REVIEW PAPER

HIV retesting among pregnant women: a literature review

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Abstract

Introduction: Human immunodeficiency virus (HIV) occurrence in pregnancy remains high, with 11 in 1,087 women infected during pregnancy, resulting in 1% of seroconversion risk and HIV incidence rate of 4 per 100 pregnant women annually. In addition, sexual activities in the first trimester of pregnancy are more frequent than in the third trimester and during postpartum. The aim of this review was to investigate HIV retesting among pregnant women, and influential factors of HIV testing.

Material and methods: This study employed a search through three databases, such as Wiley, ProQuest, and PubMed. Articles selected for analysis were published between 2010 and 2020, written English, and were primary articles. Critical appraisal stage used a checklist from the Joanna Briggs Institute.

Results: There were 8 articles selected from Africa and America. Research designs included cohort studies, qualitative papers, and randomized controlled trials. HIV retesting for pregnant women was found cost-saving, beneficial for their future health, and economically and emotionally advantageous, while disadvantage was an extra cost in areas with low HIV prevalence. The influential factors were the government policy, antenatal care, and HIV-integrated services as well as the role of healthcare providers. HIV test can generally be performed in the third trimester or 3 months after the first test.

Conclusions: HIV retesting among pregnant women is crucial for the health of the mother, child, and family. It is highly associated with false HIV-negative status, which can be otherwise positive due to getting infected during pregnancy.

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Key words: HIV, pregnancy, PMTCT, HIV retesting.

Introduction

Human immunodeficiency virus (HIV) is an infection attacking the body's immune system, especially leucocytes or CD4+ T cells. In 2019, World Health Organization (WHO) reported that 38 million people in the world lived with HIV, and 7.1 million were even unaware of contracting HIV [1]. This infection causes significant morbidity and mortality in children through mother-to-child vertical transmission [2]. Currently, the number of people living with HIV is increasing in 50 countries, including Indonesia [3].

HIV prevalence among pregnant women in Indonesia is low, but under prevention of mother-to-child transmission (PMTCT) program, the detection of 8,112 newborns with HIV is possible, thereby annually saving IDR 42 billion [4]. It seems that housewives become a part of the highest risk

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group, with 6,539 positive cases in Indonesia in 2014 [5]. HIV in pregnancy can threaten the life of mother and can be transmitted to the child during pregnancy, delivery, and breast-feeding [6]. Therefore, HIV test serves as the key factor to prevent HIV infection among infants. Additional HIV test for pregnant women is associated with their involvement into early PMTCT program [7].

Universal HIV testing approach for antenatal result in the best health condition, with the most efficient cost in the long-run [8]. In HIV tests using enzyme immunoassay (EIA), the false positive prevalence in pregnant women is higher (0.06%) compared with testing among non-pregnant women or men (1.34%). Pregnant women with reactive EIA tend to show negative or unclear Western blot test results, because of the lower percentage. Such unclear result complicates clinical management during pregnancy [9].

In Africa, HIV incidence during pregnancy is high, reaching 11 per 1,087 women, thus resulting in a seroconversion risk of 1% and HIV prevalence of 4 per 100 pregnant women annually. In addition, sexual activities during the first trimester of pregnancy are more frequent than in the last trimester and during postpartum [10]. Pregnant women under the age 25 years, who have been pregnant twice or more are 2.3 times more prone to be infected with HIV than older women [11].

Mandatory HIV testing policy for pregnant women has been applied in Ontario in 2010, resulting in an increasing test uptake from 33% in 1999 to 98% in 2010. HIV retesting has even increased to 0.05 per 1,000 people annually. Previously, in 2002, the untested HIV-positive rate among women has been twice as many as that of the women tested [12]. From the ethical and legal perspective, the HIV testing policy among pregnant women recommended by service providers is a form of forced test, although it remains acceptable. It can be regarded as an effective life-saving method. Therefore, service providers are obliged to offer HIV testing and PMTCT intervention [13]. Along with the medical development, HIV rapid tests are available [14]. Test result is reliable only after two or three negative test results obtained, and in case of two out of three tests resulted positive. Another advantage is the immediate result of the test [15].

