PLACENTUM
Laman resmi: http://jurnal.uns.ac.id/placentum
ISSN 2303-3746
e-ISSN 2620-9969
PLACENTUM Jurnal Ilmiah Kesehatan dan Aplikasinya

Triple Elimination Data Analysis (HIV, Syphilis, and Hepatitis B) among Pregnant Women in Denpasar City, Bali

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ABSTRACT

Background: In 2017, the Ministry of Health of the Republic of Indonesia launched the 'Triple Elimination' initiative, aiming to eradicate the transmission of syphilis, hepatitis B, and HIV from mother to child. This article presents the results of analysing data from the HIV/AIDS and STI Information System (SIHA) and the Hepatitis and Gastrointestinal Infection Information System (SIHEPI) among pregnant women tested for HIV, syphilis, and hepatitis B in Denpasar City, Bali. **Method:** We conducted a descriptive study with a cross-sectional design at two community health centres in Denpasar City, using secondary data from SIHA and SIHEPI between 2020 and 2022. Data were analysed univariate and bivariate with the chi square test. **Results:** According to SIHA reports, 3,831 pregnant women were tested for HIV, with a positivity rate of 0.2% (95% CI: 0.09%-0.4%); 3,716 were tested for syphilis, with a positivity rate of 0.9% (95% CI: 0.7%-1.3%); and 4,503 were tested for hepatitis B, with a positivity rate of 1.4% (95% CI: 1.1%-1.8%). Data analysis revealed a significant correlation between HIV test results and the level of education ($p<0.001$). Syphilis was significantly associated with certain risk factors ($p<0.001$), while maternal age was significantly associated with hepatitis B infection ($p=0.030$). **Conclusion:** Although the prevalence of HIV, syphilis, and hepatitis B among pregnant women in Denpasar City is relatively low, early screening and enhanced integration of triple elimination efforts across healthcare settings remain essential.

Keywords: Bali, Hepatitis B, HIV, Pregnant Women, Syphilis

INTRODUCTION

HIV, Hepatitis B virus, and syphilis affect the lives of millions of patients worldwide, causing significant morbidity and mortality.[1] Studies on the prevalence of syphilis, HBV, and HIV between 2016 and 2021 are increasingly common. The pooled global prevalence of HIV, HBV, and syphilis among pregnant women was 2.9%, 4.8%, and 0.8%, respectively, though these rates vary significantly between countries and geographical areas.[2] Pregnant women who undergo early and thorough screening can benefit from earlier interventions and a significant reduction in the risk of mother-to-child transmission (MTCT). Those who are screened and treated have a much lower risk of MTCT for all three illnesses.[3]

The World Health Organization regularly releases prevention and control strategies for HIV and viral hepatitis, with the latest publications in 2021 and 2016, respectively. Global guidelines for the elimination of MTCT of syphilis, HIV, and hepatitis B virus (HBV) have also been developed recently. [2]

A project known as "triple elimination" aims to eradicate the transmission of syphilis, hepatitis B, and HIV from mother to child. The WHO advises routine testing for hepatitis B, syphilis, and HIV in all pregnant women.[4] A survey of 111 countries co-developed by WHO Headquarters (HQ) and regional offices showed that 93% had a national policy for screening pregnant women for syphilis, 93% for HIV, and 74% for hepatitis B.[5]

In 2017, the Ministry of Health of the Republic of Indonesia released Minister of Health Regulation Number 52 of 2017, concerning the Elimination of Transmission of HIV, Syphilis, and Hepatitis B from Mother to Child. This regulation outlines the measures community health centres should follow to eradicate MTCT of these diseases.

Bali's hepatitis B prevention and control efforts culminated in the implementation of early detection programs in 2018, alongside Triple Elimination efforts. Bali's Triple Elimination program is implemented throughout its regencies and cities, including Denpasar City. According to the Denpasar City Health Service report, the percentage of pregnant women tested for HIV increased from 91.9% in 2018 to 97.3% in 2021, while testing for hepatitis B rose from 73% to 77%, and for syphilis from 71% to 76%.

