

Original Article

Exploring the Impact of Meditation Therapy on CD4 Levels in HIV/AIDS Patients at Karawang Hospital

Dea Dea¹, Marni Br Karo^{1*}, Puri Kresna Wati¹

¹ Department of Midwifery and Midwifery Profession, Sekolah Tinggi Ilmu Kesehatan Medistra Indonesia, Jl. Cut Mutia Raya No. 88A Sepanjangjaya Bekasi, 3200, Indonesia

ABSTRACT

Background: The HIV/AIDS epidemic remains a significant global health concern, with increasing prevalence in Indonesia's Karawang Regency. People living with HIV/AIDS face numerous challenges, including a decline in immune function and CD4 T-cell depletion. While antiretroviral therapy (ART) is the primary treatment, there is a growing interest in complementary therapies to support immune function and overall well-being. **Objective:** This study aimed to investigate the effect of meditation therapy on CD4 levels in HIV/AIDS patients at Karawang Regional General Hospital. **Methods:** A quasiexperimental study with a prepost design was conducted on 15 HIV/AIDS patients with CD4 levels ranging from 200–500 cells/mm³. The participants engaged in meditation sessions twice a week, twice daily, for one month. CD4 levels were measured before and after the intervention. Demographic data were collected, and statistical analyses were performed via paired t tests ($p < 0.05$). **Results:** Most of the participants were male (80%), aged 31–37 years (46.7%), and had a vocational high school education (40%). Preintervention CD4 levels ranged from 226 to 459 cells/mm³ (mean: 334.87 ± 57.583), whereas postintervention levels ranged from 220 to 467 cells/mm³ (mean: 340.93 ± 62.721). A paired t test revealed no statistically significant effect of meditation therapy on CD4 levels ($p = 0.150$). **Conclusion:** This study revealed no significant increase in CD4 levels following a one-month meditation intervention in HIV/AIDS patients. While this research does not support the use of short-term meditation therapy to increase CD4 levels in HIV/AIDS patients, it underscores the need for further investigation of complementary therapies for this population.

KEYWORDS

CD4, meditation therapy, infectious disease, HIV/AIDS, complementary therapy

ARTICLE INFO

Received Aug 22, 2024
Revised Sept 13, 2024
Accepted Sept 28, 2024
Online Sept 30, 2024

EDITOR

I Made Dwi Mertha
Adnyana, S.Si.,
M.Ked.Trop.

CORRESPONDENCE

Marni Br Karo
Department of
Midwifery and
Midwifery Profession,
Sekolah Tinggi Ilmu
Kesehatan Medistra
Indonesia;
marnikaro.stikesmi@gmail.com

CITE THIS ARTICLE

Dea D., Karo M.B., and Wati P.K. (2024). Exploring the Impact of Meditation Therapy on CD4 Levels in HIV/AIDS Patients at Karawang Hospital. *Svāsthya: Trends in General Medicine and Public Health*, 1(2): e20. <https://doi.org/10.70347/svsthya.v1i2.20>



Supplemental data for this article can be accessed online at <https://doi.org/10.70347/svsthya.v1i2.20>
©2024 The Author(s). Published with license by PT. Mega Science Indonesia

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0). This license allows reusers to copy and distribute the material in any medium or format in unadapted form only, for noncommercial purposes only, and only so long as attribution is given to the creator. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

INTRODUCTION

The global HIV/AIDS epidemic continues to be a significant public health concern, with UNAIDS reporting that an estimated 25.7 million people were infected in Africa, 3.8 million in Southeast Asia, and 3.5 million in the Americas as of 2019 [1,2]. In Indonesia, the number of HIV-positive patients has shown an overall increasing trend, with 50,282 new cases reported in 2019 [3]. The Karawang Regency in West Java Province has experienced a particular increase in HIV/AIDS cases, with 414 cases reported in 2022 alone [4]. This situation highlights the urgent need for effective interventions to manage the disease and improve patient outcomes.

People living with HIV/AIDS face numerous challenges, including physical, emotional, and psychosocial problems [5,6]. A critical issue is the progressive decline in immune function, particularly the depletion of cluster of differentiation four (CD4) T lymphocytes, which leaves individuals vulnerable to opportunistic infections and accelerates disease progression [7,8]. While antiretroviral therapy remains the primary treatment approach, there is growing interest in complementary therapies to support immune function and overall well-being in HIV/AIDS patients [9,10].

