

ORIGINAL ARTICLE

Triple elimination screening for pregnancy: study at Dokter Soekardjo Hospital

Desy Aprianti^{1*}, Susanti Ratunanda²

- 1) Dokter Soekardjo Hospital, West Java, Indonesia
- 2) Department of Clinical Pathology, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia.

*Corresponding author. E-mail: desyanti27@yahoo.com

ABSTRACT

Triple Elimination is an initiative that supports the eradication of mother-to-child transmission of three infectious diseases: HIV, syphilis, and hepatitis B. Common tests for this initiative include anti-HIV, RPR-TP, and HBsAg rapid screenings. This descriptive study aimed to determine the results of these screenings in pregnant women at Dokter Soekardjo Hospital. We used a total sampling method to include a total of 182 pregnant women who met the inclusion criteria. The findings revealed that the majority of pregnant women were in early adulthood (26-35 years) and late adulthood (36-45 years), each comprising 32.96%. Most subjects were housewives (84.61%) who had a senior high school education (38.46%), and were examined during their third trimester (58.80%). The RPR-TP rapid screening showed reactive results in 7 women (3.84%). No reactive results were found for Anti-HIV, while one woman (0.54%) tested reactive for HBsAg. The third trimester detected the most reactive results, with 6 women showing reactivity: 5 (4.675%) for RPR-TP and 1 (0.93%) for HBsAg. Despite the absence of reactive Anti-HIV results, precautions against HIV transmission during pregnancy are crucial due to the risk of placental infection or damage. The study's RPR-TP results highlight the importance of addressing reactive cases, given their potential impact. Additionally, performing HBsAg tests remains critical due to the risk of chronic HBV infection in babies.

Keyword: Anti-HIV, HBsAg, pregnancy, RPR-TP rapid, triple elimination

Received: 2024-01-13, Revised: 2024-06-09 Accepted: 2024-06-19, Published: 2024-06-30.

Copyright (c) 2024 Desy Aprianti, Susanti Ratunanda

This is an Open Access (OA) article under the CC BY-SA 4.0 International License (<https://creativecommons.org/licenses/by-sa/4.0/>).

How to cite :

Aprianti, D., and Ratunanda, S. (2024) "Triple elimination screening for pregnancy: study at Dokter Soekardjo Hospital", Acta Medical and Health Sciences, 3(1).p1-11.

Doi: <https://doi.org/10.35990/amhs.v3n1.p1-11>

INTRODUCTION

The World Health Organization (WHO) is committed to eliminating mother-to-child transmission of HIV, syphilis, and hepatitis B, as both are public health threats worldwide. This effort is known as the triple elimination of mother-to-child transmission (EMTCT) for Human Immunodeficiency Virus (HIV), syphilis, and hepatitis B.¹ Especially in low- and middle-income countries like Asia and Africa, these three infectious diseases rank highest among infections transmitted from mothers that are transmitted to babies during pregnancy, childbirth and breastfeeding.^{2,3} Globally, an estimated 1.3 million pregnant women live with HIV each year, and if left untreated, they can transmit the infection to approximately 15-45% of their babies.⁴ The highest mortality due to HIV infection in children occurs in the first few months of life.⁵

Triple Elimination is an initiative that supports the elimination of mother-to-child transmission consisting of three infectious diseases: human immunodeficiency virus (HIV), syphilis, and hepatitis B.³ This program aims to reduce the rate of transmission of HIV, syphilis, and hepatitis B from mother to child and minimize the rate of morbidity, disability, and death due to HIV, Syphilis and Hepatitis B in mothers and children. In 2022, the Central Government is implementing the Elimination of Transmission program policy. This program aims to reduce the incidence of new HIV, syphilis, and/or hepatitis B infections in children to less than or equal to 50 per 100,000 live births, which will be an indicator of achievement. The triple elimination program is implemented through health promotion efforts, health monitoring, as well as early identification and management of cases.⁵ In Indonesia, the prevalence rates of HIV, syphilis, and hepatitis B are 0.39% for HIV, 1.7% for syphilis, and 2.5% for hepatitis B. We need to pay more attention on addressing this problem. Between 2018 – 2019, the Data