In Indonesia, the HIV and syphilis recording and reporting system is carried out using a web-based application known as the HIV/AIDS and STI Information System (SIHA), while hepatitis B reporting uses the Hepatitis and Gastrointestinal Infection Information System (SIHEPI).

Despite the efforts made, data on pregnant women with HIV, syphilis, and hepatitis B infections in Denpasar City has never been analysed. This article presents the results of an analysis of SIHA and SIHEPI data on pregnant women tested for HIV, syphilis, and hepatitis B in Denpasar City.

METHODS

We conducted a descriptive study with a cross-sectional design at two community health centres in Denpasar City, using secondary data from SIHA and SIHEPI. SIHA stands for the HIV and AIDS Information System, a web-based application developed by the Indonesian Ministry of Health to record, process, and report data on HIV, AIDS, and Sexually Transmitted Infection (STI) services in an integrated manner. SIHEPI is the Hepatitis and Gastrointestinal Infection Information System, an application developed by the Indonesian Ministry of Health used for recording and reporting hepatitis and gastrointestinal infectious diseases (PISP).

This study used a total sampling method, including all pregnant women recorded in SIHA and SIHEPI at two community health centers in Denpasar City from 2020 to 2022. Data were analysed univariate and bivariate with the chi square test, for HIV status, syphilis status, hepatitis B status, age, gestational age, marital status, education, employment, and risk factors. This research was declared ethical by the Research Ethics Commission of the Faculty of Medicine, Udayana University, with No. 1508/UN14.2.2.VII.14/LT/2023.

RESULT

SIHA data from 2020 to 2022 for two health centres in Denpasar City, Bali, shows that 3,831 pregnant women underwent HIV testing, and 3,716 had syphilis testing. The majority of those tested were pregnant women aged 20-29,

accounting for 62.4% of HIV tests and 61.8% of syphilis tests. Analysis indicates that only 22.5% of pregnant women received HIV testing in the first trimester, and only 19.8% received syphilis testing in the same period. Most of the women tested were married (99.6% for HIV and 99.7% for syphilis). In terms of education and employment, 57.0% of women tested for HIV and 56.6% for syphilis had a high school education, with 47.6% of HIV-tested women and 47.5% of syphilis-tested women being unemployed (housewives). For syphilis testing, 2 women reported being sex workers, but no comparable risk factor data was available for HIV testing (see Table 1).

Table 1. Sample characteristics for HIV and Syphilis (from SIHA)

Characteristic*	HIV	Syphilis
	Number n (%)	**Number n (%)**
Maternal Age (years)		
<20th	95 (2.5)	94 (2.5)
20-29th	2,391 (62.4)	2,297 (61.8)
30-40th	1,236 (32.3)	1,249 (33.6)
>40th	110 (2.9)	76 (2.0)
Gestational Age		
1st trimester	862 (22.5)	734 (19.8)
2nd trimester	1,839 (40.0)	1,633 (43.9)
3rd trimester	1,130 (19.5)	1,349 (36.3)
Marital Status		
Unmarried	16 (0.4)	9 (0.2)
Married	3,807 (99.6)	3,706 (99.7)
Widowed		1 (0.0)
Education Level		
No formal education	10 (0.3)	7 (0.2)
Elementary school	252 (6.6)	257 (6.9)
Middle school	484 (12.6)	435 (11.7)
High school	2,182 (57.0)	2,104 (56.6)
College/University	899 (23.5)	913 (24.6)
Occupation		
Student	29 (0.8)	26 (0.7)
Civil servant/Police/Military	73 (1.9)	56)1.5)
Private sector employee	1,714 (44.8)	1,646 (44.3)
Entrepreneur	188 (4.9)	222 (6.0)
Housewife	1,818 (47.6)	1,766 (47.5)
Risk factor		
Female sex workers		2 (0.1)
Others		3,714 (99.9)

Meanwhile, SIHEPI data shows that 4,503 pregnant women were tested for hepatitis B, with the majority being in the reproductive age group of 20-29 years (62.7%). Only 13.1% of these women received hepatitis B testing in the first trimester, and most (47.1%) were private employee (Table 2).