The uptake of HIV test among sexually active men aged 18-30 years is 74%, and it is 86% among women. Such discrepancy is caused by a number of constraints, including perceived HIV risks, stigma, and limited access to healthcare facilities [16] as well as previous negative results [17]. HIV rapid retesting on delivery becomes a cost-effective strategy for countries with limited resources, such as Uganda [18]. The major challenge associated with counseling and test uptake is the fear of receiving a positive result, no HIV counseling providers, and the community (belief in alternative healthcare support) [8, 19, 20] and markedly reduced transmission to sexual partners. However, these benefits can only be realised if individuals are aware of their HIV-positive status, initiated and retained on suppressive lifelong ART. Framed using the socio-ecological model, the present study explores factors contributing to poor ART uptake among community members despite high acceptance of HIV-testing within a treatment as prevention. Furthermore, the postponement to receiving antenatal care (ANC) becomes a challenge in accessing HIV tests [21]. Healthcare workers also need to improve healthcare services as well as enhance their HIV counseling skills [22].

A study on 13,720 adults tested for HIV showed that 53% of the infected individuals were unaware of being infected, while 72% obtained home counseling, 4.1% were tested positive, and 42.5% required immediate treatment, but refused [23]. In Indonesia, only 52% of women, who were actually referred to a clinic by a private midwife to take HIV test eventually came for testing. This results in 0.9% of HIV-positives, thereby presents a challenge of increasing HIV test uptake among mothers who obtain ANC services in private healthcare facilities [24]. Similar situation occurs in South Africa, and has been resolved by redesigning the referral standard, in which the counselor is designated to retest patients prior to consultation [25].

The majority of HIV-positive patients (63%) have negative test results 12 months earlier [26]. Such incidence can also occur in HIV-negative pregnant women, but contracting the virus during pregnancy. The prevalence of HIV seroconversion during pregnancy reaches 6.8 per 100 women annually [27], thereby emphasizing the need to seriously consider HIV retesting. In fact, retesting among pregnant women was conducted with their consent, resulting in significant correlation between behavioral changes and increased likelihood of condom use by HIV-positive individuals [28]. Moreover, they accept and appreciate counseling as well as HIV testing [29]. Therefore, strategies to increase HIV testing have to be effective to intensify treatment retention, especially among patients who do not fulfill the requirements to obtain antiretroviral therapy (ART) at early diagnosis [22] opt-out HIV counselling and testing.

The implementation of PMTCT in Indonesia is mandatory for pregnant women and carried out once during the first ANC visit. In the flowchart on HIV testing and counselling (KTHIV) from the Ministry of Health, there is a procedure for health workers to inform patients about having HIV retest if they have risky behaviors, and this includes pregnant women [5]. These risky behaviors involve a history of consuming alcohol in the last three months, using injectable illicit drugs, having more than one sexual partner in the last 12 months, being a sex worker, knowing a partner with HIV-positive status, having unsafe sex, and experiencing or having a history of sexually transmitted infections [30]. According to another regulation, there are eight groups of people with the risk of HIV/AIDS infection, of which pregnant women rank first [31]. In these guidelines, pregnant women are part of the risk group, thus requiring HIV retesting prior to giving birth.

In HIV, the so-called 'window period', is a period from the time a person is infected with HIV till the time when the body produces antibodies to be detected with HIV antibody test within a period of 2-12 weeks. During the window period, a patient is highly infectious, and can easily transmit the virus to others despite negative laboratory test results. Therefore, HIV retesting for pregnant women is highly important and has become a part of HIV testing and counselling flowchart from the Ministry of Health, even though the chart actually shows groups with risky behaviors [5].

A study form India by [32] showed that the incidence of HIV-positive cases among pregnant women with HIV retesting in the 3rd trimester of pregnancy after a negative result from the first test, reached 1.2 per 1,000 women annually. Another finding of this study revealed that HIV retesting was 8.2 times more cost-effective than no HIV retesting when referring to quality-adjusted life-year (QALY) as a generic measure of disease burden, including the quality and quantity of life.

