

Meditation Maintains TCD4+ and TCD8+ Lymphocyte Levels and Viral Load Constant in People Living With HIV During the Covid-19 Pandemic

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Highlights:

- (1) Meditation increases HDL lipoprotein in PLWH during Covid-19 pandemic.
- (2) Meditation maintains TCD4+ and TCD8+ lymphocyte levels constant in PLWH.
- (3) Meditation maintains viral load constant in PLWH during Covid-19 pandemic.

ABSTRACT

Background: The meditation can be a strategy for coping with psycho-emotional and physical comorbidities, that affect people living with HIV (PLWH), and that can be exacerbated in Covid-19 pandemic. **Aim:** To evaluate the levels of TCD4+ and TCD8+ cells, viral load, and metabolic parameters of PLWH submitted to meditation sessions. **Experimental procedure:** Case-crossover study in which 07 (seven) participants attended guided meditation sessions remotely, between July and August 2020 (8 weeks), one session per week, with an average duration of 1h each. Quantification of TCD4+ and TCD8+ lymphocytes was performed by flow cytometry; the viral load was detected by the polymerase chain reaction technique and the metabolic parameters by chemiluminescence. **Results:** Meditation kept the levels of TCD4+ ($p=0.93$) and TCD8+ ($p=0.37$) and viral load (<40) lymphocytes constant. Was observed an increase in high density lipoprotein-cholesterol (HDL-c) ($p=0.01^*$), however glucose ($p=0.15$), triglycerides ($p=0.43$), total cholesterol ($p=0.18$), Glutamic Oxaloacetic Transaminase ($p=0.46$) and Glutamic Pyruvic Transaminase ($p=0.36$) did not change. **Conclusion:** Meditation increases HDL-c in PLWH. The TCD4+ and TCD8+ lymphocyte levels and viral load remained constant during the intervention. The adherence to application of meditation can translate into a greater commitment to the search for health, and thus, improve the quality of life of these individuals.

Keywords: HIV; meditation; TCD4+ and TCD8+ lymphocytes.

MEDITAÇÃO MANTÉM NÍVEIS DE LINFÓCITOS TCD4+ E TCD8+ E CARGA VIRAL CONSTANTE EM PESSOAS VIVENDO COM HIV AIDS DURANTE A PANDEMIA DA COVID-19

RESUMO

Introdução: A meditação pode ser uma estratégia para lidar com comorbidades psicoemocionais e físicas que afetam pessoas vivendo com HIV (PVH) e que podem ser exacerbadas durante a pandemia de Covid-19. **Objetivo:** Avaliar os níveis de linfócitos TCD4+ e TCD8+, carga viral e parâmetros metabólicos de PVH submetidos a sessões de meditação. **Procedimento experimental:** Estudo de caso-crossover no qual sete participantes frequentaram sessões de meditação guiadas remotamente entre julho e agosto de 2020 (oito semanas), uma sessão por semana, com duração média de uma hora cada. A quantificação de linfócitos TCD4+ e TCD8+ foi realizada por citometria de fluxo; a carga viral foi detectada pela técnica de reação em cadeia da polimerase e os parâmetros metabólicos por quimiluminescência. **Resultados:** A meditação manteve constantes os níveis de linfócitos TCD4+ ($p=0,93$) e TCD8+ ($p=0,37$) e a carga viral (<40). Foi observado um aumento no colesterol de lipoproteína de alta densidade (HDL-c) ($p=0,01^*$), no entanto glicose ($p=0,15$), triglicérides ($p=0,43$), colesterol total ($p=0,18$), Transaminase Glutâmica Oxalacética ($p=0,46$) e Transaminase Glutâmica Pirúvica ($p=0,36$) não sofreram alterações. **Conclusão:** A meditação aumenta o HDL-c em PVH. Os níveis de linfócitos TCD4+ e TCD8+ e a carga viral permaneceram constantes durante a intervenção. A adesão à prática da meditação pode se traduzir em um maior comprometimento com a busca pela saúde e, assim, melhorar a qualidade de vida desses indivíduos.

Palavras-chave: HIV; meditação; linfócitos TCD4+ e TCD8+.

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INTRODUCTION

Meditative practice is an ancient activity of mindfulness originating in the Buddhist and Hindu cultures. The person who practices this activity intentionally involves the mind, bringing more awareness to the thought and feeling¹. The meditation practice can reorganize neurological circuits to produce effects not only on the mind and brain but on the functional level of the body².

