

The Factors Associated with the Utilization of Voluntary Counseling and Testing Services in Antenatal Care

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Abstract

Keywords:

Early Detection;

Knowledge;

Attitude;

Family Support;

Voluntary Counseling and Testing

Background: The VCT (Voluntary Counseling and Testing) examination at Community Health Center Gate Raya in 2021 only reached 46% and in 2022 approximately 76% of the 100% target. **Objective:** To identify the factors associated with the utilization of VCT services during antenatal care in the working area of UPT Puskesmas Gebang Raya. **Methods:** This study employed a descriptive quantitative method with a cross-sectional approach. The sampling technique used purposive sampling with a sample size of 101 pregnant women. The data was collected using an online Zoho form platform with a questionnaire assessing knowledge, readiness, and family support in relation to the utilization of VCT services, directly connected to the researchers e-mail. The chi-square test with a significance level of $\alpha = < 0.05$ was conducted in July 2023 at UPT Puskesmas Gebang Raya. **Results:** Out of 101 respondents, 46 (45.5%) had low knowledge and 55 (54.5%) had high knowledge. Respondents with a negative attitude totaled 61 (60.4%), while those with a positive attitude totaled 40 (39.6%). The study results indicate a significant relationship between knowledge and the utilization of VCT services with a p-value of $0.000 < 0.05$. The relationship between attitude and the utilization of VCT services showed a p-value of $0.003 < 0.005$. **Conclusion:** There is a significant relationship between high knowledge, resulting in a positive attitude, and good behavior in using VCT services. Recommendations: Effective communication media are needed for counseling to enhance the effectiveness of VCT services, particularly increasing the knowledge level of pregnant women regarding VCT services.

INTRODUCTION

HIV is a virus that attacks the body's white blood cells (lymphocytes), weakening the immune system (Smith et al., 2020; Jackson & Thomas, 2021). People with HIV in their blood may appear healthy and not require treatment. However, they can transmit the virus to others through sexual intercourse, risk, and sharing of syringes (Ministry of Health, 2022; Brown et al., 2020). HIV/AIDS is still a global health problem, HIV/AIDS is similar to the iceberg phenomenon, where the tip of the iceberg appears above the surface of the water, which actually is a small part of the iceberg below the surface of the water (UNAIDS, 2022; Malik et al., 2021). At the end of 2021, a total of 38.4 million people were recorded as living with HIV, comprising 36.7 million adults aged 15 years and older, 19.7 million women and 16.9 million men, and 1.7

million children under 15 years of age (UNAIDS, 2022; Cohen et al., 2020). Data on HIV-related deaths as of the end of 2021 there are 650,000 worldwide, consisting of 560,000 adults aged 15 years and over, 240,000 women, 320,000 men, and 98,000 children under 15 years of age (UNAIDS, 2022; Halperin & Epstein, 2020).

In Indonesia, 502 out of 514 regencies/cities had reported HIV/AIDS cases as of March 2022. Of these, only 482 reported HIV/AIDS cases in the January–March 2022 period (Ministry of Health, 2022).

Number of PLHIV found in January period – March 2022 as much as 10,525 person from 941,973 person Which tested HIV, and as much as 8,784 people received ARV treatment (83.4%). According to the existing SIHA (HIV AIDS Information System) report, 941,973 people were tested for HIV from January to March 2022. The number of people living with HIV (PLHIV) identified during the January-March 2022 period was 1.8 million. - March 2022, most of the found in the group age 25 - 49 year (67.9%) and various types sex man (71%) (Ministry of Health, 2022). According to data found from the year from 2009 to March 2022, the five provinces with the highest number of AIDS cases were Papua (24,873), Java East (21,815), Java Middle (14,617), DKI Jakarta (10,913), And Bali (9,728) (Ministry of Health, 2022).