From the 3,831 pregnant women tested for HIV, 7 were reactive (0.2%; 95% CI: 0.09%-0.4%). Data analysis showed a significant correlation between HIV test results and education level ($p<0.001$). Of the 3,716 pregnant women tested for syphilis, 35 were reactive (0.9%; 95% CI: 0.7%-1.3%), with syphilis significantly associated with specific risk factors

(p<0.001) (Table 3). For hepatitis B, 63 reactive cases were found among 4,503 women tested (1.4%; 95% CI: 1.1%-1.8%), with maternal age significantly correlated with hepatitis B infection (p=0.030) (Table 4).

Table 2. Sample characteristics for Hepatitis B (from SIHEPI)

Characteristic*	**Number n (%)**
Maternal Age (years)	
<20th	144 (3.2)
20-29th	2,812 (62.7)
30-40th	1,414 (31.5)
>40th	16 (2.6)
Gestational Age	
1st trimester	579 (13.1
2nd trimester	2,263 (51.2)
3rd trimester	1,576 (35.7)
Occupation	
Student	0 (0.0)
Civil servant/police/military	60 (1.3)
Private sector employee	2,122 (47.1)
Entrepreneur	270 (6.0)
Housewife	1,905 (42.3)
Farmer/Fisherman	11 (0.2)
Others	134 (3.0)

Table 3. Bivariate test analysis results for HIV and Syphilis (from SIHA)

Characteristic*	**HIV**				**Syphilis**		
	Reactive n (%)	**Non-Reactive n (%)**	**Indeterminate n (%)**	**p value**	**Reactive n (%)**	**Non-Reactive n (%)**	**p value**
Maternal Age (years)				0.565			0.763
<20th	0 (0.0)	95 (100.0)	0 (0.0)		0 (0.0)	94 (100.0)	
20-29th	7 (0.3)	2,382 (9.7)	1 (0.04)		21 (0.9)	2,276 (99.1)	
30-40th	0 (0.0)	1,236 (100.0)	0 (0.0)		13 (1.0)	1,236 (99.0)	
>40th	0 (0.0)	110 (100.0)	0 (0.0)		1 (1.3)	75 (98.7)	
Gestational Age				0.618			0.645
1st trimester	1 (0.1)	861 (99.9)	0 (0.0)		9 (1.2)	725 (99.8)	
2nd trimester	5 (0.3)	1,833 (9.7)	1 (0.1)		15 (0.9)	1,618 (99.1)	
3rd trimester.	1 (0.1)	1,129 (99.9)	0 (0.0)		11 (0.8)	1,338 (99.2)	
Marital Status				0.983			0.953
Unmarried	0 (0.0)	16 (100.0)	0 (0.0)		0 (0.0)	9 (100.0)	
Married	7 (0.2)	3,799 (99.8)	1 (0.0)		35 (0.9)	3,671 (99.1)	
Widowed					0 (0.0)	1 (100.0)	

Education Level				<0.00			0.162
No formal	1 (10.0)	9 (90.0)	0 (0.0)	1*	0 (0.0)	7 (100.0)	
education	0 (0.0)	251 (99.6)	1 (0.4)		4 (1.6)	253 (98.4)	
Elementary	3 (0.6)	481 (99.4)	0 (0.0)		8 (1.8)	427 (98.2)	
school	2 (0.1)	2,180 (99.9)	0 (0.0)		18 (0.9)	2,086 (99.1)	
Middle school	1 (0.1)	898 (99.9)	0 (0.0)		5 (0.6)	908 (99.4)	
High school							
College/Univers							
ity							
Occupation				1.000			0.532
Student	0 (0.0)	29 (100.0)	0 (0.0)		0 (0.0)	26 (100.0)	
Civil	0 (0.0)	73 (100.0)	0 (0.0)		1 (1.8)	55 (98.2)	
servant/Police/	4 (0.2)	1,710 (99.8)	0 (0.0)		11 (0.7)	1,635 (99.3)	
Military Private	0 (0.0)	188 (100.0)	0 (0.0)		2 (0.9)	220 (99.1)	
sector employee	3 (0.2)	1,814 (99.7)	1 (0.1)		21 (1.2)	1,745 (98.8)	
Entrepreneur							
Housewife							
Risk factor							<0.001*
Female sex					1 (50.0)	1 (50.0)	
workers					34 (0.9)	3,680 (99.1)	
Others							

