

Navigating Challenges in HIV Prevention: A Comprehensive Analysis of PMTCT, ART Coverage, and the Impact of Anemia on Mother-to-Child Transmission in the Republic of Congo

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ABSTRACT

This study provides a comprehensive analysis of the challenges in HIV prevention in the Republic of Congo, focusing on the Prevention of Mother-to-Child Transmission (PMTCT) programs, antiretroviral therapy (ART) coverage, and the impact of anemia on mother-to-child transmission rates. Despite progress in reducing HIV prevalence and expanding ART access, significant barriers remain, including stock-outs of essential supplies, geographical and financial obstacles, and gaps in service integration. The rising prevalence of anemia among pregnant women further complicates PMTCT efforts, potentially hindering the effectiveness of interventions. This paper highlights the urgent need for targeted strategies to enhance PMTCT services and improve health outcomes for mothers and children in the Republic of Congo.

Abbreviations List

ART	: Antiretroviral Therapy
ARV	: Antiretroviral
HIV	: Human Immunodeficiency Virus
PMTCT	: Prevention of Mother-to-Child Transmission
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Keywords: HIV/AIDS, Mother-to-Child Transmission, Anemia, Antiretroviral Therapy

Introduction

The battle against HIV/AIDS stands as one of the most enduring challenges in global public health, with its impact reverberating across communities and nations worldwide [1,2]. In the Republic of Congo, this fight is waged on multiple fronts,

encompassing Prevention of Mother-to-Child Transmission (PMTCT) programs, antiretroviral therapy (ART) coverage, and the intricate dynamics of anemia's influence on mother-to-child transmission [3]. Amidst these complexities, effective navigation is essential, requiring a comprehensive analysis of the interplay between these factors to enhance prevention strategies and improve outcomes [4,5].

Mother-to-child transmission (MTCT) of HIV remains a significant public health concern, particularly in sub-Saharan Africa [6]. While advancements in prevention strategies have drastically reduced transmission rates, challenges persist in achieving complete elimination [2,7]. The Republic of Congo, despite making strides in combating HIV/AIDS, faces several hurdles in preventing MTCT [3, 8-10]. One critical aspect of addressing the HIV epidemic is the prevention of mother-to-

child transmission (PMTCT) of the virus [11,12]. However, the performance of PMTCT activities in the country remains alarmingly low [6,13].

According to UNAIDS, in 2020, only 85% of pregnant women living with HIV in sub-Saharan Africa had access to antiretroviral treatment (UNAIDS, 2020). This means that a significant proportion of expected HIV-positive pregnant women were not on treatment. Studies have shown that treatment uptake rates for HIV-positive pregnant women vary widely across countries and regions in Africa, with persistent access and retention challenges in PMTCT (prevention of mother-to-child transmission) programmes [14,15]. The main obstacles include stock-outs of tests and drugs, geographical and financial barriers, and gaps in the integration of PMTCT services with maternal and paediatric care [6,16]. This concerning statistic is exacerbated by the recent training of medical staff to deliver PMTCT services, indicating a delay in building the necessary capacity [17,18]. The gaps in the provision of ART to HIV-positive pregnant mothers and antiretroviral (ARV) prophylaxis to exposed babies are largely unknown [19]. A primary factor contributing to the poor performance of PMTCT activities is the recurring stock-outs of HIV rapid tests in health facilities [6,20]. This critical shortage severely hampers the timely identification and enrollment of HIV-positive pregnant women into PMTCT programs [21]. Although there were anticipated improvements in PMTCT retention through the implementation of a mother mentors' approach, this initiative faced setbacks in 2021 due to the aforementioned challenges [22]. The inability to execute this strategy further compounds the existing issues, hindering progress in preventing mother-to-child transmission [6,23]. In light of these concerns, urgent and comprehensive interventions are required to address the identified obstacles and enhance the Republic of Congo's capacity to effectively implement PMTCT activities [3,24].

