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Randomized Controlled Trial

Impact of yoga on psychopathologies and quality of life in persons with HIV: A randomized controlled study

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ABSTRACT

Background: Evidence suggests that individuals with human immunodeficiency virus (HIV) often exhibit poor physical and mental health, which contributes to a reduced Quality of Life (QoL). Yoga is a form of alternative therapy that has positive influences on general health and QoL.
Objectives: This study examined the effects of yoga on i) anxiety, depression, and psychological well-being and ii) QoL among individuals with an HIV positive status.
Methodology: Sixty individuals with HIV-positive (aged 30–50 years) from rehabilitation centres across Bangalore were randomly assigned to the yoga intervention group ($n = 30$; 11 men) or the wait-listed control group ($n = 30$; 10 men). Participants in the yoga group underwent 8 weeks of intense yoga practice performed an hour a day for 5 days a week. The yoga practice consisted of physical postures, breathing practices, relaxation techniques, and meditation. Participants in the wait-listed control group followed their normal routine. Anxiety, fatigue, depression, and QoL were assessed twice for all subjects in each group – once at the start of the study to establish a baseline and once more at the end of the 2-month study period to assess any changes. Data analysis was performed on the assessments using SPSS software version 10.
Results: Between group analysis demonstrated that a significantly different reduction in anxiety ($p < 0.001$), depression ($p < 0.001$), and fatigue ($p < 0.001$) was observed in the yoga group compared to the control group, as well as significant improvements in well-being ($p < 0.001$) and all domains of QoL ($p < 0.001$) in the yoga group compared to the control group.
Conclusion: This study indicates that yoga intervention appears to improve the psychological health and QoL of individuals who are HIV-positive. Therefore, based on these findings, yoga may be recommended as a complementary therapy to enhance conventional HIV care.

1. Introduction

Approximately, 40 million people worldwide are living with human immunodeficiency virus (HIV) infection (Alter, 2006). Country-wise, India records the second-highest number of HIV-infected persons, approximately 3–4 million (Go et al., 2004). HIV is an infectious disease that affects an individual's immunity, thus increasing vulnerability to various opportunistic infections.

Pharmacological treatments such as Anti-Retroviral Therapy (ART) are presently used to increase life expectancy and control HIV progression. But, the ART intervention is frequently associated with various side effects (Antoni et al., 2002; Hartmann, 2006).

However, despite ART intervention, several psychological issues associated with HIV, continue to persist among persons with HIV-positive (Green and Smith, 2004; Rodger et al., 2013; Rosenfield, 1996).

Additionally, individuals with HIV-positive experience social stigmas, feelings of guilt, uncertainty about the future, feelings of isolation, lack of social reinforcement, and worry about frequent infections, thus making them prone to chronic psychological problems such as anxiety disorder and depression (Bogart et al., 2000; Vogl et al., 1999). Several cross-sectional studies have demonstrated a high prevalence of anxiety disorder and depression among individuals HIV-positive, with the risk of depression being four times more as compared to healthy individuals. The prevalence rate of depression among HIV-infected individuals ranges