People living with HIV (PLWH) are more likely to have mental illnesses, mainly depression and anxiety, caused by sexual issues, social stigmas, and the undesirable effects caused by antiretroviral therapy (ART)^{3,4}. All these problems can influence adherence to ART, and consequently, the development of viral resistance⁵, as well as interfering in the levels of TCD4⁺ lymphocytes and viral load, thus affecting several health issues of these individuals^{3,4}.

Meditation lowers anxiety levels during labor and postpartum⁶ and has positive effects on anxiety, depression, pain, quality of life, and sleep in patients diagnosed with breast cancer⁶. In PLWH, mind-body practices such as mindfulness, the combination of at least three relaxation techniques and cognitive-behavioral therapy, and yoga can decrease physical and psychological symptoms and improve quality of life and health⁸, but also provide maintenance of TCD4⁺ lymphocyte levels in this population⁹.

Considering that HIV infection has no cure and has critical consequences to PLWH, the search for complementary therapeutic practices, such as meditation, is relevant to improve the quality of life of these people, reducing levels of stress, depression, and anxiety, especially during the Covid-19 pandemic period. Thus, this study evaluated the effect of meditation, during the pandemic, on the levels of TCD4⁺ and TCD8⁺ lymphocytes, viral load, and metabolic parameters in PLWH.

MATERIALS AND METHODS

Study Design

This is a case-crossover study¹⁰. The trial was conducted in collaboration with Hospital Rafael Fernandes – HRF, a reference unit for the care of PLWH, located in the municipality of Mossoró in the state of Rio Grande do Norte, Brazil, between July and August 2020 (8 weeks).

Participants

A total of 15 participants were recruited via convenience sampling. Throughout the study, eight volunteers dropped out. Thus, seven volunteers completed all phases of the study.

Selection criteria

Participants for this study included adults 18 years of age or older, both male and female, with undetectable viral load and who had been adhering to antiretroviral treatment for at least a year. Participants who had a chronic noncommunicable disease and used steroid medication (oral, nasal, or topical) were excluded from the study because such comorbidities could promote measurement bias.

Ethical Considerations

All the participants signed an informed consent form to participate in this study. The Human Research Ethics Committee from Rio Grande do Norte State University, Mossoró, RN, Brazil, approved the study protocol (CEP-Uern: 3,147,118). All procedures performed in the study complied with the ethical recommendations established by Resolution 466/2012 of the Brazilian National Health Council.

Data collection

Participants answered a survey including epidemiological and socio-demographic questions. Peripheral blood samples were collected for the biochemical/metabolic parameters tests. Initial information on the levels of TCD4⁺ and TCD8⁺ lymphocytes and viral load was obtained from the patients' medical records. After the blood and data collection, the intervention session began weekly, over two months. Peripheral blood was collected after the intervention period for the analysis of the biochemical/metabolic parameters, TCD4⁺ and TCD8⁺ lymphocyte levels, and viral load.

Epidemiological and socio-demographic survey

We used a socio-behavioral questionnaire (generically called KAPB/Knowledge, Attitudes, Practices, Beliefs survey)¹¹. See supplementary material – table 1.

Blood samples

The blood was collected by venipuncture in two 10mL tubes for analyzing viral load, TCD4⁺ and TCD8⁺ lymphocyte levels, and biochemical/metabolic tests. Trained professionals at Hospital Rafael Fernandes performed the procedure. The collection was carried out in two moments: before and immediately after the intervention.

Quantification of TCD4⁺ and TCD8⁺ Lymphocytes and determination of viral load:

The quantification of TCD4⁺ and TCD8⁺ lymphocytes was performed in collaboration with the Central Laboratory of Public Health of Rio Grande do Norte - Lacen (located in Natal), using flow cytometry (Facs-Calibur - Multitest). Viral load determination was performed using real-time PCR (Abbot Real Time HIV1). The results were monitored by the Laboratory Environment Management System – GAL, at HRF.

Measurement of metabolic parameters

The measurement of metabolic parameters was performed using commercial kits used in the diagnostic routine, through the chemiluminescence technique, at the Laboratory of Hospital Rafael Fernandes.