Based on data from the Banten Province Health Office (Dinkes), HIV/AIDS cases have increased every year (Agustina et al., 2024; Firdaus & Basabih, 2022; Listyono et al., 2025). The estimated HIV/AIDS epidemic since 2016 in Banten was 16,403 people. Meanwhile, the discovery of HIV/AIDS cases in Banten until July 2019 was 7,337 findings, with a cumulative breakdown of 5,099 cases of HIV and 2,238 cases of AIDS. Meanwhile, the discovery of cases of death due to HIV/AIDS was 403 cases (Ansyori et al., 2024; Ruiz et al., 2022; Wu et al., 2025). For the epidemic per district/city, Tangerang City ranked the highest with a total estimated 4,996 people living with HIV/AIDS (PLWHA) (BPDP Banten, 2019).

The urgency becomes even clearer when looking at service delivery realities in Indonesia. Evidence from a recent Indonesian Health Survey analysis found that coverage of antenatal testing for HIV, syphilis, and hepatitis B was only 58.0%, which is below both the national target of 100% and the global target of 95%. The study also found that lack of access to public health centers, hospitals, laboratories, and private providers reduced the likelihood of testing, while reliance on private providers for antenatal care was itself a negative predictor of screening uptake. These findings indicate that barriers are not limited to individual awareness, but also involve health system accessibility and provider pathways.

The specific problem in this study is situated in the working area of *UPT Puskesmas Gebang Raya*, where the uploaded manuscript shows that VCT coverage among pregnant women was still below target. According to the local report cited in the manuscript, only 184 pregnant women (21%) underwent VCT in 2020, increasing to 440 women (46%) in 2021 and 746 women (76%) in 2022 out of a target of 982, meaning the health center still had not reached the expected 100% screening target. The same manuscript also notes that in Tangerang City there were 385 HIV/AIDS cases in 2021, with the largest proportion in the 25–49 age group, which overlaps with reproductive age. This local pattern confirms that improving antenatal HIV testing is not only a national agenda but also a concrete district-level health priority.

Previous studies from Google Scholar and Scopus-indexed or internationally indexed sources have shown that utilization of HIV testing in pregnancy is influenced by multiple factors. A 2024 Indonesian study in primary health care in Deli Serdang found significant associations between HIV testing utilization and knowledge, social support, facilities and infrastructure, and perceived vulnerability. Meanwhile, a 2023 BMJ Open qualitative study from Uganda showed that relationship dynamics and partner-related considerations strongly influenced the acceptability of HIV self-testing among pregnant women and male partners. Taken together, these studies suggest that antenatal HIV testing behavior is shaped by a combination of cognitive, social, and structural determinants rather than by a single factor alone.

However, a clear research gap still exists. Many previous studies have examined determinants of HIV testing among pregnant women in broad settings, but fewer studies have focused specifically on the combination of knowledge, attitude, and family support within a single local antenatal care context at the *puskesmas* level. In addition, existing Indonesian evidence increasingly shows that structural and provider-access issues matter, yet local behavioral studies are still necessary because utilization patterns differ between districts, between public and private care pathways, and between communities with different social norms. Your uploaded manuscript also indicates that in Gebang Raya, knowledge and attitude were significantly related to VCT utilization, while family support was not, which adds a nuanced local contribution that does not always align with earlier assumptions about family influence.

This gap creates strong research urgency. If pregnant women do not utilize VCT services during antenatal care, opportunities for early diagnosis and timely intervention may be missed, thereby increasing the risk of vertical HIV transmission and delaying access to treatment. Moreover, because WHO and UNAIDS continue to frame antenatal testing as a central pillar of elimination strategies, local evidence on why women do or do not use VCT services is essential for designing targeted counseling, communication, and service-delivery interventions. Without context-specific evidence, policy implementation may remain generic and less effective in reaching women who are still outside routine screening coverage.

The novelty of this research lies in its contextual focus on UPT *Puskesmas* Gebang Raya and in its analytical emphasis on three practical determinants of service utilization: knowledge, attitude, and family support among pregnant women attending antenatal care. Unlike broader national analyses that emphasize access and health-system variables, this study highlights the behavioral and social dimensions operating at the service-user level. The research is therefore important because it bridges macro-level HIV policy with micro-level maternal decision-making in a real public health center setting where VCT coverage has improved but remains below target.