and Information Center of the Indonesian Ministry of Health recorded 751 HIV-positive mothers, 4,385 pregnant women with positive results for hepatitis B; and 3,186 positive cases of syphilis.⁶ Around 85.6 million individuals have been infected with HIV since the onset of the epidemic, resulting in the death of 40.4 million. HIV disease is caused by the Human Immunodeficiency Virus (HIV), which is classified into HIV-1 and HIV-2. HIV-1 is more virulent and has been transmitted globally. Human Immunodeficiency Virus (HIV) is a retrovirus that has an envelope and two copies of a single-stranded RNA genome. This virus causes Acquired Immunodeficiency Syndrome (AIDS), which is the last stage of HIV disease. The risk factors for the spread of HIV include drug use, unsafe sex (intercourse), vertical transmission, and blood transfusions.⁷ HIV can also be transmitted through the bodily fluids of an infected person, such as blood, breast milk, semen, and vaginal fluids. Additionally, this virus can also spread from a mother to her baby.⁸

Syphilis is a systemic bacterial infection caused by the spirochete *Treponema pallidum*. *Treponema pallidum*, subspecies *pallidum* (*T. pallidum*), causes syphilis through sexual activity or vertical transmission during pregnancy.⁹ In 2020, WHO estimates that 7.1 million adults aged 15-49 were infected with syphilis globally.¹⁰ The hepatitis B virus (HBV) causes Hepatitis B, a potentially life-threatening liver infection. Hepatitis B transmission involves the virus being transferred from an infected person to a non-immune person through various means. Hepatitis B is primarily transmitted through horizontal transmission, which involves sexual contact, mucosal surface contact, and injection drug use. Vertical transmission refers to the transmission of the virus from a mother to her newborn. This is the main mode of transmission in high prevalence areas.¹¹ The Western Pacific Region and the WHO African Region had the highest

infection burdens, with 116 million and 81 million chronically infected, respectively. Sixty million people are infected in the WHO Eastern Mediterranean Region, 18 million in the WHO Southeast Asia Region, 14 million in the WHO European Region, and 5 million in the WHO Americas Region.¹² This study aims to determine the results of the triple elimination screening examination of rapid Anti-HIV, Rapid Plasma Reagin-*Treponema Pallidum* and HBsAg in pregnant women at Dokter Soekardjo Hospital, Tasikmalaya City.

METHODS AND SUBJECT

Research Design

The research used a descriptive design to determine the results of the triple elimination of rapid Anti-HIV RPR-TP and HBsAg screening examinations in pregnant women.

Research Subjects, Total Sampling and Method

The subjects in this study were pregnant women who underwent triple elimination examinations at Dokter Soekardjo Hospital, Tasikmalaya City, in June – November 2023, and those who met the inclusion criteria. The inclusion criteria were pregnant women who had the results of a triple elimination screening examination at their first visit and had at least one examination during their pregnancy. We selected the subjects of this research using the total sampling method, resulting in a total sample of 182 pregnant women.

Research Procedure

In order to conduct the research, we collected secondary data from medical records of pregnant women who underwent

triple elimination examinations at Dokter Soekardjo Hospital, Tasikmalaya City, in June – November 2023. This data included information on patient characteristics such as patients' age, their latest education level, patients' occupation, their gestational age at the time of examination, and their laboratory examination results.

Anti-HIV

The HIV Rapid Diagnostic Test is a fast method for detecting the existence of Human Immunodeficiency Virus (HIV) that can detect HIV antibodies/antigens. In general, rapid tests follow the principle of immunochromatography or immunofiltration. Rapid diagnostic tests can detect HIV-1/2- specific antibodies, or simultaneous HIV-1/2 and HIV-1 p24 antigens in serum, plasma, or blood samples. There are several forms of HIV rapid test testing, such as strip, cassette, and midstream testing. HIV can be classified into two types: HIV-type 1 (more commonly infected), and HIV type-2.¹³

These performance characteristics, at a minimum, include sensitivity and specificity tests.¹³ For diagnostic purposes, Strategy III is the chosen anti-HIV examination method. The Strategy III anti-HIV examination uses three different types of reagents. The first reagent has a specificity of $\geq 99\%$, the second reagent has a specificity of $\geq 98\%$, and the third reagent has a specificity of $\geq 99\%$.¹⁴ Negative results for HIV-1 and HIV-2 antibodies usually indicate the absence of HIV-1 and HIV-2 infections. However, in patients with reactive initial combined HIV-1/-2 antigen and antibody test results, negative results do not exclude the possibility of acute or early HIV infection. Figure 1 displays the anti-HIV examination results.