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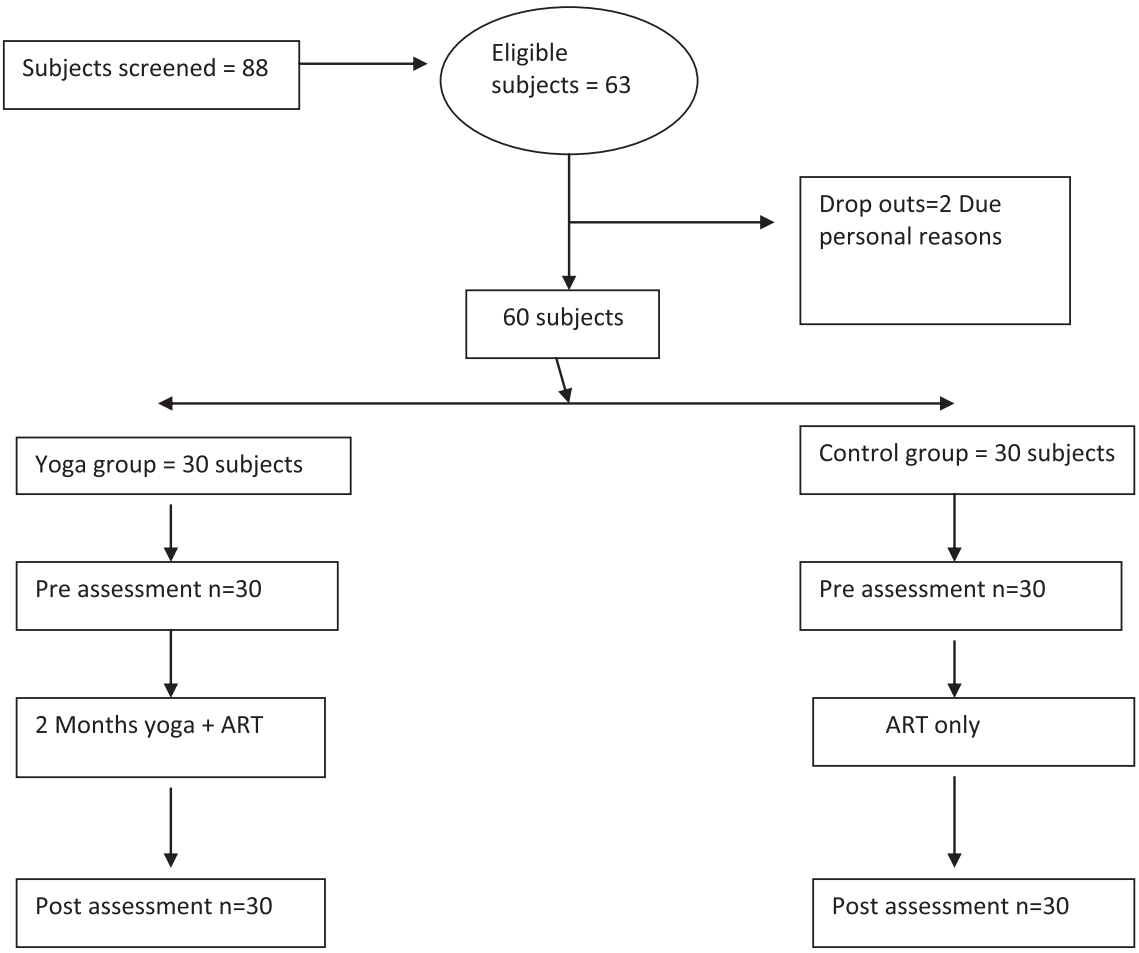

Fig. 1. Participant recruitment.

from 5% to 45%, and the prevalence rate of anxiety disorder is up to 38% (Bogart et al., 2000; Elliott et al., 2002). Also, individuals with HIV positive have depression have higher suicidal tendency than non-HIV depressed individuals (Chandra et al., 1998; Cluver et al., 2007; Penzak et al., 2000).

Further studies have shown that the presence of depression in HIV-infected individuals is associated with a decreased CD4 cell count, an increased viral load, and reduced compliance with ART (Vedhara et al., 1999; Yun et al., 2005).

Apart from frequent infections, weight loss and fatigue are observed prominently among individuals with HIV-positive. Such symptoms affect daily work and lead to more disability and dependency in the persons with HIV (Cleary et al., 1993; Low et al., 2011; Ferrando et al., 1998; Breitbart et al., 1998).

Collectively, these issues such as anxiety, depression, poor immunity, and HIV-associated symptoms lead to reduced psychological well-being and significantly affect quality of life (QoL) among HIV-positive people (Adewuya et al., 2008; AminiLari et al., 2013; Aranda, 2004).

Non-drug interventions such as yoga, meditation, tai chi, or Cognitive Behavioural Therapy (CBT) have been found to be effective in improving several physical and psychological symptoms associated with chronic health conditions, such as HIV (Antoni et al., 2002; Naoroibam et al., 2016; Bhargav et al., 2009; Taylor, 1995).