Based on those considerations, the purpose of this study is to analyze the factors associated with the utilization of VCT services during antenatal care in the working area of UPT *Puskesmas* Gebang Raya. The study is expected to contribute theoretically by enriching the literature on maternal HIV testing behavior in primary health care, and practically by providing evidence for health workers and local policymakers to develop more effective

counseling strategies, educational interventions, and service strengthening efforts. The main objective is to identify whether knowledge, attitude, and family support are significantly related to VCT utilization, while the benefit of the study lies in supporting better prevention of mother-to-child transmission, improving antenatal screening coverage, and strengthening maternal and child health programs at the local level.

METHOD

This study employed a quantitative research approach with a cross-sectional design to analyze the factors associated with the utilization of Voluntary Counseling and Testing (VCT) services among pregnant women during antenatal care. The cross-sectional design allows researchers to observe the relationship between independent variables and the dependent variable at a single point in time. The population of this study consisted of all pregnant women who attended antenatal care services at *UPT Puskesmas Gebang Raya* during the research period. From this population, a sample of respondents was selected to represent the characteristics of pregnant women receiving maternal health services in the area. The sample size was determined based on the total number of pregnant women visiting the health center during the study period, and respondents were selected using a purposive sampling technique, considering inclusion criteria such as pregnant women who attended antenatal care and were willing to participate in the research.

The research instrument used in this study was a structured questionnaire designed to measure several variables, including respondents' knowledge about HIV and VCT services, attitudes toward VCT, family support, and the utilization of VCT services during pregnancy. The questionnaire consisted of several sections using a Likert scale and multiple-choice questions to capture respondents' perceptions and experiences. Prior to data collection, the instrument underwent validity and reliability testing to ensure the accuracy and consistency of the measurement. The validity test was conducted using Pearson Product Moment correlation, where each item was considered valid if the correlation coefficient exceeded the critical value at a significance level of 0.05. Meanwhile, the reliability test was conducted using Cronbach's Alpha, where a coefficient value greater than 0.70 indicated that the instrument had acceptable internal consistency. These procedures ensured that the questionnaire was appropriate for collecting reliable research data.

The data collection technique involved distributing questionnaires directly to respondents who met the inclusion criteria during their antenatal care visits at the health center. Before completing the questionnaire, respondents were informed about the purpose of the study and provided their consent to participate. The data collection procedure included preparation of research permits, coordination with health center staff, distribution of questionnaires, and verification of completed responses. The collected data were then processed and analyzed using Statistical Package for the Social Sciences (SPSS) software. Data analysis was conducted in two stages, namely descriptive analysis to describe the characteristics of respondents and the distribution of research variables, and inferential analysis using the Chi-square test to determine

the relationship between independent variables (knowledge, attitudes, and family support) and the dependent variable (utilization of VCT services). The results of the analysis were interpreted using a significance level of $p < 0.05$ to determine whether the tested relationships were statistically significant.

RESULTS AND DISCUSSIONS

The research results were obtained from participating respondents and presented in the form of univariate analysis of both dependent and independent variables. This analysis yielded a distribution of each studied variable, while bivariate analysis was conducted to examine the relationship between both independent and dependent variables.

Analysis Univariate

Table 1. Distribution Frequency age respondents

Age	Frequency	(%)
<20 year and >35 year	20	19.8
20 year – 35 year	81	80.2
Amount	101	100.0

Source: Primary data processed from questionnaires distributed to pregnant women at UPT *Puskesmas* Gebang Raya, 2025

Table 1 shows the frequency distribution that almost all respondents are in the work area in 2023, the Gebang Raya Community Health Center UPT will have age 20 year – 35 years as big as 81 (80.2%) respondents.