Table 4. Bivariate test analysis results for Hepatitis B (from SIHEPI)

Characteristic*	**Hepatitis B**		
	Reactive n (%)	**Non-Reactive n (%)**	**p value**
Maternal Age (years)			0.030*
<20th	1 (0.7)	143 (99.3)	
20-29th	42 (1.5)	2,770 (98.5)	
30-40th	15 (1.1)	1,399 (98.9)	
>40th	5 (4.3)	111 (95.7)	
Gestational Age			0.885
1st trimester	7 (1.2)	572 (8.8)	
2nd trimester	32 (1.4)	2,231 (98.6)	
3rd trimester.	20 (1.3)	1,556 (98.7)	
Occupation			0.882
Student	0 (0.0)	0 (0.0)	
Civil servant/Police/Military	1 (1.7)	59 (98.3)	
Private sector employee	34 (1.6)	2,088 (98.4)	
Entrepreneur	4 (1.5)	266 (98.5)	
Housewife	23 (1.2)	1,882 (8.8)	
Farmer/Fisherman	0 (0.0)	11 (100.0)	
Others	1 (0.8)	133 (99.2)	

DISCUSSION

The study found that the prevalence of HIV in pregnant women was 0.2% (95% CI: 0.09%-0.4%). This figure is comparable to the HIV prevalence in Brazil (0.3%)[6] and in several Indonesian cities, such as Bandung (0.18%) and Tabanan (0.2%).[7,8]However, when compared to the prevalence of HIV in various African countries and globally, this number is significantly lower.[2,9,10]

The analysis showed that the mother's level of education was significantly correlated with HIV test results. This finding aligns with other studies, which indicate that pregnant women with higher education have a lower risk of HIV infection compared to those with less education.[11,12,13] Women who have not completed their education tend to have a higher risk of HIV infection than those who have completed high school.[14] For example, in Zambia, young women with higher levels of education had lower rates of HIV infection than those with lower levels, and the group with more education also showed the greatest reduction in infection rates between 1995 and 2003.[15]

Behavior modification is one of the primary strategies for reducing heterosexual transmission of HIV. The level of education likely influences behavior and behavior changes. School attendance may directly affect exposure to health treatments and access to health services. Consequently, higher education levels may be associated with either an increased or decreased risk of contracting HIV, depending on the balance of behavioral factors.[13,16]

Previous studies have demonstrated the positive impact of health education in preventing mother-to-child transmission (MTCT) of HIV. Formal education has been linked to increased awareness and the importance of HIV testing.[17,18] Educating women, particularly in developing countries, not only improves human capital development but also makes them more aware of their own health and the health of their unborn children. This can be achieved through HIV testing and practicing safer sexual behavior.[11]

In this study, all pregnant women who were HIV-positive were between the ages of 20 and 29, though this finding was not statistically significant. Additionally, HIV-positive pregnant women were identified in both the second and third trimesters of pregnancy.

Regarding syphilis, the study found that 0.9% of pregnant women tested positive between 2020 and 2022. Female sex workers (FSWs) are a key group at high risk of contracting syphilis due to multiple sexual partners and challenges in condom use.[19] Research conducted in Indonesia found that the prevalence of syphilis among sex workers ranged from 7.8% to 14.5% between 2005 and 2007. Numerous studies have shown a high prevalence of syphilis among female sex workers.[20, 21]

A study conducted in Egypt revealed that pregnant women with more than one sexual partner had nearly five times the risk of contracting syphilis compared to those with only one partner. This can be explained by the fact that women with multiple sexual partners are more likely to contract syphilis if their partners are infected and delay seeking treatment.[20]