Meditation practice

The meditation sessions occurred using the online platform Google Meet. The meditative meetings took place as a part of the program called “Reconnecting” project”, free and open to participants from all over Brazil. The project aimed to present the meditative practice as an integrative and active tool to reduce stress and anxiety during the social isolation period. Sixty participants participated in the project.

Qualified people guided the meditation sessions, and they had the autonomy to choose the best way to guide the group of participants, mostly laypeople, remotely. They used either ambient sounds or half-light to increase the therapeutic effect of the sessions. Participants needed to have only equipment (mobile phone, tablet, computer) with internet access.

The meditation took place weekly for 8 weeks, lasting approximately 1 hour per session, and extra practices outside the group time were also encouraged. The themes of each meeting intended to follow the line of the “Reconnecting” project, especially in the context of social isolation. The research team selected the topics after surveying the main demands/requests regarding meditative activities/services. The topics chosen were “soul detox”, “planetary healing”, “gratitude meditation”,

“the search for the self”, “forgiveness and self-forgiveness”, “expanding consciousness”, “prosperity and abundance”, and “reconnecting to your essence”.

Data analysis

The data obtained were processed and analyzed statistically using the GraphPad Prism 7.00 program. The paired t-test was used to compare the before and after the intervention of all quantitative data, and $P < 0.05$ was considered statistically significant.

RESULTS

Changes in metabolic parameters

Statistical difference was found for high density lipoprotein-cholesterol (HDL-c) values ($p = 0.01$) before and after intervention (see table 1). Furthermore, there were no statistical differences in the other metabolic parameters analyzed.

Table 1 – Metabolic data

	Week 0	Week 9	P value	Reference values (with fasting)
Glucose (mg/dL)	113,70 ± 63,46	118,30 ± 63,46	0,15	<100 ²²
Triglycerides (mg/dL)	237,10 ± 219,80	265,40 ± 266,90	0,43	<150 ²³
Total cholesterol (mg/dL)	208,60 ± 83,02	224,00 ± 68,13	0,18	<190 ²³
HDL-c (mg/dL)	40,57 ± 12,39	47,14 ± 13,47	0,01*	>40 ²³
LDL-c (mg/dL)	121,50 ± 44,56	113,60 ± 56,59	0,71	<130 ²³
Urea (mg/dL)	31,04 ± 7,21	31,09 ± 7,22	0,99	
Creatinine (mg/dL)	0,79 ± 0,27	0,85 ± 0,29	0,59	0,7 – 1,3 ²⁴
AST (U/L)	44,00 ± 37,75	61,00 ± 92,73	0,46	8 – 48 ²⁵
ALT (U/L)	54,43 ± 49,78	60,57 ± 61,87	0,36	7 – 55 ²⁵

Results are expressed mean ± standard deviation. Abbreviations: HDL-c – high density lipoprotein-cholesterol; LDL-c – low density lipoprotein-cholesterol; AST – aspartate aminotransferase; ALT – alanine aminotransferase. **Statistics:** * Significant difference calculated by the Paired T test for related samples ($P < 0,05$).

Changes in immunological parameters

The mean and standard deviation values (Table 2), and the individual data on the levels of TCD4+ and TCD8+ lymphocytes (Figures 1 and 2) did not show statistical differences.

Table 2 – Immunological data

	Week 0	Week 9	P value
T CD4+ (Cells/mm ³)	838,40 ± 311,50	844,50 ± 418,50	0,93
T CD8+ (Cells/mm ³)	1104 ± 548,40	1043 ± 501,50	0,37
HIV RNA level (Copies/mL)	<40	<40	

Results are expressed mean ± standard deviation. **Statistics:** Paired T test for related samples ($P < 0,05$).

DISCUSSION

In the present study, we observed a significant increase in HDL-c after the meditation practice. An increase in the value of HDL-c can be beneficial, as this component is crucial for the metabolism of lipids in the human body. In addition to lipid metabolism, HDL-c transports hormones, vitamins, proteins, miRNAs, and drugs to target cells with greater precision, which is interesting for PLWH using ART¹². Yoga and meditation, when practiced together in a short period, can increase HDL-c values, showing that relaxing practices help in the lipid response¹³.