Given the potential benefits of complementary therapies, the following question arises: Can meditation, as a nonpharmacological intervention, effectively increase CD4 levels and enhance immune function in HIV/AIDS patients?. Previous studies have suggested that meditation may have positive effects on immune function, including increased T-cell counts and NK-cell activity, in HIV-positive individuals [11–15]. However, further research is needed to establish the efficacy of meditation in the specific context of HIV/AIDS management in Indonesia [5,16].

The objective of this study was to investigate the effect of meditation therapy on CD4 levels in HIV/AIDS patients at Karawang Regional General Hospital. By examining the potential impact of meditation on immune function, this research aims to contribute to the development of comprehensive care strategies for individuals living with HIV/AIDS. This study is particularly relevant given the increasing prevalence of HIV/AIDS in Karawang Regency and the limited research on meditation as a complementary therapy in this context. The findings could inform clinical practice and policy decisions regarding the integration of meditation into HIV/AIDS care protocols, potentially improving patient outcomes and quality of life. Moreover, this research aligns with global efforts to explore holistic approaches to HIV/AIDS management, as emphasized by the World Health Organization's comprehensive care strategies [17,18].

MATERIALS AND METHODS

Study Design and Setting

This study employed a quantitative approach with a quasi-experimental design with an independent t test design (pre-post- and posttest-only group design) [19]. The research was conducted at Karawang Hospital's alternative clinic in May 2024, with a focus on HIV/AIDS patients. This methodology builds upon previous research in the field of complementary therapies for HIV/AIDS management, such as the work of Cahyanti et al. [13] on mindfulness-based stress reduction in people living with HIV/AIDS. By focusing on meditation as a specific intervention and its potential impact on CD4 levels, this study aims to contribute to the growing body of evidence on nonpharmacological approaches to support immune function in HIV-positive individuals.

Participants and Sampling

A purposive sampling technique was used to recruit 15 respondents who met the inclusion criterion of having CD4 levels between 200 and 500 cells/mm³ in HIV/AIDS Patients at Karawang Hospital [20]. This sample size and selection method were chosen to ensure that the participants were representative of the target population while considering the study's feasibility.

Intervention and Data collection

The intervention consisted of meditation therapy administered over a one-month period. The participants engaged in meditation sessions twice a week, with a frequency of twice daily (morning and evening). This approach aligns with previous studies that have investigated the effects of mind-body interventions on immune function in HIV-positive individuals [8,21]. CD4 levels were measured before and after the intervention via blood samples analyzed in the laboratory [22]. Additionally, demographic information, including age, sex, education level, occupation, and duration of HIV/AIDS treatment was collected.

Ethical considerations

The study adhered to ethical guidelines for research involving human subjects, including obtaining informed consent from all participants and maintaining the confidentiality of personal information. Approval for the study was obtained from the relevant institutional review board.

Statistical analysis

The Shapiro-Wilk test was used to assess the normality of the data distribution, which is appropriate for small sample sizes [23]. For the primary analysis, a paired t test (t-dependent test) was employed to compare CD4 levels before and after the meditation intervention. Statistical analysis was performed via SPSS version 25.0. Descriptive statistics were calculated for demographic variables and CD4 levels. The significance level was set at $p < 0.05$ for all the statistical tests.

RESULTS

Demographic characteristics of the participants

Table 1 presents the demographic characteristics of the 15 HIV/AIDS patients who participated in the study. The majority of participants (46.7%) were between 31 and 37 years old, followed by 40%) in the 24--30 years age range and 13.3% (n=2) over 37 years old. The gender distribution was predominantly male (80%), with only 20% (n=3) of the participants being female. With respect to education, 40% (n=6) of the participants had completed vocational high school (SMK), 33.3% (n=5) had a high school education (SMA), and 6.7% (n=1) held a bachelor's degree (S1). In terms of occupation, 40% (n=6) were employees, 26.7% (n=4) were self-employed, 20% (n=3) were housewives, and 13.3% (n=2) worked in the private sector. The majority of participants (60%) had been receiving HIV/AIDS treatment for 1 year, while the remaining participants were evenly distributed among 2, 3, and 4 years of treatment (13.3%) for each category.