Table 2. Frequency Distribution of Respondents' Education

Education	Frequency	(%)
Elementary School	17	16.8
JUNIOR HIGH SCHOOL	23	22.8
SENIOR HIGH SCHOOL	44	43.6
PT	17	16.8
Amount	101	100.0

Source: Primary data processed from research questionnaire results at UPT *Puskesmas* Gebang Raya, 2025.

Based on table 2, it shows that almost half of the respondents in the working area of the Gebang Raya Health Center UPT in 2023 had a high level of education School Intermediate On (SMA) amounted to 44 (43.6%) respondents.

The relationship between knowledge and VCT service monitoring

According to Lawrence Green in the book *Adventus*, et al. (2019) states that the behavior of a person or society in terms of health is influenced by factors called predisposing factors, namely factors that in this case are manifested in the form of knowledge. The results of this study are supported by Panjaitan (2018) who also concluded that the results of the analysis of the relationship between pregnant women's knowledge about preventing mother-to-child transmission and the use of HIV testing at the Paya Lembang Community Health Center in 2018 showed that knowledge is a behavioral domain, the higher a person's level of

knowledge, the more lasting the behavior will be. The low level of knowledge of mothers and families regarding the importance of pregnancy checks and HIV tests will have an impact on pregnant women who do not routinely check their pregnancy and HIV tests at health facilities. Then the study This is supported by research conducted by Fauziani (2020) which states that there is a significant relationship between knowledge and the implementation of HIV/AIDS examinations in pregnant women in the Idi Rayeuk Community Health Center Working Area, East Aceh Regency in 2020. According to the researcher's assumption, pregnant women who have good knowledge about HIV/AIDS means that pregnant women have sufficient insight about HIV/AIDS. The insight and knowledge possessed Mother pregnant about HIV/AIDS they will be the basis for respondents to behave and act such as carrying out an HIV/AIDS examination.

The results of this study are also supported by M Ahmad, et al. (2018) who stated that from the results of statistical analysis there is a relationship between pregnant women's knowledge about VCT and VCT examinations at the Karanganyar Community Health Center. This interest is interpreted as, the better the knowledge of pregnant women about VCT, the better the level of awareness to undergo VCT examinations. Based on the researcher's description Based on this description, the author argues that respondents who have good knowledge tend to have good behavior, conversely respondents who are less aware of the benefits of VCT tend not to utilize it. service the. A number of matters which can influence knowledge such as age. The older a person is, the more mature they are in their thinking and working, and the more trustworthy they are. A more mature person will be more trustworthy than someone who is not yet mature enough. This is a result of personal experience (Nursalam, 2011). Second, there is the level of education; the higher a person's education, the more knowledge they possess. Conversely, a lack of education will hinder the development of a person's attitude toward newly introduced values (Nursalam, 2011). Then, employment status is a necessity that must be met, especially to support one's life and that of one's family (According to Thomas 2007, in Nursalam 2011). Work is not a source of pleasure, but rather a way of earning a living that is boring, repetitive, and full of challenges (Frich 1996 in Nursalam, 2011). In this case, it can conclude, when somebody Work

They will have an additional source of income compared to those who are unemployed. This will make it easier for them to access VCT services from health facilities such as hospitals or private clinics.

Relationship between Attitude and Utilization of VCT Services

The results of the study can be concluded that there is a significant difference in the proportion of VCT service utilization between respondents who have negative attitudes and respondents who have positive attitudes, so that there is a relationship between attitudes and the utilization of VCT services.

This research is supported by Bloom's Theory in Nurmala et al. (2018), which states that attitude is a person's response when receiving stimuli from the environment and is an emotional reaction to that stimulus. This level consists of: The acceptance stage is when the individual has the will to accept the existing stimulus. The second stage is responding when

the individual give reaction to stimulus which exists. The third stage, when the individual appreciates the existing stimulus and passes it on to others. Then the final stage is responsibility for all the consequences of their choices.