1.1. Yoga

Yoga is a form of mind–body intervention consisting of physical practices, breathing techniques, and meditation. The science of Yoga is considered to be approximately more than 5000 years old. Spiritually, the practice of yoga aims to achieve the highest goal of life called *Moksha*, which refers to liberation (Siddiqui, 2016). Scientific investigations have noted the many physiological and psychological benefits of yoga practice in both clinical and nonclinical populations (Yang, 2007; Raju et al., 1986).

The practice of yoga has disease preventive effects and beneficial effects on wellness. Scientific evidences have confirmed the various wellness benefits of yoga for various health conditions, such as diabetes mellitus (Hammer et al., 2008; Mahapure et al., 2008), cardiovascular disease (Ashish, 2015), neurological disorders (Sharma et al., 2015), gastrointestinal disorders (Kaswal et al., 2013a; b), and many psychological troubles. A significant portion of yoga research has focused on studying its impact on psychological health and well-being. Yoga and meditation intervention studies show reduction in anger (Bhushan and Sinha, 2001), anxiety (Eppley et al., 1989) and depression (Krishnamurthy and Telles, 2007; Woolery et al., 2004), as well as an increase in well-being (Netz and Lidor, 2003). The potential of yoga to increase psychological well-being, including improved energy and overall QoL has been demonstrated in older adults (Oken et al., 2006). Yoga practice reduces depression symptoms in pregnant woman (Mitchell et al., 2012). Yoga can be considered an ancillary treatment option for people with depressive disorders and individuals with elevated levels of depression (Cramer et al., 2013). Yoga practice results in a significant decrease in anxiety levels and a positive change in subjective well-being among students (Jadhav and Havalappanavar,

2009). Yoga practice reduces anxiety and blood pressure and improves QoL more significantly than physical exercise (Dhawan et al., 2015; Marefat et al., 2011).

Hence, the present study intended to assess the impact of a 2-month integrated yoga intervention on psychological health, QoL, and well-being among HIV-infected persons, when compared with a matched wait-list control group.

2. Methods and materials

2.1. Participants

HIV-infected people aged 30–50 years on ART were recruited in this study. We considered the participants within this age range because after the age of 50 people with HIV usually experience severe weight loss and co-morbid conditions such as tuberculosis, hepatitis B, and fatigue syndrome rendering them unable to perform yoga. Also, the lower age limit is chosen as 30 because any HIV person below 30 years of age is usually in less advanced stages of the disease.

We approached two HIV rehabilitation centres located in Bengaluru, India. A total of 88 participants was approached for participation and were screened for eligibility criteria.

Among 88 participants, 63 were found to be eligible for the study. Of 63 potential participants, 2 declined to participate in the study. Finally, we selected 60 potential participants for the study. For the equal distribution of subjects across both groups, we did not consider the data of one subject from the yoga group. None of the participants had CD4 count of <300 indicating AIDS.

2.2. Randomization

Participants' names were placed in alphabetical order and then listed in serial order from 1 to 60. Using a computer-based random number generator, two groups were formed. The groups were named 'A' and 'B'. Group A was selected as intervention group receiveing yoga and B was a wait-list group using tossing method (Fig. 1).

2.3. Inclusion criteria

- HIV-positive and within the age range of 30–50 years
- Willing to participate in the study
- Participants of both genders

2.4. Exclusion criteria

- Prior exposure to yoga
- Physical handicap or severe disability
- Recent surgery
- Acute respiratory infection
- History of psychiatric illness or usage of antipsychotic medication
- Drug addiction

2.5. Ethical consideration

Participants were informed about the study protocol in their respective mother tongue and a written informed consent was obtained before the commencement of the study.

This study was approved by an Institutional Review Board (IRB) of the Directorate of Distance Education, SVYASA University, Bengaluru, India.