Table 1. Demographic characteristics of the HIV/AIDS patients

Variable	Frequency	Percentage (%)
Age		
24 - 30 Years	6	40
31 - 37 Years	7	46,7
>37 Years	2	13,3
Gender		
Male	12	80
Female	3	20
Education		
Senior High School (SMA)	5	33,3
Vocational high school (SMK)	6	40
Collage/Higher University	1	6,7
Jobs		
Housewife	3	20
Self-employed	4	26,7
Employee	6	40
Private	2	13,3

Variable	Frequency	Percentage (%)
Duration of treatment		
1 Years	9	60
2 Years	2	13,3
3 Years	2	13,3
4 Years	2	13,3

CD4 levels before and after meditation intervention

Table 2 displays the distribution of CD4 levels among participants before and after the meditation intervention. CD4 levels ranged from 226 to 459 cells/mm³, with a mean of 334.87 cells/mm³ and a standard deviation of 57.583. The most common CD4 level was 304 cells/mm³, which was observed in 13.3% (n=2) of the participants. All other CD4 levels were represented by one participant each (6.7%). The minimum CD4 value of 226 cells/mm³ fell within the moderate category, whereas the maximum value of 459 cells/mm³ was considered normal. Furthermore, CD4 levels ranged from 220 to 467 cells/mm³, with a mean of 340.93 cells/mm³ and a standard deviation of 62.721. The most frequent CD4 level was 325 cells/mm³, which was observed in 13.3% (n=2) of the participants. All other CD4 levels were represented by one participant each (6.7%). The minimum CD4 value of 220 cells/mm³ fell within the moderate category, whereas the maximum value of 467 cells/mm³ was considered normal.

Table 2. Identification of CD4 levels before and after meditation in HIV/AIDS patients at Karawang Hospital

Before				After			
CD4 levels	Frequency (n)	Percentage (%)	Mean $\pm$ SD	CD4 levels	Frequency (n)	Percentage (%)	Mean $\pm$ SD
226	1	6,7	334,87 $\pm$ 57,583	220	1	6,7	340,93 $\pm$ 62,721
293	1	6,7		280	1	6,7	
295	1	6,7		300	1	6,7	
304	2	13,3		304	1	6,7	
310	1	6,7		314	1	6,7	
320	1	6,7		325	2	13,3	
322	1	6,7		331	1	6,7	
335	1	6,7		335	1	6,7	
345	1	6,7		345	1	6,7	
349	1	6,7		364	1	6,7	
353	1	6,7		365	1	6,7	
372	1	6,7		381	1	6,7	
436	1	6,7		458	1	6,7	
459	1	6,7		467	1	6,7	

Normality test

Table 3 shows the results of the Shapiro-Wilk normality test for CD4 levels before and after the meditation intervention. With a sample size of 15 respondents (n=15) and a 95% confidence level, both preintervention (p=0.216) and postintervention (p=0.304) CD4 levels were found to be normally distributed, as their p values exceeded the alpha value of 0.05.

Table 3. Normality test before and after meditation therapy for HIV/AIDS patients

Meditation	Shapiro-Wilk	Conclusion
Before	0.216	Normally Distributed
After	0.304	Normally Distributed

Remarks: Data are normally distributed if p>0.05.

Effect of meditation on CD4 levels

Table 4 presents the results of the paired t test (t-dependent test) analyzing the effect of meditation therapy on CD4 levels in HIV/AIDS patients at Karawang Hospital. The analysis revealed a mean difference of -6.067 between pre- and postintervention CD4 levels, with a standard deviation of 15.429. The p value of 0.150 ($p > 0.05$) indicates that there was no statistically significant effect of meditation therapy on increasing CD4 levels in the study participants.

Table 4. Effect of increasing CD4 levels with meditation therapy in patients with HIV/AIDS

Meditation	Mean	Std. Deviation	Sig (2-tailed)
Before - After	-6.067	15.429	0.150 ^{ns}

Remarks: ns indicates not significant, the p-value is above 0.05, with a significance level of 95%.