This paper delves into the intricate landscape of HIV prevention in the Republic of Congo, shedding light on the challenges, opportunities, and critical pathways forward in the pursuit of a healthier, HIV-free generation. This study aims to comprehensively analyze the current state of HIV prevention in the Republic of Congo, focusing on three key areas: Prevention of Mother-to-Child Transmission (PMTCT) programs, antiretroviral therapy (ART) coverage, and the impact of anemia on MTCT rates. By examining these factors, we can identify the critical challenges hindering the country's progress towards eliminating MTCT.

Methods

We conducted a descriptive and analytical study that relied on a systematic literature review and an analysis of epidemiological data. The study period was precisely defined, covering the years from 2010 to 2023. To ensure the validity and relevance of the data, we utilized various sources, including scientific databases such as PubMed, WHO, and UNAIDS, as well as institutional and governmental reports.

The inclusion criteria encompassed studies published in English and French, peer-reviewed articles, official reports, and meta-analyses focusing on HIV, Prevention of Mother-to-Child Transmission (PMTCT), and anemia in pregnant women in

sub-Saharan Africa. Conversely, we excluded studies focusing on other geographical regions, those that did not specifically mention PMTCT, and outdated reports published before 1990.

Data collection was carried out through a systematic literature search in recognized databases like PubMed, Google Scholar, and Scopus. The variables studied included the prevalence of HIV among pregnant women and children, coverage of antiretroviral treatments (ART) and PMTCT services, the impact of anemia on mother-to-child transmission, as well as factors limiting access to care, whether geographical, financial, or logistical.

For the analysis, we conducted a descriptive analysis of trends regarding prevalence, ART coverage, and the evolution of anemia. Additionally, we compared our results with those of other countries in the region to identify gaps and best practices. Finally, we synthesized the challenges encountered and formulated concrete recommendations to improve PMTCT services in the Republic of Congo.

Results

The results of this literature review highlight the persistent challenges associated with the prevention of mother-to-child transmission of HIV in the Republic of Congo. Despite notable advances in access to antiretroviral treatment (ART) and the implementation of prevention of mother-to-child transmission (PMTCT) programs, several obstacles remain. Data collected reveal significant gaps in coverage and integration of services, as well as a worrying impact of anemia on maternal and child health outcomes.

Vingt-quatre publications ont été identifiées et ont été réparties comme décrit dans la Table 1

Table 1 : Research Flowchart

Categories	Themes	Number of articles
Prevention of mother-to-child transmission of HIV (PMTCT)	Impact of PMTCT programmes	1
	Advances in antiretroviral treatment	1
	Challenges in accessing PMTCT services	1
Anaemia and its impact	Anaemia and HIV	1
	Effectiveness of prevention programmes	1
HIV treatment and prevention	Progress towards eliminating transmission	1
	Study on access to care	1
	Challenges in the fight against HIV	1
Challenges and obstacles	Challenges in access to healthcare services	1
	Analysis of obstacles to implementation	1
Global health and impacts	State of health and HIV	1
	Global strategies to combat HIV	1

Integration of health services	Integration of health programmes	1
Other considerations	ART Coverage	1
	Polices and recommendations	1

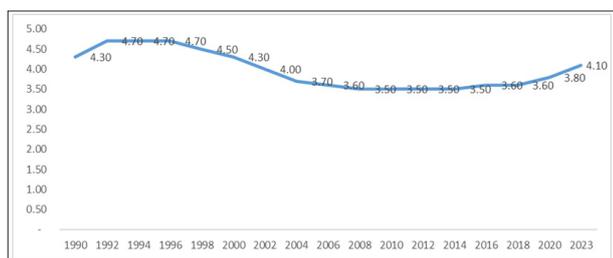


Figure 1: Prevalence of HIV, total (% of population ages 15-49) - Congo, Rep. (UNAIDS estimates)

The prevalence of HIV in the Republic of Congo has followed a generally declining trend over the past three decades, dropping from a high rate of around 4.5% in the early 1990s to around 3.8% in 2023. After fluctuating around 4.0% to 4.7% in the 1990s and early 2000s, the prevalence began a steady decline in the mid-2000s, with a significant drop between 2006 and 2008, where the rate fell from 4.0% to 3.6%. Since 2008, the prevalence has continued to gradually decrease, with some minor variations, reaching 3.8% in 2023. While this downward trend is encouraging, the HIV prevalence rate remains relatively high in the Republic of Congo compared to many other countries, underscoring the need to continue efforts to combat the epidemic and improve public health outcomes in the country.