The perception of weight gain was observed in 48.6% of people during the Sars-CoV-2 pandemic¹⁴. Additionally, food consumption and meal patterns (type of food, eating out of control, snacks between meals, and the number of main meals) were severely impaired during confinement¹⁵. Also, physical and mental stresses are risk factors that can modify lipid profiles, causing dyslipidemia, high low density lipoprotein-cholesterol (LDL-c) levels, and low HDL-c levels^{16,17}. Despite this, LDL-c levels have not changed with the meditation practice.

Loneliness can be responsible for increasing risk factors for cardiovascular diseases such as hyperglycemia, hypertension, central adiposity, and high triglycerides¹⁸. Loneliness also directly affects personal well-being. Floyd shows in their study that greater social inclusion decreases glucose levels¹⁹. Thus, social isolation increases loneliness among people, consequently increasing the risk of metabolic syndromes. Despite this, the participants in this study did not suffer the consequences of social isolation on the analyzed biochemical/metabolic markers.

Regarding the immunological parameters, the mean and standard deviation values, as well as the individual data on TCD4⁺ and TCD8⁺ lymphocytes remained stable after the meditation practice. The viral load remained undetectable, with no changes after the intervention. These results are relevant and interesting because they show that the practice of meditation, by promoting stress reduction (information collected from the focus group - data not shown), may have contributed to the maintenance of the immunological parameters in the participants. In stressful situations, such as the pandemic and social isolation, the decrease of these immunological parameters is common in these patients, given that the hormone cortisol reduces the number and activation of leukocytes²⁰.

There is an improvement in the count of TCD4⁺ lymphocytes through the practice of meditation in PLWH, immediately after the intervention and at long-term follow-up, according to a systematic review and meta-analysis²¹. In the studies included in the review, the average number of sessions was twelve and the average number of hours was one hour for each study. We believe that the stability in the levels of TCD4⁺ lymphocytes observed in this study is a consequence of stress in the pandemic and that more important than increasing the levels of these cells, in the pandemic context, is the maintenance of their levels in conditions compatible with health and good quality of life for the patients.

The small number of participants was the main limitation of this study. Communication through online platforms facilitated interaction, but the dependence on the internet may have hindered the concentration of some participants, being more interesting if the meditative practice had taken place in person. However, in addition to the quantitative data, given the context of pandemic and social isolation, which changed the emotional and psychological reality of the participants, the meditative group was able to bring a new look at the “new normal”, including improving interpersonal relationships and being a tool for understanding the symptoms of anxiety and depression in this period.

CONCLUSIONS

The practice of meditation during social isolation may have contributed to the increase in HDL-c in PLWHA, while the maintenance of TCD4⁺ and TCD8⁺ lymphocyte levels and viral load is mainly due to the use of antiretroviral treatment, but we cannot rule out that meditation can contribute a small part to this process.

These results are interesting and unprecedented in the context of social isolation in this population. This study expands the knowledge about the practice of meditation and allows the development of research on the effects of meditation, and other integrative and complementary health practices, on the levels of inflammatory markers and their use as an appropriate tool in complementary therapy under stress conditions to other populations.