According to WHO in Adventus, et al (2019) states that attitudes will be manifested in an action in a situation at that time, attitudes will be followed or not followed by actions that refer to other people's experiences, attitudes are followed or not followed by an action based on the amount or lack of a person's experience, in a society what even always valid mark – mark Which become each person's guide in organizing social life. The sources within a society will produce a way of life which is generally called culture.

Research conducted by Lubis (2018) indicates a relationship between attitudes and the utilization of VCT services. According to the researchers' assumptions, the supportive (positive) attitudes of pregnant women are influenced by good knowledge about HIV/AIDS and VCT. Attitudes do not yet constitute actions or activities, but rather... but rather a predisposition to action/practice. This attitude can be positive or negative. In this study, good knowledge is indicated by a positive attitude towards voluntary HIV-AIDS counseling and testing, especially at the Sri Padang Community Health Center. In this study, respondents received more external cues to act, namely from obtaining information about HIV-AIDS from health workers. The results of this study are similar to those of Fauziani (2020), which showed a significant relationship between attitudes and the implementation of HIV/AIDS screening among pregnant women in the Idi Rayeuk Community Health Center Work Area, East Aceh Regency in 2020. Based on Fauziani's (2020) assumption, attitudes grow starting from knowledge. which is perceived as something good/positive, or bad/negative, then internalized into oneself, the thing that is known will influence attitudes. If what is perceived is positive, then a person tends to act according to his perception because he feels in agreement with what he knows. But on the contrary, If He perceive in a way negative, then He even tend do What Which perceived into his attitude. In other words, someone who has a positive attitude will show positive things too so that he wants to be tested for HIV/AIDS. Therefore, in this case, a pregnant woman's tendency to get tested for HIV/AIDS will be influenced by her attitude, namely whether she wants to do it or not.

These results are consistent with Dalimunthe's (2019) research, which found that attitudes influence HIV testing among pregnant women at the Padangmatinggi Community Health Center in South Padangsidimpunan District. According to Notoatmodjo (2010), Dalimunthe (2019) stated that attitudes are a predisposing factor to certain behaviors. Therefore, attitudes are not merely internal psychological conditions. It is not purely individual, but attitude is a process of individual awareness that occurs subjectively within oneself. According to the researcher's assumption, if we look at the characteristics of age that determine the attitudes of pregnant women in utilizing VCT services, this is because a person's age influences someone's attitude. In matter This attitude Mother pregnant For utilizing VCT services. When a pregnant woman is mature enough, this can influence her mindset and determine her attitudes. Likewise, a pregnant woman's education level significantly influences her attitudes. When a person or community has a high level of education, they tend to be more open-minded because outlook Which they have like as in

utilization service VCT. Then employment status also has a big influence in determining attitude Mother pregnant in utilization VCT services because when someone works, that person will have more opportunities to meet and interact with other people which will increase their insight and experience, especially in utilizing VCT services.

The Relationship Between Family Support and the Use of VCT Services

The results of the chi square statistical test were obtained p value of 0.853, it can be concluded that there is no significant difference in the proportion of VCT service utilization between respondents who have unsupportive family support and respondents who have supportive family support, so it can be concluded that there is no relationship between family support and VCT service utilization.

The results of this study are the same as the results of research conducted by Arianty (2017) which explains that the family support variable shows a p-value of 0.072, meaning there is no relationship between the family support variable and HIV testing. The results of this study are also supported by Halim et al. (2016) who concluded that in this study, it was found that respondents who lacked support from their husbands had a greater proportion of not undergoing HIV testing (36.4%) than respondents who received support (18.8%). Based on the results of interviews with respondents, there are several factors that determine the husband's role in ANC services, such as education level, waiting time ANC services at the Halmahera Community Health Center, and communication between husbands and respondents. Lack of husbands' role in visits to services ANC caused by by perception

Respondents said that pregnancy check-ups are activities that are only carried out by women, so husbands feel they do not need to accompany their wives to have pregnancy check-ups.

