

HIV Infection And Neonatal Outcomes In Pregnant Women Living With Hiv In Iran: A Systematic Review

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Abstract

Background

Pregnant women worldwide face a significant public health problem caused by HIV infection. In addition to the risk of mother-to-child transmission, it can result in significant complications and detrimental pregnancy and neonatal outcomes. No comprehensive evidence is available to measure the neonatal outcomes of HIV infection in pregnant women in Iran. This study aimed to assess neonatal outcomes of HIV infection in pregnant women in Iran.

Methods

The search for international databases, including PubMed, Scopus, ISI, and Embase, as well as all national databases, was done systematically until September 25th, 2024. The inclusion criteria encompassed any records reporting neonatal outcomes among pregnant women in Iran. The study outcomes included any neonatal implications related to HIV infection in pregnant women.

Results

A total of seven studies with participating 497 pregnant women living with HIV were identified. Abortion was the most common adverse pregnancy outcome. The proportion of newborns with HIV infection varied from 0% to 25.7%. The live birth rate exceeded 95% in most studies. Prophylaxis has been initiated for all newborns. Infant growth was within the normal range for the majority of infants.

Conclusion

Adverse neonatal outcomes among pregnant mothers with AIDS in Iran are quite low, and most of them receive care.

Keywords Acquired Immune Deficiency Syndrome Virus, pregnancy outcome, infectious, epidemiology, Iran.

Introduction

Background

Pregnant women around the world face a major public health issue, which is the human immunodeficiency virus (HIV) infection [1]. The statistics of the World Health Organization (WHO) indicate that by the end of 2021, about 38.4 million people worldwide were infected with HIV, of which about 19.7 million people, i.e. more than half of the infected, were women over 15 years old [2, 3]. Young women (10–24 years old) have a twice higher risk of HIV infection than their male counterparts

because of unequal cultural, social, and economic conditions [4]. Also, according to statistics, about one million and three hundred thousand women and girls infected with HIV become pregnant every year [2, 5].

During pregnancy, delivery, and breastfeeding, HIV can also be transmitted to children through mother-to-child transmission (MTCT) [6]. MTCT is the main cause of >90% of pediatric HIV infections, and over 1600 children are infected with HIV daily [7]. MTCT rates can range from 15% to 45% without any intervention. The transmission rate is estimated to be 35, 65, and 7-22% while pregnant, post-partum, and breastfeeding, respectively [8]. Owing to the lack of healthcare standards, poor perinatal care, late diagnosis, lack of antiretroviral therapy and poor interventions to prevent MTCT, the risk of MTCT is still high in Iran [9] and developing countries [10]. The prevention of MTCT can be hindered by the behavioral characteristics of mothers, apart from the quality of clinical care [11].

Infection rates among women in Iran have been on the rise in recent years [12]. The increase in MTCT risk has highlighted the need to strengthen preventive measures in this area [13]. The number of HIV infections in Iran is estimated by statistical modeling to be over 80,000 cases [14, 15].

In 2013, Iran started a program to prevent mother-to-child transmission (PMTCT) and introduced antiretroviral therapy [13]. There is still a lack of understanding about the adverse pregnancy outcomes among pregnant women with HIV in Iran. The PMTCT program is estimated to have an abortion rate of approximately 2.5% among newborns from mothers enrolled [13, 16].

There is no comprehensive evidence based on systematic review, to measure pregnancy and neonatal outcomes of HIV infection in pregnant women in Iran. Therefore, this review aimed to assess neonatal outcomes of HIV infection in pregnant women in Iran.

Methods

Search strategy

The study systematically searched published literature in English and Persian from PubMed, ISI, Scopus, Embase, Google scholar, and Persian databases including Iran doc, MedLib, IranMedex, SID, and Google free search up to 25th September 2024. Grey literature also was explored from Center for Disease Control and Prevention of the Ministry of Health of Iran, WHO and CDC reports, congress papers, and records. The study searched any records reporting pregnancy and neonatal outcomes, and PMTCP among pregnant women in Iran.

The search used both free text words and medical subject headings (MeSH terms). The initial search terms were "HIV" OR "pregnant women" in the title and/or abstract. The final search used the relevant MeSH terms and text words related to HIV among pregnant women in conjunction with "pregnancy" OR "fertility" OR "mother" AND "HIV" OR "AIDS" OR "Acquired Immunodeficiency Syndrome" AND "pregnancy outcome" OR "adverse pregnancy" OR "prevention" OR "antiviral" OR "mortality" OR "neonate" OR "newborn" OR "infant" OR "child". The reference lists of the recovered records were also screened with the purpose to identify other potential data sources.