Based on the description of PMTCT implementation for pregnant women, clinical and non-clinical problems as well as the benefits of HIV retesting among pregnant women, testing should be done to ensure safety of mother and child during pregnancy and labor. A study by Kim *et al*. [23] in Uganda reported that HIV retesting in pregnant women is highly acceptable and feasible, with 82% respondents taking HIV test more than once during pregnancy. Therefore, it is possible to provide HIV retesting to pregnant women, especially to those who are at risk and having good knowledge on HIV/AIDS.

One of the efforts recommended by WHO to eliminate HIV transmission can be made through health promotion, a process to encourage individuals to increase control and improve their health. Health promotion on the prevention of mother-to-child transmission of HIV can provide knowledge about the importance of preventing transmission, which is expected to make changes in attitudes and behaviors of the target group [33].

HIV retesting for pregnant women is extremely necessary, because the policy is to conduct HIV tests among pregnant women only in the first trimester of pregnancy. A negative result of the first test can be false negative due to a failure to detect antibodies or antigens in someone actually infected with HIV (misidentifying an HIV-positive person as HIV-negative). This can occur during the window period, when antibodies and antigens cannot be detected. Based on the above-mentioned background, it was essential to review a number of articles related to HIV retesting among pregnant women, with advantages, disadvantages, influential factors, and time for HIV retesting.

Material and methods

Research question

The research questions in this article were:

1. What are the advantages and disadvantages of HIV retesting among pregnant women?
2. What are the factors, which affect HIV retesting in pregnant women?
3. What is the appropriate time for HIV retesting among pregnant women?

Table 1. Framework scoping review

Framework studies	
P (population)	Pregnant women
I (intervention/issue)	HIV retesting
C (comparison)	–
O (outcomes)	Advantages, disadvantages, factors, which affect HIV retesting for pregnant women, time for HIV retesting in pregnant women

Eligibility criteria

It was important to develop questions effectively, because it was the basis for the entire review protocol, guiding the formation of search strategies, inclusion criteria, and data extraction [34]. Feasibility study in this review used PICO (population, intervention/issue, comparison, outcome) tool that was the basis for determining the eligibility criteria for this review. Additionally, PICO was selected because it was suitable for all types of research used in the selection of articles adapted for the purpose of conducting the review. This framework model helps in identifying key concepts in the focus of the review, developing appropriate search terms to describe the problem, and determining criteria in the review; thus, PICO (Table 1) was considered appropriate [35].

Inclusion criteria

Stage in formulating the problem was in line with relevant criteria in order to develop a decision plan in finding terms used, searching for sources, time span, and language. Identifying relevant articles in this scoping review (ScR), the first step was to determine the inclusion and exclusion criteria from the framework created, so that data focused on the purpose of the review. The inclusion and exclusion criteria were as follows: 1) English-written articles published from November 6, 2010 to November 6, 2020; 2) types of articles and research subjects applied to humans; 3) research independent variable was HIV in pregnant women, and dependent variable was HIV retesting; 4) the selected articles on HIV retesting included advantages, disadvantages, factors influencing HIV retesting, and timing of retesting.

Exclusion criteria

1. Article opinion: the researcher did not choose an article, because it was only the opinion of the author, not scientific evidence, and not research-obtained. 2. Article review: researchers did not select articles, which were carried out using the same method as scoping reviews, systematic reviews, and others.

Article search strategies

The main article search was performed in three databases, including Wiley, PubMed, and ProQuest. Key words were HIV retesting among pregnant women published from November 2010 to November 2020. The specific key words used in each database were as follows:

1. Wiley: "retest OR retested OR retesting OR retests OR Re-testing OR Test-retest OR "repeat testing" OR "second test"" in Title and "HIV OR "human immunodeficiency

virus" "anywhere and "pregnant OR pregnants OR pregnancies OR pregnancy OR Prenatal OR Pre-natal OR Maternity OR Maternal OR antenatal OR antenatally" anywhere.