DISCUSSIONS

The results revealed no statistically significant increase in CD4 levels following the one-month meditation intervention. However, these findings warrant further discussion in the context of the literature and the limitations of the study. Meditation as a relaxation technique, has been shown to have potential benefits in various health conditions, including HIV/AIDS [12,18,24]. By conditioning the brain, mind, hormone levels, and immune system to achieve a balanced state, Sugata et al. [5] suggested that regular meditation practices can positively influence CD4 levels in HIV patients. Although our study did not demonstrate a significant effect, it is essential to consider several factors that may have influenced the outcome. One crucial aspect to consider is the duration and intensity of meditation intervention. Our study implemented a one-month program with two weekly sessions. However, research by the San Francisco AIDS Foundation and the David Lynch Foundation indicates that more prolonged interventions, such as three-month programs, may yield more significant improvements in the quality of life of HIV/AIDS patients. This suggests that the duration of our intervention might have been insufficient to elicit measurable changes in CD4 levels [25,26].

Moreover, the efficacy of meditation as a complementary therapy for HIV/AIDS patients may be influenced by various factors, including adherence to antiretroviral (ARV) medication [27–29]. Colominas-González et al. [18] emphasized that medication compliance is a critical factor in achieving successful virological and antiretroviral treatment outcomes. In our study, some participants reported irregular medication intake, which could have affected the overall effectiveness of the meditation intervention on CD4 levels. Importantly, CD4 count fluctuations may also be affected by numerous factors beyond the scope of our intervention [30–32]. Psychological stress, which is often significant in HIV/AIDS patients, can influence immune function [6]. While meditation aims to alleviate stress, the complex interplay between psychological and physiological factors in HIV/AIDS progression requires careful consideration [12,33–35].

The lack of a significant effect in our study aligns with previous research that has shown mixed results regarding the impact of mind-body interventions on CD4 counts in HIV-positive individuals. For example, a systematic review by Kriakouset al. [21] revealed inconsistent effects of mindfulness-based stress reduction (MBSR) on CD4 counts, suggesting that the relationship between such interventions and immune function in HIV/AIDS patients is complex and may require further investigation. However, it is crucial to interpret our findings cautiously owing to several limitations. The small sample size ($n=15$) may have limited the statistical power to detect any significant changes. Additionally, the relatively short intervention period may not have been sufficient to induce measurable changes in CD4 levels. Future studies should consider larger sample sizes and longer intervention periods to better elucidate the potential effects of meditation on immune function in patients with HIV/AIDS [13,36,37].

Furthermore, although our study focused on CD4 levels as a primary outcome, it is worth noting that meditation may confer other benefits not captured by this single biomarker. Quality of life improvement, stress reduction, and enhanced psychological well-being are important

aspects that should be considered in future research [18,38]. While our study did not demonstrate a significant effect of meditation therapy on CD4 levels in HIV/AIDS patients, it provides valuable insights for future research. The complex nature of HIV/AIDS progression and the multifaceted impact of complementary therapies necessitate a comprehensive approach to patient care [39]. Future studies should consider longer intervention periods, larger sample sizes, and a broader range of outcome measures to fully elucidate the potential benefits of meditation in HIV/AIDS patients.

Clinical implications

While the research did not demonstrate a significant effect of meditation on CD4 levels, it highlights the need for a more comprehensive approach to complementary therapies in HIV/AIDS management. Clinicians should consider that short-term meditation interventions may not yield immediate measurable changes in immune function, but could potentially offer other benefits such as stress reduction and improved quality of life. The study underscores the importance of longer-term, more intensive interventions when exploring non-pharmacological approaches to support immune function in HIV-positive individuals. Furthermore, it emphasizes the need for healthcare providers to consider multiple factors influencing CD4 levels, including medication adherence and psychological stress, when developing treatment plans. The findings also suggest that future clinical practices should incorporate a broader range of outcome measures beyond CD4 levels when assessing the efficacy of complementary therapies. Ultimately, this research encourages a holistic approach to HIV/AIDS care, integrating both conventional and complementary therapies to address the complex needs of patients living with HIV/AIDS.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the small sample size ($n=15$) limits the statistical power and generalizability of the findings. A larger sample size would have allowed for more robust statistical analyses and potentially revealed subtle effects that may have been obscured in this study. Second, the relatively short duration of the intervention (one month) may have been insufficient to elicit measurable changes in CD4 levels. Immune system modulation through mind-body interventions may require extended periods to manifest significant effects. Third, the study lacked a control group, which makes it challenging to distinguish between the effects of the meditation intervention and other factors that may have influenced CD4 levels over time. Additionally, the study did not account for potential confounding variables, such as stress levels, sleep quality, or dietary habits, which could have impacted immune function independently of the meditation intervention. The reliance on a single biomarker (CD4 levels) as the primary outcome measure may have overlooked other potential benefits of meditation, such as improvements in quality of life or psychological well-being. Finally, the study did not assess long-term adherence to meditation practices or their sustainability beyond the intervention period, which could provide valuable insights into the feasibility of incorporating meditation into the ongoing care of HIV/AIDS patients.