Eligibility criteria

The inclusion criteria were any paper that reported any pregnancy and/or neonatal outcomes in pregnant women with positive HIV in Iran. Exclusion criteria included studies conducted among non-pregnant women and /or men, studies evaluated only pregnant women knowledge and attitude, reviews, letters, conference abstracts, editorials, commentaries, and qualitative studies. The study also excluded records with incomplete data regarding pregnant women infected with HIV.

Data selection and extraction

Eligibility assessment of the papers was conducted independently in a blinded, standardized manner by two reviewers (HA, ZhB). Initially, the title and abstract were screened, followed by the two reviewers screening and selecting relevant full-text papers. The study data and information were extracted based on pre-specified criteria into an Excel sheet.

Extracted data included the year of publication, name of the first author, study design, province/city, number of pregnant women (sample size), socio-demographic characteristics of patients, type of pregnancy, HIV positive rate among spouses/partners, pregnancy outcomes, delivery, live birth rate, newborn prophylaxis, HIV positive status among infants, and infant growth status..

Quality assessment

The quality and strength of the included papers were assessed using Crombie's tool [17]. Crombie's instrument consists of seven items for evaluating the quality of cross-sectional studies, including sample size and representativeness, appropriateness of methods, data and outcome variable ascertainment, reliability and validity of measurements, clarity and reporting of non-respondents, appropriateness of statistical methods, and adequacy of analyses. Quality scoring ranged from 0 to 7 for each article. The final selection of included studies was determined by consensus between the two authors (ZZ, ZhB). In cases of disagreement, the third author (ShA) would make the final decision.

Risk of bias assessment

The risk of bias was evaluated using parameters from the Newcastle-Ottawa Scale [18]. The following parameters were taken into account for the risk of bias assessment: sampling method and strategy (employing random and unbiased sampling methods), adequate sample size, appropriate data collection methods, response rate adequacy, inclusion/exclusion criteria, sample representativeness, and suitable statistical analysis. The final scoring system consisted of 11 criteria for rating various risk of bias elements for each eligible article out of a total of 12 scores. Scale weights (with unbiased sampling and data collection methods receiving the highest weights) were recommended by the authors for each parameter of the scoring system, as suggested in other meta-analyses. Studies were categorized into three levels of risk of bias: low risk (9-12 points), moderate risk (5-8 points), and high risk (<5 points) [19].

Results

Study selection and characteristics

A total of 27,853 records were retrieved after searching for potentially relevant studies. Of these, 27,831 studies were excluded due to duplicate and abstract screening, leaving 22 studies eligible for full-text assessment for final inclusion. Ultimately, 7 articles were included in the systematic review and meta-analysis to evaluate maternal and neonatal outcomes of HIV infection in pregnant women and to present the treatment status of HIV in pregnant mothers and newborns (**Fig. 1**).

Results of the quality assessment

Figure 2 shows a summary of the risk of bias assessment. The overall risk of bias was found to be low. A low percentage (<15%) of serious risk of bias was identified in the second domain, featuring bias due to the selection of participants. A moderate risk of bias (<30%) was noted in confounding and selection of participants, missing data, and less than 10% in selection of reported results. There was no significant bias detected in the third (classification of interventions), fourth (deviations from intended interventions), and sixth (measurement of outcomes) domains.

Table 1 shows baseline characteristics of the included studies. A total of 497 pregnant women infected with HIV have participated in included studies. All seven eligible studies were descriptive and/or descriptive-analytical designs. Studies were published between 2016 and 2023. No studies designed with a control group, such as cohort or case-control studies, were found that could compare pregnancy and neonatal outcomes using epidemiological measures of association between HIV-infected and non-HIV-infected pregnant women. In general, very few analytical studies have been published regarding HIV in pregnant women in Iran. Most of the studies had small sample sizes, with the largest being 112 and the smallest 39. Out of the 7 studies, 3 were conducted in Tehran. In most studies, the average age of pregnant women was 30 years or older. The majority of pregnant women with HIV had non-university education and lived in urban areas.