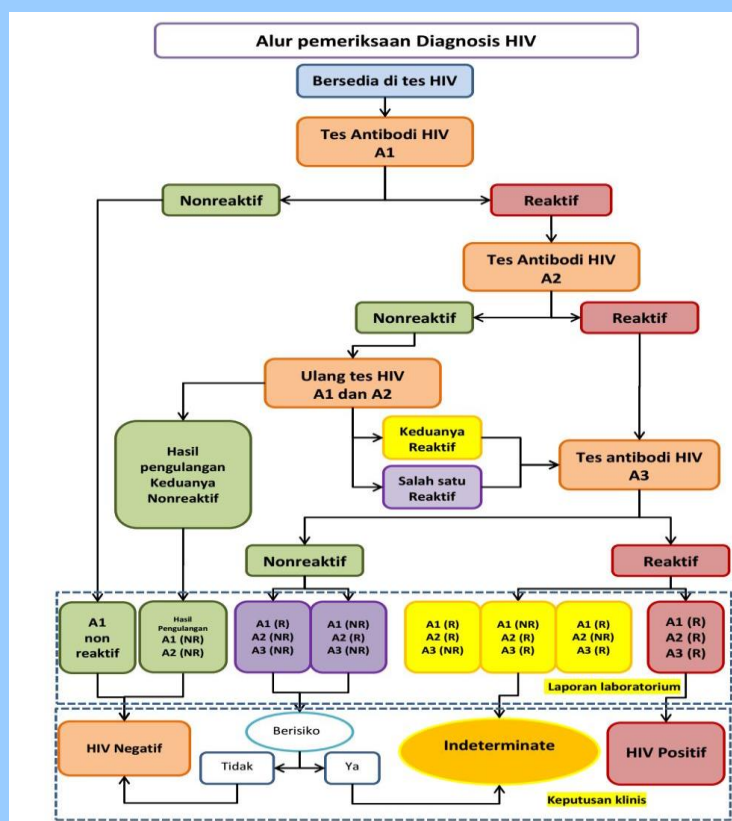


Figure 1. The illustration of anti-HIV examination results ¹⁵

RPR-TP rapid

Rapid plasma reagin (RPR) is a diagnostic blood test used to detect syphilis antibodies. The RPR test is a non-treponemal flocculation test that works by detecting non-specific antibodies (regain) in plasma and serum. If there are IgM or IgG antibodies against lipoidal antigens, agglutination will occur in the test results. There are only two classes of interpretation in the RPR examination that is reactive and nonreactive.¹⁶

HBsAg

HBsAg is the most commonly performed hepatitis B test. The presence of HBsAg in the serum indicates that the patient has an HBV infection. We use this test to identify individuals who could potentially spread the disease, for example,

pregnant women, blood donors, injecting drug users, health workers, hospitalized people, transplant donors and recipients, and semen donors for artificial insemination. Patients with chronic infections can use quantitative HBsAg testing to monitor the treatment progress. The presence of HBsAg indicates that the person is infectious. HBsAg examination results can be reactive or non-reactive.^{17,18}

Data Analysis

We then processed, analyzed and presented the data in tables that describe the characteristics of each research variable: age, latest level of education, occupation, gestational age at the time of the examination, and the results of the triple elimination examination of rapid Anti-HIV, RPR-TP and HBsAg in pregnant women.

Ethical Aspects of Research

The researcher has obtained permission for data collection and research from the Head of Education and Training at Dokter Soekardjo Hospital, Tasiklamaya City. The data sheet only provides a code, not the name of the research subject. The researcher guarantees the confidentiality of all data collected from the research subject.