Housewives are also at risk of contracting HIV, syphilis, and hepatitis B. According to HIV and AIDS data submitted to the Bali Provincial Health Office, there has been an increase in HIV cases among women. This could be due to their husbands or sexual partners engaging in risky behaviors, such as using non-sterile injectable drugs or having unprotected sex outside of marriage. Several factors at the individual, household, community, and macro levels

contribute to women's vulnerability to HIV and other sexually transmitted infections (STIs), with many women remaining unaware of the risks they face.[21]

Syphilis is a sexually transmitted infection often associated with risky sexual behavior, such as having multiple partners or engaging in unprotected sex. Housewives are particularly vulnerable, as they may contract syphilis from their husbands, unaware of how to protect themselves from STIs and trusting their partners.[8] The findings of this study are consistent with previous research conducted at Sanglah General Hospital in Denpasar, which found that people aged 20 to 35, who are sexually active, had the highest prevalence of syphilis.[22] Sexual activity, especially with multiple partners, increases the risk of contracting syphilis.

Age is a significant factor influencing sexual behavior. Younger individuals tend to take more risks, which increases their likelihood of contracting syphilis. High levels of sexual activity, workplace and environmental influences, or risky sexual behavior may contribute to this trend.[8] The study indicates that behaviors such as having multiple sexual partners and inconsistent condom use increase the risk of syphilis and HIV. Targeted interventions should focus on promoting safer sexual practices among pregnant women and the general population.[23]

In this study, the prevalence of hepatitis B was found to be 1.4% (95% CI: 1.1%-1.8%). This rate is lower than the global prevalence of 4.8%, as well as the prevalence in low-income countries (6.6%) and lower-middle-income countries (4.9%).[24] Consistent with previous research, maternal age was significantly associated with hepatitis B infection. The likelihood of testing positive for hepatitis B surface antigen (HBsAg) increased with age.[25,26] This may be related to the administration of immunoprophylaxis,[27] which has been provided to all infants since 1997 in Indonesia. This intervention boosts immunity against HBV and reduces the risk of infection in infancy.

During pregnancy, childbirth, and breastfeeding, an infected mother can transmit HIV, syphilis, and hepatitis B to her child. These infections can lead to illness, disability, or death, thereby jeopardizing the child’s chances of surviving and living a healthy life. However, these outcomes can be prevented through early detection (screening), early treatment, and vaccination. Breaking the transmission of HIV, syphilis, and hepatitis B through "triple elimination" is a vital strategy, ensuring that even in cases where a mother has one or more of these infections, transmission to her child is minimized. Regulation No. 52 of 2017, issued by the Minister of Health of Indonesia, emphasizes the importance of eliminating mother-to-child transmission of HIV, syphilis, and hepatitis B. The first trimester of pregnancy is the optimal time for screening.[28]

Early antenatal care (ANC) is widely regarded as an effective strategy for reducing poor pregnancy outcomes. Timely and frequent prenatal visits are crucial for identifying and addressing pregnancy-related issues, thus meeting global standards for diagnosis and treatment. Adequate ANC is associated with earlier identification of problems and timely interventions.[29,30]

The analysis of the SIHA and SIHEPI data for pregnant women in Denpasar City reveals that there is still a gap in meeting the triple elimination goals for HIV, syphilis, and hepatitis B. The prevalence of HIV, syphilis, and hepatitis B in pregnant women was found to be 0.2%, 0.9%, and 1.4%, respectively, which is relatively low compared to global figures. However, efforts to ensure early detection and intervention through antenatal care (ANC) services need to be

strengthened, particularly regarding screening in the first trimester.

Despite the high coverage of pregnant women attending health facilities (K1) in Denpasar City, which exceeded 90%, the actual number of women who underwent laboratory examinations for HIV, syphilis, and hepatitis B during the first trimester was much lower—23% for HIV, 20% for syphilis, and only 13% for hepatitis B. This gap highlights the need for improved integration of triple elimination screening within ANC services, especially in non-public health facilities such as private hospitals, clinics, and private midwifery practices.