REFERENCES

- ¹ Basso JC, Mchale A, Ende V, Oberlin DJ, Suzuki WA. Brief, daily meditation enhances attention, memory, mood, and emotional regulation in non-experienced meditators. *Behavioural Brain Research*. 2019; 356:208-220.
- ² Ricard M, Lutz A, Davidson R. En el cerebro del meditador. *Investigación y ciencia*. 2015 May 20;(428):18-25.
- ³ Phillips KD, Sowell RL, Rojas M, et al. Physiological and psychological correlates of fatigue in HIV disease. *Biological research for nursing*. 2004;6(1):59-74. DOI: 10.1177/1099800404264846.
- ⁴ Schuster R, Bornoalova M, Hunt E. The influence of depression on the progression of HIV: direct and indirect effects. *Behavior modification*. 2012;36(2):123-45. DOI: 10.1177/0145445511425231.
- ⁵ Bernard C, Dabis F, Rekeneire N. Prevalence and factors associated with depression in people living with HIV in sub-Saharan Africa: a systematic review and meta-analysis. *Plos One*. 2017;1-22.
- ⁶ Marc I, Toureche N, Ernst E, et al. Mind-body interventions during pregnancy for preventing or treating women's anxiety. *The Cochrane database of systematic reviews* vol. 2011,7 CD007559. 6 Jul. 2011, DOI: 10.1002/14651858.CD007559.pub2
- ⁷ Greenlee H, DuPont-Reyes MJ, Balneaves LG, et al. Clinical Practice Guidelines on the Evidence-Based Use of Integrative Therapies During and After Breast Cancer Treatment. *A cancer journal for clinicians*. 2017;24:194-232.
- ⁸ Ramirez-Garcia MP, Gagnon MP, Colson S, et al. Mind-body practices for people living with HIV: a systematic scoping review. *Bmc Complementary Medicine And Therapies*. 2019;125(19):1-30.
- ⁹ Creswell JD, Myers HF, Cole SW, et al. Mindfulness meditation training effects on CD4+ T lymphocytes in HIV-1 infected adults: a small randomized controlled trial. *Brain, Behavior, And Immunity*. 2009;23(2):184-188.
- ¹⁰ Mittleman MA, Madura M, Robins JM. Control Sampling Strategies for Case-Crossover Studies: An Assessment of Relative Efficiency. *American Journal of Epidemiology*. 1995;142(1):91-98.
- ¹¹ Bastos FI, Lowndes CM, Santos EM. Características Sociodemográficas, Comportamentais e Vulnerabilidade à Infecção pelo Vírus da Imunodeficiência Humana em Homens que fazem Sexo com Homens do "Projeto Rio" [Doctoral Thesis]. Fundação Oswaldo Cruz; 2001.
- ¹² Ben-Aicha S, Badimon L, Vilahur G. Advances in HDL: muito mais do qumuch more than lipid transporterse transportadores de lipídios. *International Journal Of Molecular Sciences*. 2020;1-18.
- ¹³ Yadav RK, Magan D, Yadav R, et al. High-density lipoprotein cholesterol increases following a short-term yoga-based lifestyle intervention: A non-pharmacological modulation. *Acta Cardiologica*. 2017;(23)69.
- ¹⁴ Renzo LD, Gualtieri P, Pivari F, et al. Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. *Journal of Translational Medicine*. 2020;1-15.
- ¹⁵ Ammar A, Brach M, Trabelsi K, et al. Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients* vol. 12,6 1583. 28 May. 2020. DOI: 10.3390/nu12061583
- ¹⁶ ASSADI SN. What are the effects of psychological stress and physical work on blood lipid profiles? *Medicine*. 2017;96(18):1-6.
- ¹⁷ Catalina-Romero C, Calvo E, Sánchez-Chaparro A, et al. The relationship between job stress and dyslipidemia. *Scandinavian Journal of Public Health*. 2013;(2):142-149.
- ¹⁸ Henriksen RE, Nilsen RM, Strandberg RB. Loneliness as a risk factor for metabolic syndrome: results from the hunt study. *J Epidemiol Community Health*. 2019:1-6.
- ¹⁹ Floyd K, Veksler AE, McEwan B. Social Inclusion Predicts Lower Blood Glucose and Low-Density Lipoproteins in Healthy Adults. *Health Communication*. 2016;56(8):1-4.
- ²⁰ Silva AP, Vallim CA. Relação do estresse com a imunidade. *Revista de iniciação científica da universidade vale do rio verde* vol8,2; 2018.
- ²¹ Taiyi JMD, Jianhua HMS, Runsong SMSW, et al. Immunological and Psychological Efficacy of Meditation/Yoga Intervention Among People Living With HIV (PLWH): A Systematic Review and Meta-analyses of 19 Randomized Controlled Trials. *Ann. Behav. Med.*; 2020.
- ²² Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*. 2003 Jan,;26(Suppl 1):S5-S20.

- ²³ Faludi AA, Izar MCO, Saraiva JFK, Chacra APM, Bianco HT, Afune Neto A et al. Atualização da Diretriz Brasileira de Dislipidemias e Prevenção da Aterosclerose – 2017. Arq Bras Cardiol 2017;109(2Supl.1):1-76.
- ²⁴ Kidney Disease Improving Global Outcomes. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int Suppl. [Internet]. 2013 [acessado em: 11 jan. 2018];3(1):1-150.
- ²⁵ Tinsay A. Woreta, Saleh A. Alqahtani. Evaluation of Abnormal Liver Tests, Medical Clinics of North America. 2014;98(Issue 1):1-16. ISSN 0025-7125. ISBN 9780323287128

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