2. ProQuest: ((((((((((((((((((retest) OR (retested)) OR (retested)) OR (retesting)) OR (retesting)) OR (retesting)) OR (retests)) OR (retests)) OR (Re-testing)) OR (Test-retest)) OR ("Repeat HIV Testing")) OR ("Repeat HIV-Testing")) OR ("Repeat HIV-Testing")) OR ("repeat testing")) OR ("second HIV test")) OR ("second HIV-test")) AND ((HIV) OR ("human immunodeficiency virus"))) AND ((((((((((((((((retest) OR (retested)) OR (retested)) OR (retesting)) OR (retesting)) OR (retesting)) OR (retests)) OR (retests)) OR (Re-testing)) OR (Test-retest)) OR ("Repeat HIV Testing")) OR ("Repeat HIV-Testing")) OR ("Repeat HIV-Testing")) OR ("repeat testing")) OR ("second HIV test")) OR ("second HIV-test")) AND ((HIV) OR ("human immunodeficiency virus")))) AND ((((((((((pregnant) OR (pregnants)) OR (pregnancies)) OR (pregnancy)) OR (Prenatal)) OR (Prenatal)) OR (Pre-natal)) OR (Maternity)) OR (Maternal)) OR (antenatal)) OR (antenatally)).

3. PubMed: ((((((((((retest) OR (retested)) OR (retesting)) OR (retests)) OR (Re-testing)) OR (Test-retest)) OR ("Repeat HIV Testing")) OR ("Repeat HIV-Testing")) OR ("repeat testing")) OR ("second HIV test")) OR ("second HIV-test")) AND ((HIV) OR ("human immunodeficiency virus"))) AND ((((((((((pregnant) OR (pregnants)) OR (pregnancies)) OR (pregnancy)) OR (Prenatal)) OR (Pre-natal)) OR (Maternity)) OR (Maternal)) OR (antenatal)) OR (antenatally)).

Criteria

Inclusion criteria were articles published in English from November 6, 2010 to November 6, 2020, and limited to articles' types and human subjects as well as studies on HIV in pregnant women as the independent variable and HIV retesting as the dependent variable. The selected articles discussed the benefits of HIV retesting, advantages, disadvantages, influential factors, and time for HIV retesting.

Search outcomes

Early stage of the article search used pre-determined key words for the 3 databases, resulting in 1,535 articles. The articles were then verified for auto-duplicates, and 1,502 were obtained. Screening based on titles resulted in 106 articles, followed by abstract-based screening. Abstract selection examined whether an article mentioned HIV retesting, hence 46 articles were acquired. Subsequently, full-text papers were read, obtaining 13 articles. The process of article search is described in PRISMA flow diagram in Figure 1.

Results

Quality appraisal

The reviewer read the 8 selected full papers and carried out a quality appraisal. The instrument from Joanna Briggs Institute (JBI) was used with critical appraisal checklist, consisted of qualitative, randomized-controlled trail (RCT), and cohort studies. Assessment was done to input and eliminate articles in the synthesis stage by employing the inclusion criteria based on the research subjects, research samples, instrument validity and reliability, confounding factors, and statistical analysis. The results showed that the eight articles fulfilled these criteria.

Data charting

The eight articles included in the review are presented in Table 2. The main variables were the health promotion methods reviewed in the articles.

Article characteristics

Country

The obtained articles (Figure 2) were from African and American countries, including Uganda, Cameroon, and Kenya in Africa as well as from Canada, Mexico, USA, and New Zealand.

Research design

The research design (Figure 3) varied, with 4 cohort studies, 2 randomized controlled trials, and 2 qualitative studies.