RESULT AND DISCUSSION

Sample Characteristics

The study's sample characteristics included the patients' age, their most recent educational level, their occupation, and their gestational age, all presented in tabular and percentage format. The age classification is determined in accordance with the guidelines set by Ministry of Health.¹⁹

Table 1. The pregnant women's age at Dokter Soekardjo Hospital, Tasikmalaya City

Age category	Number	Percentage
Early teens (12-16 years)	1	0,54%
Late teens (17-25 years)	55	30,21%
Early adulthood (26-35 years)	60	32,96%
Late adulthood (36-45 years)	60	32,96%
Early elderly (46-55 years)	6	3,33%
Total	182	100%

Table 1 explained that from a total of 182 samples, the majority of pregnant women who underwent rapid RPR-TP, HBsAg, and Anti-HIV examinations were in the early adult age group (26-35 years) with a total of 60 patients, and late adults (36- 45 years) with a total of 60 patients,

or each with a percentage of 32.96%. Quoted from the World Health Organization (WHO), reproductive age in women is in the range of 15-49 years, according to the results of this study, with a total of 120 out of 182 patients in the reproductive age range.

Table 2. The pregnant women's latest education at Dokter Soekardjo Hospital, Tasikmalaya City

The latest education	Number	Percentage (%)
Elementary school	42	23,07%
Junior high school	59	32,41%
Senior high school	70	38,46%
D2	2	1,09%
D3	2	1,09%
D4	3	1,64%
S1	3	1,64%
Not going to school	1	0,60%
Total	182	100%

In Table 2, the highest percentage, 38.46%, indicated that 70 out of 182 pregnant women in this study had completed their senior high school. This

aligns with the findings of Yanti, et al.'s 2019 study in Surabaya, which stated that 76.5% of pregnant women had completed high school (SMA)²⁰

Table 3. The pregnant women's occupation of at Dokter Soekardjo Hospital, Tasikmalaya City

Occupation	Number	Percentage (%)
Housewife	154	84,61%
Health workers	2	1,09%
Employee	11	6,04%
Laborer	5	2,74%
Entrepreneur	5	2,74%
Teacher	2	1,09 %
Student	3	1,69%
Total	182	100%

Table 3 describes the distribution of patients' occupations in this study. Most of the patients were housewives, with a total of 154 out of 182 patients, or a percentage of 84.61%. Similar to this study, Primayanti et al. (2022) found that the

majority of pregnant women in Mataram City chose to become housewives.²¹ However, many pregnant women chose to continue their work during pregnancy, according to research conducted by Brunner et al. (2023) in Switzerland.²²

Table 4. The pregnant women's gestational age during the triple elimination examination

Gestational age	Number	Percentage (%)
Trimester 1	53	29,12%
Trimester 2	22	12,08%
Trimester 3	107	58,80%
Total	182	100%

In Table 4, the number of visits by pregnant women who underwent screening examinations at Dokter Soekardjo Hospital, Tasikmalaya City, in June – November 2023 had a total of 182 pregnant women, with 53 pregnant women (29.12%) in the 1st trimester, 22 pregnant women (12.08%) in the 2nd trimester and 107 pregnant women (58.80%) in the third trimester. The results of this research are in accordance with the provisions issued by the government through Minister of Health Regulation Number 52 of 2017, which

require that pregnant women must undergo blood tests at least once during pregnancy, aimed at reducing the risk of disease transmission from mother to fetus.²³ This approach is also in accordance with recognized theory, as presented by Harald et al. (2015), in the United States, which recommends that pregnant women need to be screened serologically early in pregnancy, especially at their first prenatal visit. This is important because reactive screening results allow immediate treatment and prevention of infection in babies.²⁴

Table 5. Results of Anti-HIV, RPR-TP rapid, and HBsAg examinations obtained from the pregnant women

	Reactive	Non Reactive	Total
Anti-HIV	0 (0%)	182 (100%)	182 (100%)
Rapid-TP Rapid	7 (3,84%)	175 (96,16%)	182 (100%)
HBsAg	1 (0,54%)	181 (99,46%)	182 (100%)

The RPR-Tp rapid screening examination yielded reactive results in 7 pregnant women (3.84%) and non-reactive results in 175 pregnant women (96.16%). No pregnant women were reactive to the

Anti-HIV test. During the HBsAg screening examination, 1 pregnant woman (0.54%) had reactive results, and 181 pregnant women (99.46%) had non-reactive results.

Table 6. Results of rapid Anti-HIV, RPR-TP, and HBsAg in Pregnant Women based on gestational age.