Table 2 shows adverse neonatal outcomes among pregnant women infected with HIV. The live birth rate in most studies was nearly 100%. Nonetheless, the most common adverse neonatal complication was abortion. Birth weight and infant growth were reported positively in most studies. Infant feeding was with powdered milk in over 90% of cases, although many studies had limited information on this issue and other pregnancy outcomes. Out of 7 eligible studies, the HIV positive rate was 0.0% in 2 studies, while in the others it was less than 25%. Newborn prophylaxis was administered in almost 100%

of studies. More details on the maternal and neonatal outcomes of HIV infection in pregnant women are presented in Table 2.

Discussion

This review demonstrating neonatal outcomes of HIV infection in pregnant women, as well as the status of HIV treatment and prophylaxis in pregnant mothers and newborns, along with demographic features in Iran. Findings indicate that there are few studies directly estimating HIV incidence in pregnant women with HIV and its consequences for mothers and infants in Iran. Holistic and population-based studies focused on pregnant women are necessary to present and evaluate the overall prevalence of HIV infection and its consequences. This meta-analysis, by combining the results of existing studies through a statistical approach and qualitative assessment of bias risk, was able to provide a comprehensive evaluation of the status of HIV in pregnant women in Iran, as well as fertility and newborn outcomes.

The findings of this review indicate a need for more comprehensive primary studies utilizing cohort and longitudinal designs, alongside comparisons with control groups. Additionally, it is essential to consider broader pregnancy and neonatal outcomes, including the status of ART and prophylaxis in mothers and their newborns, as well as clinical features, morbidity, and mortality rates among pregnant women and infants. Neonatal outcomes such as preterm birth, low birth weight, stillbirth, and both spontaneous and induced abortions should also be examined.

The estimated rates of HIV transmission during pregnancy, postpartum, and breastfeeding are 35%, 65%, and 7-22%, respectively [20]. These rates remain high in developing countries due to inadequate healthcare standards, insufficient perinatal care, late diagnoses, lack of antiretroviral treatment, and ineffective interventions to prevent mother-to-child transmission. Besides the quality of clinical care, the behavioral characteristics of mothers may also pose barriers to PMTCT[21].

Findings indicated that the percentage of HIV-positive newborns in Iran is very low, and the live birth rate also is near to 100%. A systematic review and meta-analysis conducted in sub-Saharan Africa indicated an average HIV incidence rate of 3.6 per 100 person-years among pregnant and breastfeeding women [22]. Additionally, we found that the prevalence of newborn prophylaxis is nearly 100%. These findings highlight the favorable effectiveness of the PMTCT program for HIV in Iran. Nonetheless, it remains unclear how the original studies have managed to account for all pregnant women, both those receiving care and those who are not [23].

A study conducted in Namibia in 2020 revealed that the proportion of MTCT was 33.6% among pregnant mothers who did not receive ART [24]. Without ART, around 15% to 40% of pregnant or breastfeeding individuals with HIV will have a child who is also HIV positive. However, the risk of perinatal and postpartum transmission drops to less than 2% if ART is initiated early in pregnancy with sustained viral suppression [24, 25].

Limitations

This is one of the rare review study in Iran indicating the neonatal outcomes of HIV infection in pregnant women in Iran. However, the current study had limitations. The primary concern was the small number of studies and the absence of cohort studies or studies with a control group (healthy pregnant women) to estimate effect sizes such as odds ratios and risk ratios.

Conclusion

Although most of the pregnant women living with HIV are under care and the adverse neonatal outcomes are very few, however, longitudinal studies are required for a well understanding of the condition of pregnant women with HIV in Iran.

Declarations

Ethics approval and consent to participate

No primary data were collected for this study.

Competing interests

The authors declare that there is no conflict of interests.

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Authors' contributions

All authors conceived, searched, extracted the relevant records, and synthesized the data that led to the manuscript or played an important role in the acquisition, analysis and interpretation of the data or both. All authors contributed in the manuscript development and/or made substantive suggestions for revision. All authors approved the final submitted version.