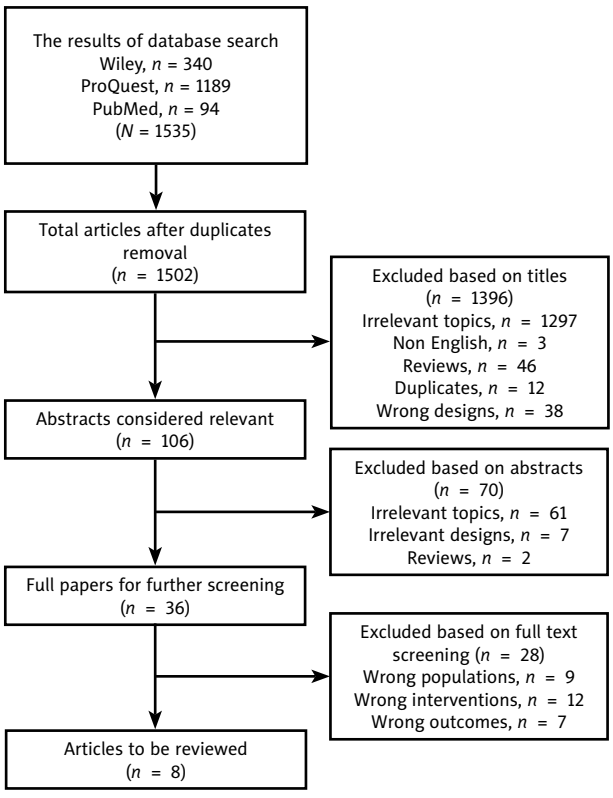

Figure 1. PRISMA flowchart

Table 2. Data charting

No.	Author, year, and country [Ref.]	Design	Main variables	Sample size
1	Remis *et al.*, 2012, Canada [12]	Cohort study	Loss, HIV retesting factor, timing	147,411 pregnant women
2	Kim *et al.*, 2013, Uganda [23]	Cohort study	Advantages	10,000 pregnant women
3.	McAllister *et al.*, 2013, New Zealand [41]	Qualitative research study	HIV retesting factor	6 pregnant women, 11 midwives, 19 general practitioners
4.	Egbe *et al.*, 2016, Cameroon [27]	Cohort study	Revisit timing	477 pregnant women
5.	Kendall, 2014, Mexico [38]	Qualitative	Advantages, revisit timing	48 pregnant women
6.	Mugo *et al.*, 2016, Kenya [40]	RCT	HIV retesting factor	410 participants
7.	Wesolowski *et al.*, 2011, Unites States [9]	Retrospective cohort study	Advantages	921,501 pregnant women
8.	Wagner *et al.*, 2021, Kenya [37]	RCT	Disadvantages	4,401 pregnant women

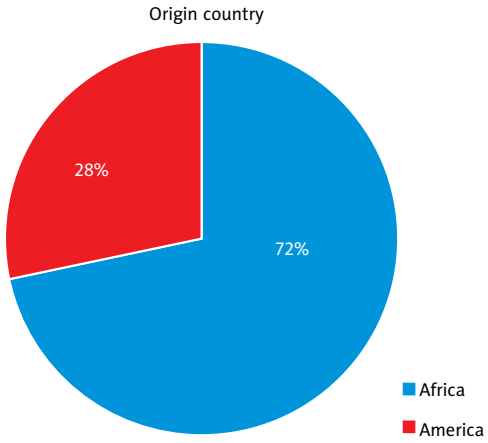

Figure 2. Country-based article characteristics

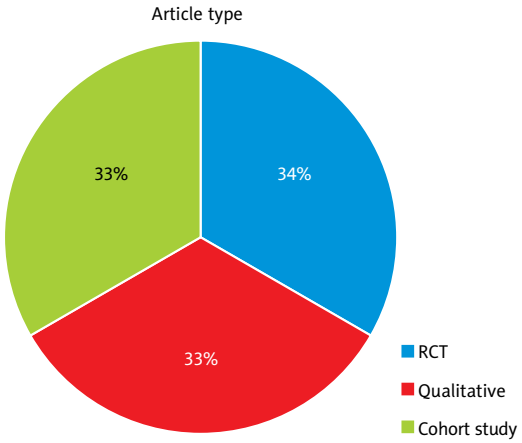

Figure 3. Research-based characteristics

Discussion

Advantages of HIV retesting

There were 3 articles discussing the advantages of HIV retesting among pregnant women. These advantages were associated with cost-effectiveness compared with the cost of HIV-positive patient's life-time treatment, healthcare cost, economic cost, and emotional cost.