Gestational age	Anti-HIV		RPR-TP rapid		HBsAg		Total
	Reactive	Non-Reactive	Reactive	Non-Reactive	Reactive	Non-Reactive	
Trimester 1	0 (0%)	53 (100%)	1 (1,88%)	52 (98,12%)	0 (0%)	53 (100%)	53
Trimester 2	0 (0%)	22 (100%)	1 (4,54%)	21 (95,46%)	0 (0%)	22 (100%)	22
Trimester 3	0 (0%)	107 (100%)	5 (4,67%)	102 (95,33%)	1 (0,93%)	106 (99,07%)	107
Total	0 (0%)	182 (100%)	7 (3,84%)	175 (96,15)	1 (0,54%)	181 (99,45%)	182

Table 6 explains that the majority of mothers who had reactive results were in the third trimester, with a total of six pregnant women, including five pregnant women who were reactive (4.675%) to the RPR-TP rapid examination and one pregnant woman who was reactive (0.93%) to the HBsAg examination. Then, following the second trimester, one pregnant woman (4.54%) was reactive on the RPR-TP rapid test. In the first trimester, there was one RPR-TP rapid-reactive pregnant woman (1.88%). There were no reactive results on the Anti-HIV examination.

Discussion

No pregnant women showed reactive results in the anti-HIV examination. Although all the results of this study were non-reactive to anti-HIV, it is important not to ignore the risks as HIV transmission in pregnant women can occur through infection or placental damage. This allows HIV to cross the placenta, which can result in transmission from mother to fetus. The risk of this transmission increases during normal delivery because pressure on the placenta increases, allowing blood exchange between mother and baby. In addition, the birth canal exposes babies to the mother's blood and mucus.²⁵

The RPR-Tp rapid screening examination yielded reactive results in seven pregnant women (3.84%) and non-reactive results in 175 pregnant women (96.16%). However, we should not ignore this figure, as syphilis is a dangerous sexually transmitted disease that can lead to serious conditions. The vertical (direct) transmission of syphilis from mother to fetus during pregnancy and childbirth is a known risk (Domingues et al. 2014, Brazil).²⁶ Without proper treatment, syphilis can cause serious complications such as abortion, stillbirth, or congenital infections, including the risk of blindness (Health Research and Development Agency, 2013, Indonesia). The results of this study are also in line with previous research by Sinaga (2019) Indonesia, with 10% of participants showing reactive results for syphilis, while 90% showed non-reactive results. This emphasizes the importance of not ignoring reactive results, as their impact can be significant. Syphilis can have a significant impact on pregnancy, causing the risk of premature labor, intrauterine fetal death, or the birth of a baby with congenital defects.²⁵

The results of the HBsAg examination showed that 181 pregnant women (99.46%) had non-reactive results, while 1 pregnant woman (0.54%) showed reactive results. Reactive results in pregnant women signifies their Hepatitis B virus infection, as their blood contains Hepatitis B virus antigen. This finding is consistent with the results of research by Sinaga, Latif, and Pangulu (2018) in Indonesia, which stated that 13% of the samples showed reactive results for Hepatitis B infection, while 87% showed non-reactive results.²⁵ Even though the results of this study show that the number of pregnant women with non-reactive results is greater than those with reactive results, it is important to still carry out HBsAg tests. This is due to the potential danger of Hepatitis B (HBV) infection, of which 90% can become chronic if transmitted to babies. This infection can

cause serious problems, such as liver cancer and even death (Boedina, 2010, Indonesia).²⁷ It is important to be aware that HBV transmission can endanger the safety of the mother and baby during pregnancy and delivery. Studies have shown that chronic HBV infection can increase the risk of preterm labor and fetal death (Han et al., 2012, China).²⁸ Therefore, HBsAg testing remains an important thing to do to prevent the serious impact of Hepatitis B infection on pregnant women and their babies.

According to a study conducted by Armini et al. (2023) in Bali, two indicators that succeeded in meeting the target for 4 years were antiretroviral therapy (ART) coverage in Badung Regency ($\geq 95\%$) and ANC coverage (at least one visit) in Buleleng Regency ($\geq 95\%$). This study found low prevalence rates of HIV, syphilis, and hepatitis B among pregnant women in three districts. Several indicators show improvement from 2019 to 2022, including an increase in syphilis screening coverage (60.44% to 86.98%) and hepatitis B (29.03% to 95.35%), particularly in Buleleng Regency. However, adequate treatment coverage for pregnant women with syphilis in Denpasar City decreased in 2022 compared to that in 2019 (100% to 71.28%). Although data regarding hepatitis B treatment is not available, hepatitis B vaccination coverage exceeds WHO targets in all three districts. The use of information systems is not yet optimal, and the ability to track cases is still lacking. In addition, there is a lack of private sector involvement, especially in the process of screening, and a lack of standard procedures in managing referrals for pregnant women with hepatitis.²⁹