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Figure legends

Fig. 1 PRISMA flow diagram

Fig. 2 Results of quality assessment

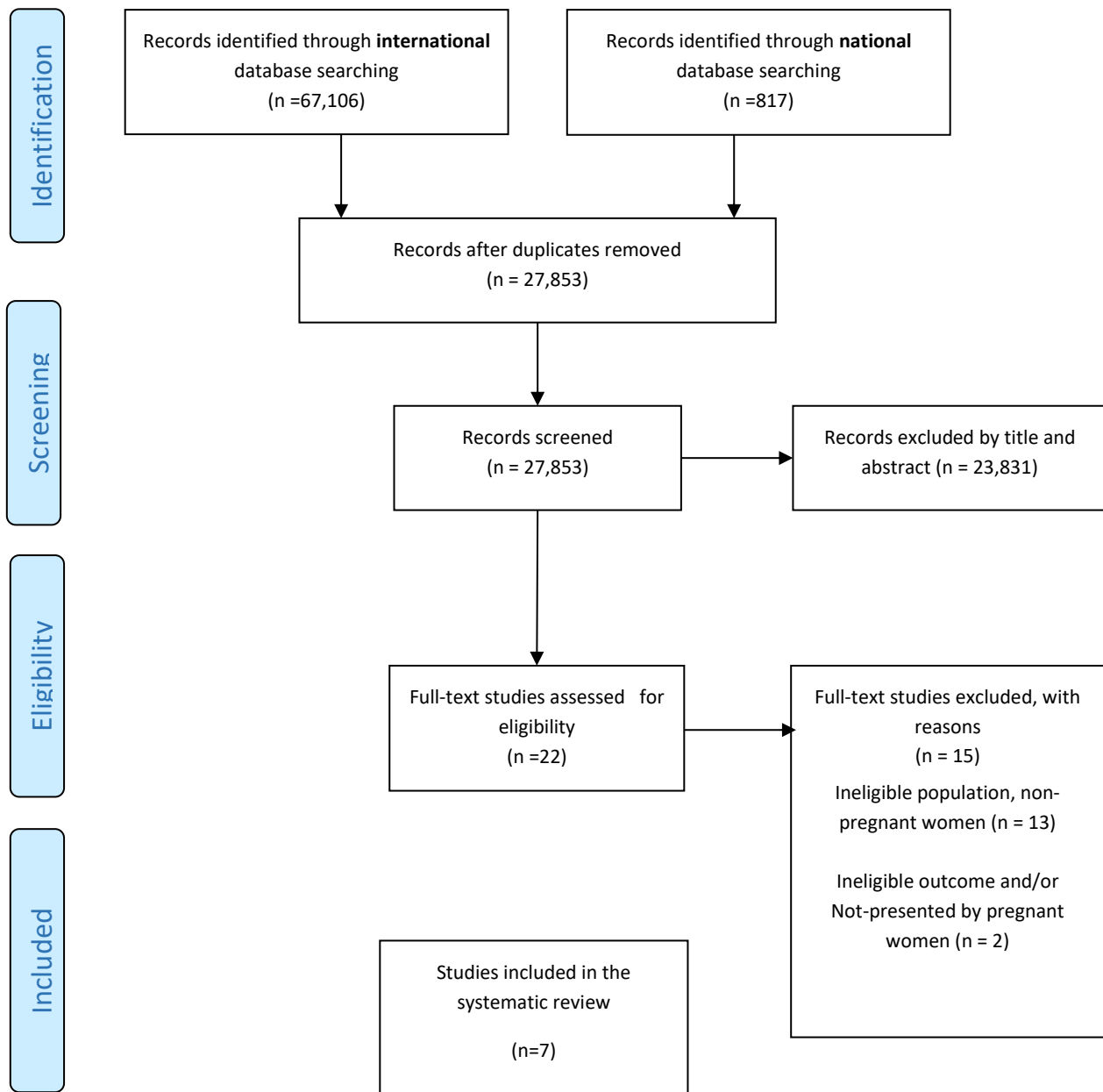


Figure 1: PRISMA flow diagram

Table 1. Baseline characteristics of the review

Study	Year	Sample size	Study design	Province	Age range	Non-academic education (%)
Afsar Kazeroni. P[13]	2021	76	Cross-sectional	Pilot, national	Mean: 31 years	96%
Lorestani. R [26]	2023	95	Cross-sectional	Kermanshah	Mean: 35.9 years	81%
Bokharaei Salim.F [27]	2018	54	Cross-sectional	Tehran	Mean: 30.1 years 26-34: 66.7%	100%
Shikhansari. S [28]	2022	81	Cross-sectional	Rasht & Tehran,	35–44: 55.4%	NR
Ghasemi.M [29]	2021	112	Cross-sectional	Ahvaz	33.06 years	95%
Salmanzadeh. Sh [9]	2016	39	Cross-sectional	Khuzestan	26.7 years	NR
Mohraz.M [16]	2018	40	Cross-sectional	Tehran	26-30 years: 42.5%	90%