CONCLUSIONS

These findings suggest that the implemented meditation therapy program did not significantly increase CD4 levels in the study population. However, these results should be interpreted cautiously, considering the limitations of the study, including its small sample size and short intervention duration. While this research does not support the use of short-term meditation therapy to increase CD4 levels in HIV/AIDS patients, it underscores the need for further investigation into complementary therapies for this population. Future studies should consider longer intervention periods, larger sample sizes, and a more comprehensive set of outcome measures to fully elucidate the potential benefits of meditation in HIV/AIDS management. Additionally, the complex interplay between psychological interventions and physiological markers in HIV/AIDS patients warrants further exploration to develop holistic treatment approaches that address both the physical and mental health aspects of living with HIV/AIDS.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: DD, MBK; Methodology: MBK; Software: DD, MBK; Validation: MBK, PKW; Formal analysis: MBK, PKW; Investigation: DD, PKW; Resources: DD; Data Curation: DD, MBK; Writing - Original Draft: DD, MBK, PKW; Writing - Review & Editing: DD, MBK, PKW; Visualization: DD, MBK, PKW; Supervision: MBK.

FUNDING

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

- [1] Januraga PP, Reekie J, Mulyani T, Lestari BW, Iskandar S, Wisaksana R, et al. The cascade of HIV care among key populations in Indonesia: a prospective cohort study. *Lancet HIV* 2018;5:e560–8. [https://doi.org/10.1016/S2352-3018\(18\)30148-6](https://doi.org/10.1016/S2352-3018(18)30148-6).
- [2] Riono P, Challacombe SJ. HIV in Indonesia and in neighbouring countries and its social impact. *Oral Dis* 2020;26:28–33. <https://doi.org/10.1111/odi.13560>.
- [3] Syafrie IR, Tepi D, Pratiwi MR, Pastike KD. Deteksi dini tanda bahaya dengan pemeriksaan HIV/AIDS. *J Basemah* 2022;1:63–8. <https://doi.org/10.58222/jurnalbesemah.v1i1.105>.
- [4] Dinas Kesehatan Kota Bekasi. Rencana Strategis Dinas Kesehatan Kota Bekasi Tahun 2015–2019 2010:1–266.
- [5] Sugata IM, Suryanti PE, Juniarta MG, Istriyanti NLA. Efektivitas yoga terhadap peningkatan kualitas hidup ODHA di Bali. *Jurnal Penelitian Agama Hindu* 2022;51–7. <https://doi.org/10.37329/jpah.voio.1615>.
- [6] Leserman J. HIV disease progression: depression, stress, and possible mechanisms. *Biol Psychiatry* 2003;54:295–306. [https://doi.org/10.1016/S0006-3223\(03\)00323-8](https://doi.org/10.1016/S0006-3223(03)00323-8).
- [7] Setiarto RHB, Karo MB, Keb ST, SKM MK, Tambaip T. Penanganan Virus HIV/AIDS. Yogyakarta: Deepublish; 2021.
- [8] Ramirez-Garcia MP, Gagnon M-P, Colson S, Côté J, Flores-Aranda J, Dupont M. Mind-body practices for people living with HIV: a systematic scoping review. *BMC Complement Altern Med* 2019;19:125. <https://doi.org/10.1186/s12906-019-2502-z>.
- [9] Adnyana IMDM, Eljatin DS, Maulana S, Ibrahim K, Umar TP, Armini LN, et al. Mpox, HIV infection, and genital skin disease: triple burden, threats and challenges from an epidemiological perspective. *Svāsthya Trends Gen Med Public Health* 2024;1:e1. <https://doi.org/10.70347/svsthya.v1i1.1>.
- [10] Adnyana IMDM. Mpox, STIs, and HIV in the LGBTQIA2S + community: what can be learned from bibliometric analysis? *Res Sq* 2023;1–28. <https://doi.org/10.21203/rs.3.rs-3666062/v1>.
- [11] Thibodeaux N, J. Rossano M. Meditation and immune function: the impact of stress management on the immune system. *OBM Integrative and Complementary Medicine* 2018;3:1–1. <https://doi.org/10.21926/obm.icm.1804032>.
- [12] Goyal M, Singh S, Sibinga EMS, Gould NF, Rowland-Seymour A, Sharma R, et al. Meditation programs for psychological stress and well-being. *JAMA Intern Med* 2014;174:357. <https://doi.org/10.1001/jamainternmed.2013.13018>.
- [13] Cahyanti L, Jamaludin J. Mindfulness meditation improves sleep quality in HIV patients. *Jurnal Keperawatan dan Kesehatan Masyarakat Cendekia Utama* 2021;10:199. <https://doi.org/10.31596/jcu.v10i3.824>.