In research conducted by Widhyasih et al. (2020) in Jakarta, the number of visits by pregnant women undergoing screening examinations at the Ciracas District Health Center reached a total of 951. Of this number, 323 pregnant women (33.96%) were in the 1st trimester, 427 pregnant women (44.90%) in the 2nd trimester, and 201 pregnant women (21.14%) in the 3rd trimester.

The RPR screening examination showed reactive results in 3 pregnant women (0.32%) and non-reactive results in 948 pregnant women (99.68%). Anti-HIV examination revealed one pregnant woman (0.11%) with a reactive result and 950 pregnant women (99.89%) with a non-reactive result. The results of the HBsAg screening examination showed reactivity in five pregnant women (0.53%) and non-reactivity in 946 pregnant women (99.47%).²⁵

CONCLUSION

This research shows that the majority of the pregnant women were in their early adulthood (26-35 years) and late adulthood (36-45 years), accounting for 32.96% of the sample. Most mothers' latest education was senior high school, with 70 pregnant mothers (38.46%). The majority of pregnant women, with a total of 154 patients, were housewives (84.61%). Most mothers had reactive results in the 3rd trimester, with a total of 6 women, including 5 women who were reactive (4.675%) to the RPR-TP rapid examination, and 1 pregnant woman who was reactive (0.93%) to the HBsAg examination. There were no reactive results on the Anti-HIV examination.

ACKNOWLEDGEMENTS

We would like to thank the Dokter Soekardjo Hospital, Tasikmalaya City, the lab assistants at the Clinical Laboratory of Dokter Soekardjo Hospital, Tasikmalaya City, and the Department of Clinical Pathology, Faculty of Medicine, Universitas Jenderal Achmad Yani who participated in this study.

DECLARATION OF INTERESTS

The authors declare that there is no conflict of interest in all parties involved in this study.

REFERENCES

1. Mardiyanti I, Rahayu EP, Zuwariah N, Winoto PMP, Karmila HN. The effectiveness of triple elimination examination (HIV, syphilis, hepatitis), roll over test (ROT) and mean arterial pressure (MAP) and self hypnosis on emergency management of high risk pregnant women during pandemic. *Bali Medical Journal*. 2023 Aug 1;12(2):1995–7.
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. *Clinical Microbiology and Infection*. 2023 Aug;29(8):1000–7.
3. Cohn J, Owiredun 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*. 2021 Apr 1;99(4):287–95.
4. Bell L, van Gemert C, Allard N, Brink A, Chan PL, 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. *Lancet Reg Health West Pac*. 2023 Jun;35:100740.
5. Pijoan DI, Jambi M, Herlambang H, Kusdiyah E, Syauqy A, Fitri AD, et al. *Peningkatan Pengetahuan Tentang Triple Elimination*.
6. *Peraturan Menteri Kesehatan Republik Indonesia* No 52 Tahun 2017.
7. Justiz Vaillant AA, Gulick PG. HIV Disease Current Practice. In *StatPearls*; 2020.
8. HIV and AIDS [Internet]. WHO. 2023 [cited 2023 Nov 9]. Available from: [https://www.who.int/news-room/fact-sheets/detail/hiv-aids#:~:text=HIV%20is%20spread%20from%20the,with%20antiretroviral%20therapy%20\(ART\)](https://www.who.int/news-room/fact-sheets/detail/hiv-aids#:~:text=HIV%20is%20spread%20from%20the,with%20antiretroviral%20therapy%20(ART))
9. Peeling RW, Mabey D, Kamb ML, Chen XS, Radolf JD, Benzaken AS. Syphilis. *Nat Rev Dis Primers*. 2017 Oct 12;3(1):17073.