The findings underscore the importance of ensuring that all healthcare settings, including private providers, offer standardized care and comprehensive screening for triple elimination. Many women, particularly those who receive antenatal care outside public health centres, may not be receiving the full range of necessary services. Ensuring that both public and private healthcare facilities adhere to the same standards of care is essential for achieving the goals of triple elimination.

This study has some limitations, including the use of secondary data, which restricted the number of variables that could be analysed. Additionally, the data only covered two health centres out of the eleven in Denpasar City and was limited to a three-year period (2020-2022). Future studies should include a broader range of variables and involve more health centres to provide a more comprehensive assessment of the effectiveness of the triple elimination program in Denpasar City.

CONCLUSION

In conclusion, while the prevalence of HIV, syphilis, and hepatitis B among pregnant women in Denpasar City remains relatively low, there is still a need to increase early screening and improve integration of triple elimination efforts across all healthcare settings. Strengthening these efforts will ensure that more women receive timely interventions, thereby reducing the risk of mother-to-child transmission of these infections.

ACKNOWLEDGEMENT

We would like to thank the research and community service institute of Udayana University for funding this research. We would also like to thank the maternal and child health service officers and the IMS and HIV officers at the two health centres that were the research locations, who helped in the data collection process.

REFERENCES

1. Mohamed Al-Ismaili O, Al-Jardani A, Al-Hinai F, Al-Shukri I, Mathew M, Al-Abri S, et al. Prevalence of Hepatitis B Infection Among Pregnant Women in Oman. J Epidemiol Glob Health [Internet]. 2022 [cited 2023 Nov 20];12:311–5. Available from: https://doi.org/10.1007/s44197-022-00043-7
2. Wu S, Wang J, Guo Q, Lan H, Sun Y, Ren M, et al. Prevalence of human immunodeficiency virus, syphilis, and hepatitis B and C virus infections in pregnant women: a systematic review and meta-analysis. Clin Microbiol Infect. 2023 Aug 1;29(8):1000–7.
3. Bell L, Van Gemert C, Allard N, Brink A, Chan P-L, Cowie B, et al. Progress towards triple elimination of mother-to-child transmission of HIV, hepatitis B and syphilis in Pacific Island Countries and Territories: a systematic review. 2023 [cited 2023 Nov 20]; Available from: www.thelancet.com
4. Cohn J, Owiredu MN, Taylor MM, Easterbrook P, Lesi O, Francoise B, et al. Eliminating mother-to-child transmission of human immunodeficiency virus, syphilis and hepatitis B in sub-Saharan Africa.

Bull World Health Organ [Internet]. 2021 Apr 4 [cited 2024 Jul 1];99(4):287. Available from: /pmc/articles/PMC8085625/