NR: not reported

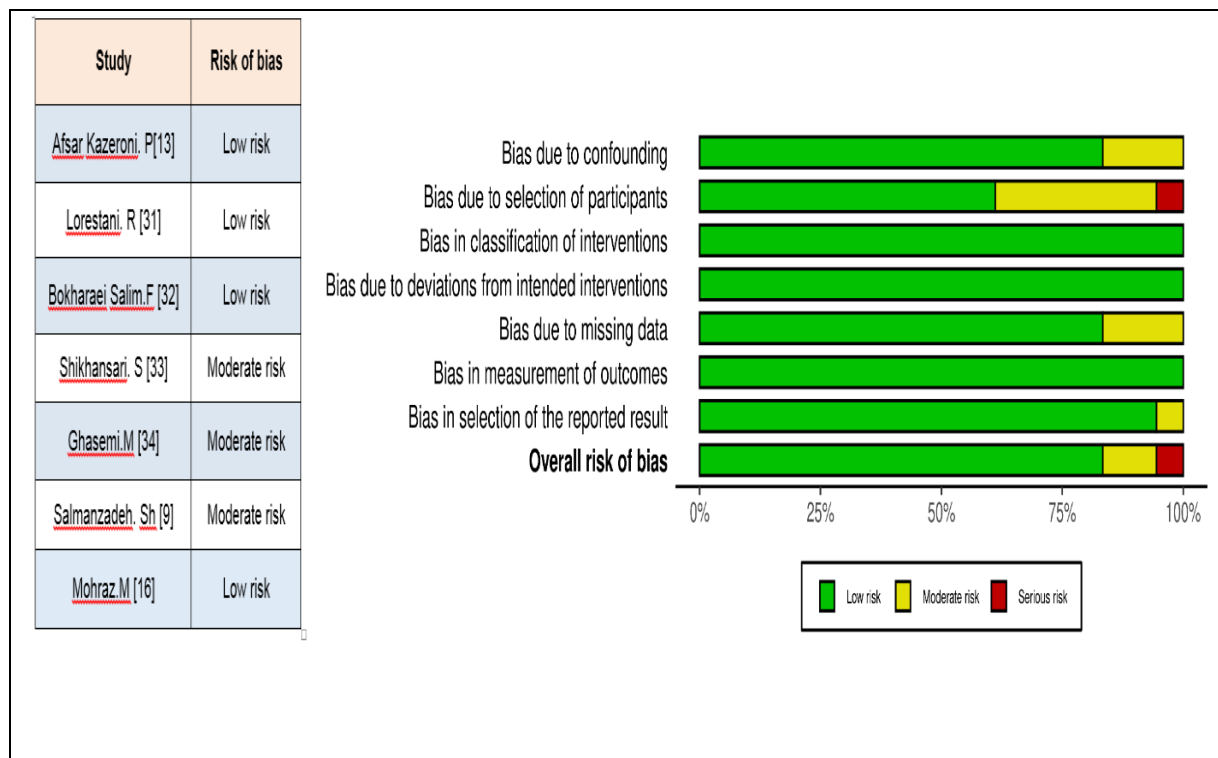
**Figure 2)** Results of quality assessment

Table 2) Adverse neonatal outcomes among pregnant women living with HIV in Iran

Study	Live birth (%)	Newborn prophylaxis	HIV positive infant	Abortion (%)	Infant growth status
Afsar Kazeroni. P[13]	88.2%	95.50%	1.50%	2.6%	79%; Normal range
Lorestani. R [26]	100%	100%	0.00%	NR	Birth weight: 2868 g
Bokharaei Salim.F [27]	100%	100%	20%	NR	NR
Shikhansari. S [28]	NR	NR	2%	NR	NR
Ghasemi.M [29]	94%	NR	NR	Abortion risk: 1.06(0.50-2.22)	Birth weight of 88% of the infants were over 2500 g
Salmanzadeh. Sh [9]	NR	NR	25.7%	NR	92% Powdered milk; 77.1% were 2500-3500 g
Mohraz.M [16]	97.5%	100%	0.00%	2.5%	All of neonatal had the normal Apgar