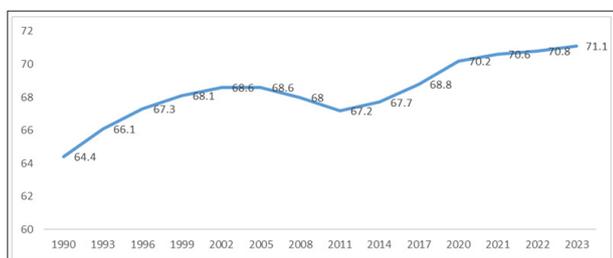


Figure 2: Women's share of population ages 15+ living with HIV (%) - Congo, Rep. (UNAIDS estimates)

The Figure 2 shows a consistent upward trend in the share of women aged 15 and above living with HIV in the Republic of Congo over the past three decades. In 1990, women represented around 64.4% of the HIV-positive population in this age group. This share then progressed steadily, reaching 67.3% in 1993, 68.6% in 1999 and 2002. After 2002, the increase accelerated, rising to 69% in 2005, 70.2% in 2008, and 70.8% in 2011. This upward trend has continued up to 2023, where women now account for 71.1% of the population aged 15 and above living with HIV in the country. This progressive feminization of the HIV/AIDS epidemic in the Republic of Congo underscores the need to adopt approaches and interventions that specifically take gender issues into account in order to effectively combat this public health challenge.

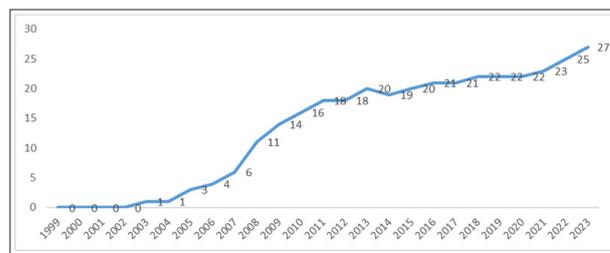


Figure 3: Antiretroviral therapy coverage (% of people living with HIV)

The key takeaway is that the situation has improved considerably over the past 20 years, but significant efforts are still needed. Starting from a very low ART coverage in 2000 (only 3.6% of people living with HIV), the country has gradually managed to increase access to antiretroviral treatment. This shows that the public health authorities have made significant progress in setting up and expanding HIV/AIDS testing and care programs. This has resulted in a continuous increase in ART coverage, which reached 85.3% in 2023. However, the fact that 15% of PLHIV remain excluded from access to treatment underscores the need to continue and intensify efforts to achieve universal ART coverage. The challenges to be addressed likely concern the geographic and financial accessibility of treatment, as well as the awareness and mobilization of the most vulnerable populations. Particular emphasis will also need to be placed on key populations (men who have sex with men, sex workers).

Ultimately, although remarkable progress has been made, the Republic of Congo must maintain and strengthen its policies to fight HIV/AIDS in order to ensure optimal care for all people living with HIV.

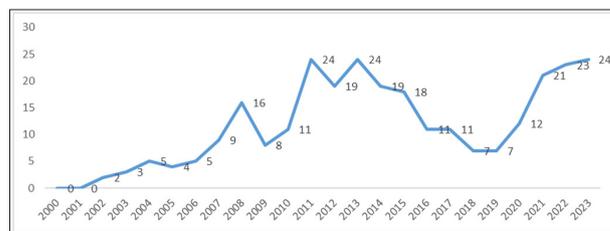


Figure 4: Antiretroviral therapy coverage for PMTCT (% of pregnant women living with HIV)

The Figure shows the trend in antiretroviral therapy (ART) coverage for preventing mother-to-child transmission (PMTCT) of HIV in the Republic of Congo from 2000 to 2023. In 2000, the ART coverage for PMTCT was very low at around 3%. Over the years, the coverage has steadily increased, reaching 9% in 2005, 16% in 2010, and 24% in 2015. The coverage then experienced a sharp increase, reaching 24% in 2018 and peaking at 25% in 2021. However, the coverage has since declined slightly, reaching 24% again in 2023. Overall, the graph demonstrates that the country has made significant progress in expanding access to ART for preventing mother-to-child transmission of HIV, with the coverage increasing from a very low base in 2000 to reach around 24-25% in recent years. However, the coverage has not yet reached universal levels, and continued efforts are needed to further improve access to PMTCT services.