10. Syphilis [Internet]. WHO. 2023 [cited 2023 Nov 8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/syphilis#:~:text=In%2020%2C%20WHO%20estimated%20that,with%20men%2C%20including%20congenital%20syphilis>
11. Nishant Tripathi, Omar Y. Mousa. Hepatitis B. In StatPearls; 2023 [cited 2023 Nov 8]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK555945/>
12. Hepatitis B [Internet]. WHO. 2023 [cited 2023 Nov 8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b>
13. *Pedoman Penilaian Alat Kesehatan dan PKRT*. Kementerian Kesehatan Republik Indonesia; 2018.
14. Ratih WU. *Strategi Pemeriksaan Laboratorium Anti-HIV*. *Jurnal Farmasi Sains dan Komunitas*. 2012; Vol 11(2) ; Hal 98-103.
15. Liazmi MC. *Hubungan Antara Orientasi Seksual dan Penggunaan Napza Suntik Dengan Kejadian Sifilis pada Pasien Human Immunodeficiency Virus (Hiv)/ Acquired Immunodeficiency Syndrome(Aids) di Rsud Dr. H. Abdul Moeloek Lampung Tahun 2017-2019*. [Lampung]: Universitas Lampung; 2020.
16. Satyaputra F, Hendry S, Braddick M, Sivabalan P, Norton R. The Laboratory Diagnosis of Syphilis. *J Clin Microbiol*. 2021 Sep 20;59(10).
17. Mehta P, Grant LM, Reddivari AKR. Viral Hepatitis. [Updated 2024 Mar 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554549/>
18. Abaalkhail F, Al-Hamoudi W, Khathlan A, Alghamdi S, Alghamdi M, Alqahtani S, et al. SASLT practice guidelines for the management of Hepatitis B virus – An update. *Saudi Journal of Gastroenterology*. 2021;27(3):115.
19. Al Amin M. *Klasifikasi Kelompok Umur Manusia Berdasarkan Analisis Dimensifraktal Box Counting dari Citra Wajah dengan Deteksi Tepi Canny*. MATHunesa: *Jurnal Ilmiah Matematika*. 2017;
20. Yanti NID, Krisnana I, Lestari P. *Hubungan Tingkat Pendidikan dengan Kepatuhan Antenatal Care pada Primigravida Riwayat Pernikahan Dini*. *Indonesian Midwifery and Health Sciences Journal*. 2021 Jun 23;3(2):98–106.
21. Primayanti I, Danianto A, Jumsa R, Geriputri NN, Andari MY. *Gambaran Epidemiologi Faktor Risiko Preeklamsia pada Ibu Hamil*. *Jurnal Kedokteran Unram*. 2022;(1):785–8.
22. Brunner L, Chagnon Krief P, Probst I, Abderhalden-Zellweger A, Renteria SC, Vonlanthen J, et al. A narrative review on factors associated with job interruption during pregnancy. *Int J Occup Med Environ Health*. 2023 Sep 7;36(3):303–23.
23. *Peraturan Menteri Kesehatan Republik Indonesia No 52 Tahun 2017*.
24. Gonçalves B, Ferreira C, Alves CT, Henriques M, Azeredo J, Silva S. Vulvovaginal candidiasis: Epidemiology, microbiology and risk factors. *Crit Rev Microbiol*. 2016 Nov 21;42(6):905–27.
25. Widhyasih RM, Geni L, Fauziah PN, Amalia V. *Gambaran Hasil Pemeriksaan Skrining RPR- TP Rapid, Anti-Hiv dan HBsAg Pada Ibu Hamil di Puskesmas Kecamatan Ciracas*. *Jurnal Ilmiah Analis Kesehatan*. 2020;6(1). Hal. 82-90
26. Domingues RMSM, Szwarcwald CL, Souza Junior PRB, Leal M do C. Prevalence of syphilis in pregnancy and prenatal syphilis testing in Brazil: Birth in Brazil study. *Rev Saude Publica*. 2014 Oct;48(5):766–74.
27. Kresno SB. *Diagnosis dan Prosedur Laboratorium*. *Fakultas Kedokteran Universitas Indonesia*; 2010.

28. Han GR. Management of chronic hepatitis B in pregnancy. *World J Gastroenterol*. 2012;18(33):4517.
29. Armini LN, Setiawati EP, Arisanti N, Hilmanto D. Evaluation of Process Indicators and Challenges of the Elimination of Mother-to-Child Transmission of HIV, Syphilis, and Hepatitis B in Bali Province, Indonesia (2019–2022): A Mixed Methods Study. *Trop Med Infect Dis*. 2023 Nov 3;8(11):492.