5. Taylor MM, Wi T, Gerbase A, Thwin SS, Gottlieb S, Babovic MT, et al. Assessment of country implementation of the WHO global health sector strategy on sexually transmitted infections (2016-2021). PLoS One [Internet]. 2022 May 1 [cited 2024 Jun 28];17(5):3. Available from: /pmc/articles/PMC9067912/
6. Pereira GFM, Sabidó M, Caruso A, de Oliveira SB, Mesquita F, Benzaken AS. HIV Prevalence among Pregnant Women in Brazil: A National Survey. Rev Bras Ginecol e Obs [Internet]. 2016 Aug 1 [cited 2024 Jul 18];38(8):391–8. Available from: https://www.scielo.br/j/rbgo/a/cTBvnFVHkHbRXwLMM6P9xWB/?lang=en
7. Azhali BA, Setiabudi D, Alam A. Evaluating the impact of triple elimination program for mother-to-child transmission of HIV, syphilis, and hepatitis B in Indonesia. Narra J [Internet]. 2023 Nov 18 [cited 2023 Nov 27];3(3):e405–e405. Available from: https://narraj.org/main/article/view/405
8. Luh Gede Erawati1 MWGD, I Nyoman Wirata1 GAM. Overview of HIV, Syphilis and Hepatitis B Screening for Pregnant Women at the Selemadeg Community Health Center, Tabanan Regency, 2019-2021 | Erawati | Jurnal Ilmiah Kebidanan (The Journal Of Midwifery) [Internet]. Jurnal Ilmiah Kebidanan. 2023 [cited 2023 Nov 21]. p. 222–9. Available from: https://ejournal.poltekkes-denpasar.ac.id/index.php/JIK/article/view/2559/1297
9. Geremew D, Tajebe F, Ambachew S, Endalamaw A, Eshetie S. Seroprevalence of HIV among pregnant women in Ethiopia: a systematic review and meta-analysis. [cited 2024 Jul 18]; Available from: https://doi.org/10.1186/s13104-018-4022-1
10. Ozim CO, Mahendran R, Amalan M, Puthussery S. Prevalence of human immunodeficiency virus (HIV) among pregnant women in Nigeria: a systematic review and meta-analysis. BMJ Open [Internet]. 2023 [cited 2024 Jul 18];13:50164. Available from: http://dx.doi.org/10.1136/bmjopen-2021-050164
11. Orish VN, Onyeabor OS, Boampong JN, Afoakwah R, Nwaefuna E, Acquah S, et al. Influence of Education on HIV Infection among Pregnant Women Attending their Antenatal Care in Sekondi-Takoradi Metropolis, Ghana. J Health Care Poor Underserved [Internet]. 2014 [cited 2024 Jul 31];25(3):982–90. Available from: https://muse.jhu.edu/pub/1/article/552179
12. Utulu SN, Lawoyin TO. EPIDEMIOLOGICAL FEATURES OF HIV INFECTION AMONG PREGNANT WOMEN IN MAKURDI, BENUE STATE, NIGERIA. J Biosoc Sci [Internet]. 2007 May [cited 2024 Jul 31];39(3):397–408. Available from: https://www.cambridge.org/core/journals/journal-of-biosocial-science/article/abs/epidemiological-features-of-hiv-infection-among-pregnant-women-in-makurdi-benue-state-nigeria/EB96799F5AA0FC2575565272FF070E48
13. Hargreaves JR, Glynn JR. Educational attainment and HIV-1 infection in developing countries: A systematic review. Trop Med Int Heal. 2002;7(6):489–98.

14. Pettifor AE, Levandowski BA, Macphail C, Padian NS, Cohen MS, Rees H V. Keep them in school: the importance of education as a protective factor against HIV infection among young South African women.
15. Michelo C, Sandøy IF, Fylkesnes K. Marked HIV prevalence declines in higher educated young people: Evidence from population-based surveys (1995-2003) in Zambia. AIDS [Internet]. 2006 Apr [cited 2024 Aug 1];20(7):1031–8. Available from: https://journals.lww.com/aidsonline/fulltext/2006/04240/marked_hiv_prevalence_declines_in_higher_educated.11.aspx
16. Pinto M, Silveira T, Silveira MF, Müller CH. Quality of Life of Pregnant Women Living with HIV/AIDS Qualidade de vida de gestantes vivendo com HIV/Aids. 2016 [cited 2024 Jul 31]; Available from: http://dx.doi.org/
17. Onyeabor OS, Iriemenam N, Adekeye OA, Rachel SA. The effect of educational attainment on HIV testing among African Americans. J Health Care Poor Underserved [Internet]. 2013 [cited 2024 Aug 1];24(3):1247–56. Available from: https://pubmed.ncbi.nlm.nih.gov/23974395/
18. Adeleke SI, Mukhtar - Yola M, Gwarzo GD. Awareness and knowledge of mother-to-child transmission of HIV among mothers attending the pediatric HIV clinic, Kano, Nigeria. Ann Afr Med. 2009 Dec 1;8(4):210–4.
19. Ouedraogo HG, Meda IB, Zongo I, Ky-Zerbo O, Grosso A, Samadoulougou BC, et al. Syphilis among female sex workers: Results of point-of-care screening during a cross-sectional behavioral survey in Burkina Faso, West Africa. Int J Microbiol. 2018;2018.
20. Beriso JA, Kitila FL, Ferede A, Kaso AW. High seroprevalence of syphilis infection among pregnant women in Public Health facilities in Shashemene town, southern Ethiopia. Clin Epidemiol Glob Heal [Internet]. 2023;21:101288. Available from: https://www.sciencedirect.com/science/article/pii/S2213398423000751
21. Dewi DMSK, Wulandari LPL, Karmaya INM. Kerentanan perempuan terhadap penularan IMS dan HIV: gambaran perilaku seksual berisiko di Kota Denpasar. Public Heal Prev Med Arch [Internet]. 2013 Jul 1 [cited 2023 Nov 27];1(1):13–8. Available from: https://www.phpmajournal.org/index.php/phpma/article/view/152
22. Adisthanaya S. GAMBARAN KARAKTERISTIK SIFILIS DI POLIKLINIK KULIT DAN KELAMIN SUB DIVISI INFEKSI MENULAR SEKSUAL RSUP SANGLAH DENPASAR/FK UNUD PERIODE JANUARI 2011-DESEMBER 2013. E-Jurnal Med Udayana [Internet]. 2016 Sep 5 [cited 2023 Nov 28];5(9):2303–1395. Available from: https://ojs.unud.ac.id/index.php/eum/article/view/23480
23. Kurnia Fitri Jamil. Profil kadar CD4 terhadap infeksi oportunistik pada penderita human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) di RSUD dr. Zainoel Abidin Banda Aceh. J Kedokt Syiah Kuala. 2014;14(2):76–80.
24. Wu S, Wang J, Guo Q, Lan H, Sun Y, Ren M, et al. Prevalence of human immunodeficiency virus, syphilis, and hepatitis B and C virus infections in pregnant women: a systematic review and meta-analysis. Clin Microbiol Infect [Internet]. 2023 Aug 1 [cited 2024 Oct 14];29(8):1000–7. Available from: http://www.clinicalmicrobiologyandinfection.com/article/S1198743X2300