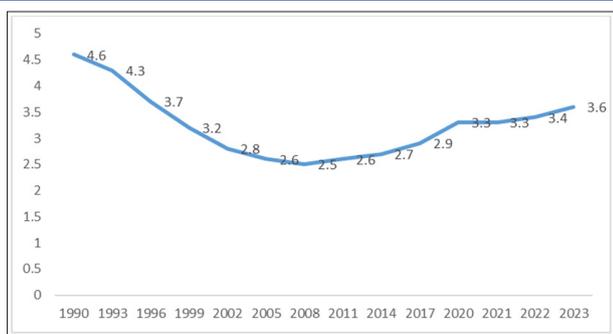


Figure 5: Prevalence of HIV, female (% ages 15-24)

The graph shows the trend in the prevalence of HIV among females aged 15-24 years in the Republic of Congo from 1990 to 2023. The HIV prevalence started relatively high at 4.6% in 1990. It then declined steadily over the years, reaching a low of 2.5% in 2008. After 2008, the prevalence started increasing again, reaching 3.6% in 2023. There have been fluctuations in the prevalence, with a few periods of decline followed by periods of increase. Overall, the prevalence has remained in the range of 3-4.6% throughout the time period shown. The graph indicates that while the HIV prevalence among young women in the Republic of Congo has seen some fluctuations, it has remained a significant public health challenge in the country. The increase in recent years is particularly concerning and suggests the need for continued efforts to address the HIV epidemic, especially among this vulnerable population.

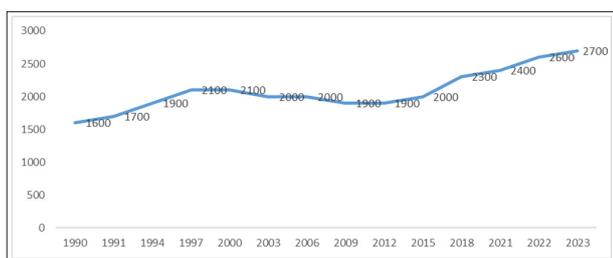


Figure 6: Number of children (ages 0-14) newly infected with HIV

The number of new HIV infections among children started relatively high at around 1,700 in 1990, but has generally decreased over the years. While the overall trend is downward, there have been some fluctuations, with increases and decreases in certain years. For example, the number increased from around 2,000 in 2003 to 2,400 in 2006, before declining again. After 2009, the number of new infections dropped more rapidly, from around 2,000 in 2009 to around 1,900 in 2012, 1,600 in 2015, and reaching a low of 1,500 in 2018. Since 2018, the number of new infections has started to increase again, reaching 2,700 in 2023. Even with the overall decline, the number of new HIV infections among children remains high, indicating that this continues to be a significant public health challenge in the country.

Prevalence of anemia among pregnant women and its impact on Prevention of Transmission of Mother-to-Child HIV (PTCTM)

Anemia, a condition characterized by a lack of red blood cells or insufficient hemoglobin, affects millions of pregnant women globally. This can have significant implications for both mother and child, particularly when considering PTCTM strategies.

The World Health Organization (WHO) estimates that around 50% of pregnant women worldwide experience anemia. Rates are particularly high in developing countries, where factors like malnutrition, malaria, and HIV infection contribute significantly. In Sub-Saharan Africa, for example, anemia prevalence among pregnant women can reach as high as 70%.