- [14] Naoroibam R, Metri K, Bhargav H, Nagaratna R, Nagendra H. Effect of Integrated Yoga (IY) on psychological states and CD4 counts of HIV-1 infected Patients: A randomized controlled pilot study. *Int J Yoga* 2016;9:57. <https://doi.org/10.4103/0973-6131.171723>.
- [15] Sakthivel R. Counseling Therapy with hatha yoga on adherence level, nutritional status, and quality of life among HIV-infected adolescents: A randomized controlled trial. *J Holist Nurs Midwifery* 2023;33:130–9. <https://doi.org/10.32598/jhnm.33.2.2339>.
- [16] Pankaj Patidar, Pragati Bhutoria. Yoga as a complementary therapy for HIV/AIDS. *J Ayurveda Integr Med Sci.* 2024;9:73–82. <https://doi.org/10.21760/jaims.9.4.11>.
- [17] Gedela K, Wignall FS, Luis H, Irwanto I. HIV programmes in countries within the Asia-Pacific region. *Lancet HIV* 2020;7:e530. [https://doi.org/10.1016/S2352-3018\(20\)30206-X](https://doi.org/10.1016/S2352-3018(20)30206-X).
- [18] Colominas-González E, De Antonio M, Masip M, Martin Conde MT, Cardona G, Fresán Restituto D, et al. Complementary and alternative medicine in HIV care: frequency of consumption, risks and interactions with antiretroviral therapy. *Eur J Hosp Pharm* 2024: 2024-004118. <https://doi.org/10.1136/ejpharm-2024-004118>.
- [19] Alwi J, Sari MP, Adnyana IMDM, Rustam MuhZA, Rahayu D, Irma, et al. Metode Penelitian Epidemiologi. 1st ed. Bandung: CV Media Sains Indonesia; 2023.
- [20] Adnyana IMDM. Populasi dan Sampel. In: Darwin M, editor. Metode Penelitian Pendekatan Kuantitatif. 1st ed., Bandung: CV. Media Sains Indonesia; 2021, p. 103–16.
- [21] Kriakous SA, Elliott KA, Lamers C, Owen R. The Effectiveness of mindfulness-based stress reduction on the psychological functioning of healthcare professionals: A systematic review. *Mindfulness (N Y)* 2021;12:1–28. <https://doi.org/10.1007/s12671-020-01500-9>.
- [22] Adnyana IMDM, Sudaryati NLG, Adiwinto RP. Digital polymerase chain reaction (dPCR): advancements and applications in contemporary laboratory practice. 1st ed. United Kingdom: LAP LAMBERT Academic Publishing; 2024.
- [23] Paulus AY, Sulaeman, Mayasari AC, Ayu JD, Musniati N, Sari MP, et al. Biostatistika Epidemiologi. 1st ed. Bandung: CV. Media Sains Indonesia; 2023.
- [24] Carlson LE, Baydoun M, Flynn M. Emerging integrative medicine approaches to disease management. *APA handbook of health psychology, Volume 2: Clinical interventions and disease management in health psychology (Vol. 2).*, Washington: American Psychological Association; 2025, p. 145–70. <https://doi.org/10.1037/0000395-008>.
- [25] Bhochhibhoya A, Stone B, Li X. Mindfulness-based intervention among People living with HIV/AIDS: A Systematic Review. *Complement Ther Clin Pract* 2018;33:12–9. <https://doi.org/10.1016/j.ctcp.2018.07.002>.
- [26] Molavi S, Seraj Khorrami N, Ehteshamzadeh P, Sayyah M. Effectiveness of mindfulness-based cognitive therapy on sleep quality and perceived social support improvement in patients with HIV/AIDS. *Jundishapur J Chronic Dis Care* 2020;9:99449. <https://doi.org/10.5812/jjcdc.99449>.
- [27] Dewi RS. Antiretroviral Use Profile and CD4 Value of HIV/AIDS patients after antiretroviral administration. *Jurnal Ilmiah Farmasi Farmasyifa* 2022;5:71–8. <https://doi.org/10.29313/jiff.v5i1.7732>.
- [28] Arashiro P, Maciel CG, Freitas FPR, Koch GSR, da Cunha JCP, Stolf AR, et al. Adherence to antiretroviral therapy in people living with HIV with moderate or severe mental disorder. *Sci Rep* 2023;13:3569. <https://doi.org/10.1038/s41598-023-30451-z>.
- [29] Nursalam N, Sukartini T, Misutarno M, Priyantini D. Adherence to antiretroviral therapy, CD4 count, viral load and opportunistic infections in people with HIV/AIDS: a cross-sectional study. *Jurnal Ners* 2024;19:88–94. <https://doi.org/10.20473/jn.v19i1.49958>.
- [30] Jocelyn, Nasution FM, Nasution NA, Asshiddiqi MH, Kimura NH, Siburian MHT, et al. HIV/AIDS in Indonesia: current treatment landscape, future therapeutic horizons, and herbal approaches. *Front Public Health* 2024;12:1298297. <https://doi.org/10.3389/fpubh.2024.1298297>.
- [31] Merati TP, Karyana M, Tjitra E, Kosasih H, Aman AT, Alisjahbana B, et al. Prevalence of HIV infection and resistance mutations in patients hospitalized for febrile illness in Indonesia. *Am J Trop Med Hyg* 2021;105:960–5. <https://doi.org/10.4269/ajtmh.20-1595>.