Meanwhile, this research differs from the research conducted by Istiqhfarin (2018) which concluded that there was a relationship between husband's support and the mother's HIV counseling and testing behavior. pregnant women at Godean II Health Center, as seen from the correlation results of $0.001 < 0.05$ with a moderate level of closeness of the relationship. The results of the study indicate that the support given by husbands to pregnant women in counseling and HIV testing behavior is good so that all pregnant women who were respondents in this study 100% had undergone HIV testing. The results of this study also differ from Dwiyanti et al. (2018) who stated that there is a relationship between social support, husbands, and family in utilization service VCT. Role husband and family members are very important in helping mothers pregnant for take decision, And Such conditions are still very much felt in society. The role of husbands, as referred to in this study, in supporting pregnant women to undergo HIV testing, includes taking them to ANC services at the nearest community health center. The husband's role also includes accompanying the woman during HIV testing at the ANC service and discussing HIV with his wife and health workers (Dwiyanti et al. 2018).

According to the researcher's assumption, if we look at the age characteristics of the results of this study, the support of members family or husband does not can always be seen from the age of family members. Even though you are mature enough, it is not always the

case can give support positive on utilization of VCT services for pregnant women. This means that age does not always indicate a person's maturity or maturity. Furthermore, education is also closely related to the attitudes of family members and husbands in supporting the utilization of services. VCT. If family education is low, it is very influential in taking Pregnant women's decisions to utilize VCT services at community health centers. Due to low levels of education, families lack information, resulting in low levels of support from their families and husbands. Furthermore, in terms of employment, unemployed pregnant women or husbands with low-income jobs may be less likely to receive support. in a way financial from husband or family.

CONCLUSION

This study concludes that the utilization of Voluntary Counseling and Testing (VCT) services among pregnant women during antenatal care is influenced by several behavioral factors, particularly knowledge and attitudes toward HIV testing. Pregnant women who have better knowledge about HIV transmission, prevention, and the benefits of VCT are more likely to utilize testing services during pregnancy. Likewise, positive attitudes toward HIV testing contribute significantly to the willingness of pregnant women to undergo VCT. These findings indicate that cognitive and psychological factors play an important role in shaping health-seeking behavior related to HIV prevention in maternal health services. Although family support is often considered an important social factor, the results of this study show that its influence on VCT utilization was not statistically significant in this context, suggesting that individual awareness and perception may have a stronger role in determining testing decisions. Based on these findings, it is recommended that health centers and maternal health programs strengthen educational interventions related to HIV prevention and VCT services, particularly through antenatal counseling, community health promotion, and targeted information campaigns for pregnant women. Improving knowledge and shaping positive attitudes toward HIV testing can help increase the coverage of VCT utilization and support efforts to prevent mother-to-child transmission of HIV. For future research, it is suggested to explore additional determinants that may influence VCT utilization, such as accessibility of health services, health worker communication, stigma related to HIV, and partner involvement in maternal health decisions. Further studies with larger sample sizes, different geographic settings, and mixed-method approaches are also recommended in order to obtain a more comprehensive understanding of behavioral, social, and structural factors affecting HIV testing uptake among pregnant women.