Maternal anemia can lead to complications during pregnancy and childbirth, including increased risk of prematurity, low birth weight, and maternal mortality. It can also impact the effectiveness of PTCTM interventions, potentially reducing the success rate of preventing mother-to-child HIV transmission. Anemic mothers may have lower levels of HIV-specific antibodies, which are crucial for protecting their babies from infection. Additionally, anemia can weaken the immune system, making both mother and child more susceptible to other infections.

Antiretroviral Therapy Coverage for PMTCT

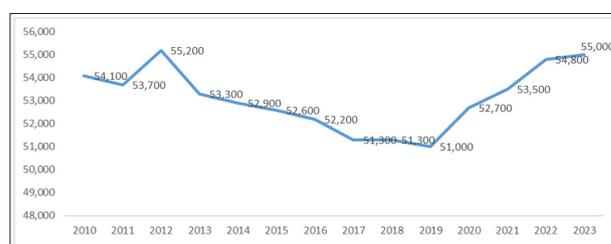


Figure 7: Antiretroviral Therapy coverage for PMTCT: % of pregnant women living with HIV

The prevalence of anaemia in pregnant women shows an overall downward trend over the period 2010-2023, falling from around 54,800 in 2010 to 53,500 in 2023. There are fairly wide annual fluctuations, with successive rises and falls. For example, prevalence rises from 2010 to 2013, then falls from 2013 to 2017, before rising again until 2020. Some periods show relative stability, such as from 2017 to 2020, when prevalence remains around 51,000-52,000. The highest values are observed in 2013 (55,200) and 2023 (54,800), while the lowest are in 2020 (51,000) and 2021 (52,700).

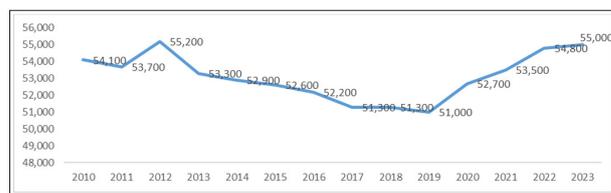


Figure 8: Prevalence of Anemia among pregnant women (%)

The prevalence of anaemia in pregnant women shows an overall downward trend over the period 2010-2023, falling from around 54,800 in 2010 to 53,500 in 2023. There are fairly wide annual fluctuations, with successive rises and falls. Prevalence rises from 2010 to 2013, then falls from 2013 to 2017, before rising again until 2020. Some periods show relative stability, such as from 2017 to 2020, when prevalence remains around 51,000-52,000. The highest values are observed in 2013 (55,200) and 2023 (54,800), while the lowest are in 2020 (51,000) and 2021 (52,700).

Discussion

Trends in HIV prevalence in the Republic of Congo are highly informative and highlight several key aspects. With regard to the general downward trend, progress has been made in the fight against the epidemic. However, fluctuations were observed in the years 1990/2000. This suggests that prevention and care efforts were not completely linear during this period. A significant drop was observed after 2006. The fact that prevalence fell more sharply between 2006 and 2008, from 4.0% to 3.6%, suggests that specific interventions or policies put in place at that time accelerated the reduction in HIV. Although the trend is positive, the prevalence rate of 3.8% in 2023 remains relatively high compared to many other countries. There is a need to continue efforts to achieve more ambitious HIV elimination targets.

The analysis of this trend over the past three decades reveals a progressive and worrying feminization of the HIV/AIDS epidemic in the country. The share of women among the HIV-positive population aged 15 and above has indeed constantly increased, from 64.4% in 1990 to 71.1% in 2023. This rise, at first relatively gradual, then accelerated in the mid-2000s, suggesting the emergence of factors that amplified the vulnerability of women to the virus. The fact that women now represent more than seven-tenths of this at-risk population underscores the scale and persistence of this concerning dynamic. Given this observation, public health authorities must imperatively adopt approaches and interventions that specifically take gender issues into account in order to more effectively curb this major public health problem in the country.