Cost-effectiveness

HIV rapid test retaken in the last trimester of pregnancy could save the total cost of HIV treatment. This was based on the cohort analysis of 10,000 pregnant women from Uganda, as an example of a country with limited resources and high HIV prevalence (more than 8%) [23]. Retesting for postponed antenatal tests using HIV rapid test also proved to be cost-effective [36].

Health, economic, and emotional consequences

There could be more serious consequences in health, economic, and emotional aspects if retesting was not performed, due to the mother's unknown condition. Additionally, HIV retesting was a healthcare approach not only for the mother, but also for the family. The most serious consequence of not HIV retesting was the possibility of HIV to progress into AIDS, or leading to death. In countries with low HIV prevalence, the increasing number of HIV cases could be prevented by retesting [36]. Moreover, retesting could also prevent the false positive incidence that was found higher among non-pregnant women [9].

Disadvantages of HIV retesting

There were 2 articles discussing the disadvantages of retesting due to the extra cost, time, and ineffectiveness of various HIV tests with a relatively high number of false positive results. HIV retesting in pregnant women significantly increases cost-effectiveness [12]. Another study in America reported that retesting can reduce the budget of treatment for HIV as much as $US 819,231 per case. HIV rapid test for retesting showed inaccurate results, such as being reactive to determinants, but non-reactive in the first response [37].

Influential factors in HIV retesting

Three articles investigated the influential factors in HIV retesting in pregnant women. These factors were a part of support system for the uptake of HIV retesting, such as the government policy, HIV test integration with ANC, and active role of healthcare workers to remind and educate pregnant women about the recommended time to retest. Similarly, there were obstructing factors, such as the women's self-perception and not revealing their status to their partners (closedness).

HIV test policy for all pregnant women

There was a dramatic increase in prenatal HIV testing after 11 years of implementation [12]. This policy emphasized coordination between ANC regulations and laws on HIV testing and counseling proposed by ANC service providers [38]. Additionally, the need to integrate HIV testing with routine ANC services influence increased opportunities of PMTCT program for HIV-positive pregnant women [39].

Providing a reminder

Providing a reminder in person or through SMS and phone call can improve the uptake of HIV retesting by 40%. Such low-cost intervention can facilitate the detection of acute HIV infection and the use of HIV retesting in accordance with public health recommendations [40].

Women's self-perception

Pregnant women perceived that the 12-week waiting time for retesting is too long, but healthcare providers assumed otherwise. Therefore, the support of healthcare providers was found crucial for women who were shocked after being confirmed positive in the early examination. Healthcare providers' support, knowledge, and communicative competences are extremely helpful in relieving anxiety [41]. Some of these women refuse to take the test due to lack of detailed information about HIV [38]. Educating pregnant women and their communities would improve their knowledge on HIV and reduce stigma [39].

HIV retesting time for pregnant women

There were 2 articles examining the time for HIV retesting in pregnant women. In general, retesting was performed in the third trimester prior to delivery. Some articles suggested retesting in 3 months after the first test. HIV rapid test can also be implemented, showing accurate and immediate results.

The second retesting assumed to be taken in five months of pregnancy [12]. In Cameroon, 54.9% pregnant women retake the test in 3 months after their first negative result, whereas 25.8% retake it in the 4th month, 14.2% in the 5th month, and 6.1% in the 6th month of pregnancy. For earlier identification of seroconversion cases, it was strongly suggested to retake HIV test every 3 months until delivery [28]. Other research reported that HIV retesting should be performed in the third trimester to identify women living with HIV, prevent vertical transmission, and enable appropriate referral [38].

Conclusions

The advantages of HIV retesting among pregnant women is cost-effectiveness in healthcare and positive impact on health and emotions. The disadvantage of HIV retesting is its additional cost, long waiting time, and ineffectiveness of HIV testing with less accurate methods. Factors, which influence HIV retesting are policies, perceptions of pregnant women, and a reminder about testing. The right time to perform a HIV retest is in the third trimester of pregnancy.

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