1167/fulltext
25. Ngimbi P, Boisson-Walsh AJ, Ntambua S, Matondo J, Mwandaglirwa Kashamuka M, Emch M, et al. Hepatitis B virus prevalence and transmission in the households of pregnant women in Kinshasa, 1 Democratic Republic of Congo 2 3 Camille E. [cited 2024 Oct 14]; Available from: https://doi.org/10.1101/2023.11.27.23298863
26. Bajema KL, Stankiewicz Karita HC, Tenforde MW, Hawes SE, Heffron R. Maternal Hepatitis B Infection and Pregnancy Outcomes in the United States: A Population-Based Cohort Study. Open forum Infect Dis [Internet]. 2018 Jun 1 [cited 2024 Oct 16];5(6). Available from: https://pubmed.ncbi.nlm.nih.gov/29992174/
27. Ding Y, Sheng Q, Ma L, Dou X. Chronic HBV infection among pregnant women and their infants in Shenyang, China. 2013 [cited 2024 Oct 16]; Available from: http://www.virologyj.com/content/10/1/17
28. Kementerian Kesehatan Republik Indonesia. PERATURAN MENTERI KESEHATAN REPUBLIK INDONESIA NOMOR 52 TAHUN 2017 TENTANG ELIMINASI PENULARAN HUMAN IMMUNODEFICIENCY VIRUS, SIFILIS, DAN HEPATITIS B DARI IBU KE ANAK [Internet]. Kementerian Kesehatan Republik Indonesia. 2017 [cited 2024 Oct 16]. Available from: https://www.regulasip.id/book/5115/read
29. Yaya S, Bishwajit G, Ekholuenetale M, Shah V, Kadio B, Udenigwe O. Timing and adequate attendance of antenatal care visits among women in Ethiopia. 2017 [cited 2024 Aug 6]; Available from: https://doi.org/10.1371/journal.pone.0184934
30. Yaya S, Oladimeji O, Oladimeji KE, Bishwajit G. Prenatal care and uptake of HIV testing among pregnant women in Gambia: a cross-sectional study. BMC Public Health [Internet]. 2020;20(1):485. Available from: https://doi.org/10.1186/s12889-020-08618-4