The ART coverage for PMTCT was very low, reaching only 3% in 2000. This shows that HIV/AIDS programs were still in their infancy at that time in the country. Between 2000 and 2015, coverage increased steadily, rising from 3% to 24%. This indicates that efforts were made to gradually develop access to antiretroviral treatment among pregnant women living with HIV. Acceleration of progress: After 2015, we observe an acceleration in the increase of coverage, reaching 24% in 2018 and then peaking at 25% in 2021. This suggests an intensification of PMTCT programs during this period. Since 2021, there has been a slight decrease in coverage, which has fallen back to 24% in 2023. The reasons for this temporary decline should be analyzed in more detail. Significant progress but room for improvement: Although coverage has been multiplied by 8 in 23 years, it is still far from the 100% coverage target. Additional efforts are therefore necessary to achieve universal PMTCT coverage.

The number of new pediatric HIV infections was relatively high, reaching around 1,700 in 1990. This reflects the scale of the HIV epidemic affecting children at that time in the country. Over the entire period, there is a trend of decreasing the number of new pediatric infections, which is a positive evolution. However, this downward trend has not been linear, with variations in increases and decreases in certain years. An intensification of efforts to combat mother-to-child transmission of HIV. Unfortunately, since 2018, there has been a new increase in the number of pediatric infections, reaching 2,700 in 2023. This raises concerns about a potential setback in the progress made. Although the number of infections has generally decreased, it remains very high at 2,700 in 2023. This shows that the fight against HIV

transmission to children remains a major public health challenge in the Republic of Congo.

The overall downward trend suggests progress in the prevention and management of anaemia in pregnant women, thanks to public health interventions. However, the annual fluctuations show that more needs to be done to stabilise and sustainably reduce the prevalence of anaemia. Periods of stability indicate phases when the policies and programmes in place have been effective, and could serve as a benchmark for periods of increase. The extreme values, in particular the peak in 2013 and the rise again in 2023, require in-depth analysis of the explanatory factors in order to adjust strategies accordingly.

Recommendations

To strengthen prevention of mother-to-child transmission of HIV in the Republic of Congo, it is essential to improve access to care by increasing the number of specialized centers, particularly in rural areas. Regular training of healthcare professionals is crucial to ensure better knowledge of prevention protocols. At the same time, awareness campaigns must be launched to inform pregnant women and their families about the importance of antiretroviral treatment and screening tests, in order to reduce the stigma associated with HIV. It is also important to provide psychological and social support to women living with HIV, notably through support groups, to strengthen their resilience and adherence to treatment.

In addition, the establishment of robust monitoring and evaluation systems will make it possible to measure the effectiveness of interventions and adjust strategies according to results. Promoting partnerships between the health, education and human rights sectors is necessary to address the social determinants of health that influence HIV transmission. In addition, encouraging research into new prevention strategies and adapting them to women's specific needs is essential. Integrating HIV prevention services with other reproductive health services, such as family planning and prenatal care, will also help to provide a comprehensive approach to women's health. These recommendations aim to strengthen efforts to eliminate mother-to-child transmission of HIV and improve the health and well-being of women and children in the country.

Conclusion

Prevention of mother-to-child transmission of HIV in the Republic of Congo remains a crucial public health issue. Data indicate a significant improvement in antiretroviral (ARV) treatment coverage among pregnant women, which has contributed to a reduction in mother-to-child transmission of HIV. However, challenges remain, including unequal access to care, the stigma attached to HIV infection and socio-cultural barriers to the uptake of health services.

To achieve the global goals of eliminating mother-to-child transmission of HIV, it is imperative to step up awareness-raising and education efforts, improve access to ARV treatment and strengthen healthcare infrastructures. It is also essential to encourage person-centered approaches that take into account the specific needs of women living with HIV.

Although progress has been made, continued commitment and multi-sector collaboration are needed to overcome the remaining obstacles and ensure that all women and their children have access to comprehensive and effective healthcare. Achieving these goals will not only improve the health of mothers and children, but will also contribute to the fight against the HIV epidemic at national and global level.

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Author contributions

Author contributed towards data analysis, drafting and critically revising the paper, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

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Patient and Public Involvement

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Patient Consent for Publication

Not applicable.

Provenance and Peer Review

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Data Availability Statement

All data relevant to the study are included in the article.

Disclosure

Author report no conflicts of interest in this work.

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