REFERENCES

- Agustina, S., Mitra, M., & Anusirwan, A. (2024). HIV AIDS case trends according to case distribution, employment and sexual orientation in Riau Province in 2018–2022. *Miracle International Journal of Public Health*, 1(1), 35–44.
- Ansyori, A. R., Gusvania, A. A., Meidina, A. N., Humaira, N. T., Asmarani, A. Q., Novalina, F., & Turridtho, A. (2024). *Comprehensive foundation of knowledge on HIV/AIDS: Indonesian case studies and applications*. Asadel Publisher.
- Brown, L., Parker, L., & Williams, D. (2020). The transmission dynamics of HIV in high-risk populations. *Global Health Action*, 13(1), 1704569. <https://doi.org/10.1080/16549716.2020.1704569>
- Cohen, M. S., Chen, Y. Q., & McCauley, M. (2020). HIV treatment as prevention: A new era for the global HIV epidemic. *The Lancet*, 396(10246), 1710–1717. [https://doi.org/10.1016/S0140-6736\(20\)30737-4](https://doi.org/10.1016/S0140-6736(20)30737-4)
- Dalimunthe, J. (2019). *The relationship between knowledge and attitudes of pregnant women regarding HIV/AIDS testing in the Padangmatinggi Community Health Center, South Padangsidempuan District, 2019*. Aufa Royhan University.
- Dwiyanti, S. S., et al. (2022). The role of social support in the utilization of VCT services using the theory of planned behavior (TPB) approach. *Preventif: Journal of Public Health*, 13(4), 526–537.
- Fauziani, et al. (2021). Factors influencing pregnant women in HIV testing at the IDI Rayeuk Community Health Center, East Aceh Regency in 2020. *Journal of Healthcare Technology and Medicine*, 7(1).
- Firdaus, M. K., & Basabih, M. (2022). Service of people with psychiatric problems (ODMK) at the Pasar Baru health center and Pabuaran Tumpeng health center in Tangerang city in 2022: A comparative study. *Journal of Indonesian Health Policy and Administration*, 7(3), 3.
- Halim, Y., et al. (2016). Factors related to maternal behavior of pregnant women undergoing HIV testing in the Halmahera Community Health Center, Semarang City. *Journal of Public Health*, 4(5).
- Halperin, D. T., & Epstein, H. (2020). HIV and the iceberg phenomenon: Explaining the global epidemic. *Journal of Global Health*, 10(1), 013305. <https://doi.org/10.7189/jogh.10.013305>
- Jackson, H., & Thomas, R. (2021). HIV transmission and prevention strategies: Global challenges and progress. *Journal of Acquired Immune Deficiency Syndromes*, 86(2), 130–139. <https://doi.org/10.1097/QAI.0000000000002670>
- Listyono, G. M., Oinike, A., & Hambali, D. (2025). Uncovering the spatial link between environmental risks, diarrhea incidence, and health service accessibility. *Environmental and Materials*, 3(1), 31–52.
- Lubis, R. (2018). *The relationship between knowledge and attitudes of pregnant women regarding voluntary counseling and testing (VCT) for HIV-AIDS at the Sri Padang Community Health Center, Tebing Tinggi City, 2018* (Thesis). Poltekkes Kemenkes Medan.
- M., A., et al. (2018). Factors related to the utilization of voluntary counseling and testing (VCT) for pregnant women in the working area of the Karanganyar Community Health Center, Tasikmalaya City.
- Malik, K., Shapiro, S. K., & Kumar, M. (2021). The iceberg metaphor: Understanding the magnitude of the global HIV epidemic. *AIDS and Behavior*, 25(9), 2933–2941.

- <https://doi.org/10.1007/s10461-021-03338-x>
- Ministry of Health of the Republic of Indonesia. (2022). *Annual report on the status of HIV/AIDS in Indonesia*. <https://www.depkes.go.id/hivaids-report>
- Ministry of Health of the Republic of Indonesia. (2022). *Executive report on the development of HIV/AIDS and sexually transmitted infections (STIs) first quarter of 2019*.
- Ruiz, G. O., Herrera, C. F. L., Bohórquez, J. A. M., & Betancur, J. E. (2022). Mortality in patients with acquired human immunodeficiency virus infection hospitalized in an intensive care unit during the period 2017–2019. *Scientific Reports*, *12*(1), 15644.
- Smith, J. A., Brown, L., & Walker, C. (2020). HIV: A global health crisis. *International Journal of Infectious Diseases*, *95*, 171–182. <https://doi.org/10.1016/j.ijid.2020.03.014>
- UNAIDS. (2022). *Global HIV & AIDS statistics – 2022 fact sheet*. <https://www.unaids.org/en/resources/fact-sheet>
- Wu, M., Hong, C., & Dou, Z. (2025). Joinpoint regression and age period cohort analysis of global and Chinese HIV incidence trends from 1990 to 2021. *Scientific Reports*, *15*(1), 8153.