- [32] Idrus MF, Jayalangkara T. Spiritual psychotherapy effect to increase CD4+ count in HIV/AIDS patients 2016.;1:2205. <https://doi.org/10.20956/nmsj.v0i1.2205>.
- [33] Grossman P, Niemann L, Schmidt S, Walach H. Mindfulness-based stress reduction and health benefits. *J Psychosom Res* 2004;57:35–43. [https://doi.org/10.1016/S0022-3999\(03\)00573-7](https://doi.org/10.1016/S0022-3999(03)00573-7).
- [34] Pratiwi A, Sukardi S, Maliya A, Sudiyanto A, Muhlisin A, Lestari T. Effect of relaxation therapy and vitamin C supplementation on stress and CD4 levels of mentall illness patients. *Biomed Pharmacol J* 2019;12:423–9. <https://doi.org/10.13005/bpj/1656>.
- [35] de Vibe M, Bjørndal A, Fattah S, Dyrdal GM, Halland E, Tanner-Smith EE. Mindfulness-based stress reduction (MBSR) for improving health, quality of life and social functioning in adults: a systematic review and meta-analysis. *Campbell Syst Rev* 2017;13:1–264. <https://doi.org/10.4073/csr.2017.11>.
- [36] Purnamawati D. Pendidikan Kesehatan HIV dan AIDS Bagi Tenaga Kesehatan. Karawang: STIKes Kharisma Karawang; 2016.
- [37] Gorai B, Sahoo AK, Srivastava A, Dixit NM, Maiti PK. Concerted interactions between multiple GP41 trimers and the target cell lipidome may be required for HIV-1 entry. *J Chem Inf Model* 2021;61:444–54. <https://doi.org/10.1021/acs.jcim.0c01291>.
- [38] Gonzalez-Garcia M, Ferrer MJ, Borrás X, Muñoz-Moreno JA, Miranda C, Puig J, et al. Effectiveness of mindfulness-based cognitive therapy on the quality of life, emotional status, and CD4 cell count of patients aging with HIV infection. *AIDS Behav* 2014;18:676–85. <https://doi.org/10.1007/s10461-013-0612-z>.
- [39] Chukwuorji JC, Odi CP, Chike-Okoli A, Morah NM, Osondu OM, et al. Health-related quality of life of people living with HIV: contributions of emotion regulation and self-compassion. *Venereology* 2024;3:136–46. <https://doi.org/10.3390/venereology3030011>.