant women in their first trimester was to provide adequate therapy promptly therefore cutting the risk of infection to their infants. This is especially crucial in preventing MTCT of HIV and syphilis. This study found not

all HIV-positive pregnant women in Bandung received ARV medications. Only 59.5% of pregnant women received ARV therapy in 2020, which was comparable to the Quarterly Report of HIV/AIDS and STIs in 2021, which showed that only 36.5% of HIV-positive pregnant women received ARV therapy [17]. It was also revealed that the number of HIV-positive cases among children under the age of 24 months increased in 2019 but dropped in 2020. Children born to HIV-positive mothers are often diagnosed over the age of one year using widely available anti-HIV serological tests [18]. Increment in 2019 could be attributed to the previous year's surge in HIV-positive rates, which was 0.3% in 2018, and coverage of ARV administration to pregnant women was likewise only 76.1%.

Preventing MCTC of HIV requires ongoing intervention, starting with screening and therapy for HIV-positive pregnant women and continuing ARV prophylaxis in neonates. Gaps in any phase may significantly decrease the intervention's effectiveness [19]. WHO recommends starting anti-retroviral therapy (ART) as soon as feasible in HIV-positive pregnant women as an effective strategy in minimizing MTCT of HIV, and evidence revealed that at least 4–13 weeks of ART is needed to achieve viral suppression at the time of delivery [20]. According to one study, the rate of HIV transmission in non-breastfed infants reached 5.7% in utero and 4.8% during intrapartum even though the infant had been given ARV prophylaxis for 6 weeks if the mother did not receive ARV therapy during pregnancy, demonstrating the critical role of providing ART to HIV positive pregnant women in reducing vertical transmission [21].

Since the introduction of the triple elimination program, there has been an increase in the number of maternal syphilis diagnoses, but this has not been followed up with adequate therapy, benzathine penicillin G administration. According to the Quarterly Report of HIV/AIDS and STIs in 2021, 44.3% of syphilis-positive pregnant women received treatment, which was higher than the findings obtained in this study which was 25% in 2020. A study conducted at a tertiary hospital in Surabaya revealed that only 66.7% of pregnant women with syphilis received benzathine penicillin G injections [13]. In high-income developed countries such as the United States Centers for Disease Control (CDC) reported a 30.7% delay in treating syphilis in pregnant women even though it was diagnosed during the first antenatal screening, leading to a 261% increase in the number of congenital syphilis cases between 2013 and 2018, from 362 to 1,306 [22]. This study also discovered an increase in syphilis cases in children under the age of 24 months, which can be attributed to inadequate treatment of pregnant mothers who tested positive for syphilis in Bandung.

In this study, a weak positive correlation was identified between the number of pregnant women screened for syphilis and the incidence of congenital syphilis. Many pregnant women have tested positive for HIV, syphilis, and HBV infection but have not received adequate treatment by program standards, resulting in numerous missed opportunities. The situation may contribute to a rise in cases among children later in life.

Effective triple-elimination programs demand a collaborative, interdisciplinary approach, yet in practice, programs were frequently administered independently. Inequitable funding for these three diseases, with less investment in syphilis and hepatitis B compared to HIV, impedes efficient integrated treatment [23]. Differences in finance and political support have resulted a greater progress in HIV infection control than in syphilis and hepatitis B [23]. This problem was also discovered in this study, which revealed that screening for each disease was done individually, as seen by disparities in number of pregnant women who received HIV, syphilis, and hepatitis B screening. HIV screening was performed more frequently in pregnant women than hepatitis B screening. Screening for syphilis lags substantially behind HIV and hepatitis B. The main cause for the low coverage of syphilis interventions for pregnant women was said to be a lack of political and monetary funding. Shortage of rapid diagnostic tests and benzathine penicillin G therapy limits pregnant women's access to treatment [24].

Some limitations of this present study need to be discussed. The use of tertiary data was one of the limitations of this study. Several factors may influence data quality, such as from registry accuracy until reporting. Data availability was highly dependent on the report fulfillment and certain data were still incomplete.

Conclusion

The triple elimination program of MTCT for HIV, syphilis, and hepatitis B has the primary objective of minimizing vertical transmission from infected mothers to their infants through antenatal screening, treatment of infected pregnant women, follow-up, and vaccination of infants born to infected mothers. Since the implementation in 2018, there has been an increase in HIV, syphilis, and hepatitis B screening coverage for pregnant women in Bandung, although the target has yet to be met. To achieve the triple elimination program goals, comprehensive coordination among all relevant stakeholders is required, as is continuous monitoring and evaluation.

Ethics approval

This study was approved by the Research Ethics Commission of Universitas Padjadjaran, Bandung, Indonesia number: 151/UN6.KEP/EC/2022 and authorized by the National Unity and Political Agency of the Bandung City Government listed in the Research Certificate Number: PP.09.01/212-kesbangpol/II/2022.

Competing interests

The authors declare that there is no conflict of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

How to cite

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