2.6. Intervention

All subjects in the yoga group performed 2 months of yoga practice consisting of loosening practices, Suryanamaskara, breathing practices, Asanas, Pranayama, meditation, and relaxation techniques (See Table 1), which were performed daily for 1 hour 5 days a week. The subjects in the control group followed their normal routine activity. Regular attendance was monitored by maintaining an attendance register and subjects who attended <70% of the sessions were excluded from analysis. A total of 95% of the subjects attended all sessions, none of the subjects had attendance less than 70%.

The yoga module used in the study by Naoroibam et al. (2016) was applied in this study.

3. Assessments and tools

3.1. Primary outcome measures

3.1.1. WHO quality of life- HIV brief (WHOQOL-HIV BREF)

Both groups were administered WHOQOL-HIV BREF before and after 2 months of (Hsiung et al., 2011).

The WHOQOL-HIV BREF is considered to be a valid and reliable tool to assess different domains of QoL among HIV-infected persons. It comprises of 31 items, each using a 5-point Likert scale (5 most to 1 least). The 31 items are distributed across six domains. The six domains of QoL are as follows: physical health, psychological health, level of independence, social relationships, environment, and spirituality/religion/personal beliefs. The physical health domain measures pain and discomfort, energy and fatigue, and sleep and rest. The psychological health domain measures positive feelings, thinking, learning, memory and concentration, self-esteem, body image and appearance, and negative feelings. The

Table 1
List of practices performed by the yoga group.

Sl.No.	Name of Practices	Number of rounds	Duration
	Starting prayer		2 minutes (min)
Shithilikarana practices			
1	Forward and backward bending	5 rounds	2 min
2	Twisting	5 rounds	2 min
3	Side bending	5 rounds	2 min
Suryanamaskara		6 rounds	8 min
Quick relaxation technique			3 min
Breathing practices			
1	Hands in and out breathing	5 rounds	2 min
2	Ankle stretch breathing	5 rounds	2 min
3	Bhujangasanabreathing	5 rounds	2 min
4	Straight leg- raise breathing	5 rounds	2 min
Asanas			
1	Ardhakatichakrasana	1 round	2 min
2	Ushtrasana	1 round	1 min
3	Paschimothanasana	1 round	1 min
4	Bhujangasana	1 round	1 min
5	Shalabhasana	1 round	1 min
6	Setubandasana	1 round	1 min
7	Vipareetakarani	1 round	2 min
Quick relaxation technique			3 min
Pranayama			
1	Kapalabhati	60–80 rounds/min	2 min
2	Sectional breathing	5 rounds	5 min
3	Nadishudhi	10 rounds	5 min
4	Seetkari/Seetali/Sadanta	5 rounds	2 min
5	Bhramari	10 rounds	5 min
Meditation			
1	Nadanusandhana	9×4	5 min
Deep relaxation technique			10 min
Closing prayer			2 min

level of independence domain measures mobility, daily life activities, dependence on medications or treatments, and work capacity. The social relationships domain includes personal relationships, social support, and sexual activity. The environment domain measures physical safety and security, home environment, financial resources, health and social care, accessibility and quality, opportunities for acquiring new information and skills, participation in and opportunities for recreation and leisure activities, and physical environment (pollution, noise, traffic, climate, and transport) (Fatiregun et al., 2009).

3.2. Secondary outcome measures

3.2.1. Hospital anxiety and depression scale

Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale.

The Hospital Anxiety and Depression Scale (HADS) is a valid tool to assess symptom severity and anxiety disorders and depression in both individuals under somatic, psychiatric, and primary care as well as those in the general population. The scale contains a total of 14 items, of which 7 items assess subjective anxiety and 7 assess depressions (Snaith, 2003; Zigmond and Snaith, 1983).

3.2.2. Fatigue severity scale

For both groups, subjective fatigue was assessed using the Fatigue Severity Scale (FSS) before and after 2 months.

The FSS is a valid tool to assess subjective fatigue. For both groups, the FSS was administered before and after 2 months. The FSS is a method of evaluating the impact of fatigue (Valko et al., 2008).

3.2.3. WHO (five) well-being index (1998 version)

Both groups were administered WHO (Five) Well-Being Index (1998 version) before and after 2 months of the yoga intervention (Huen & Bonsiqnore M 2001).

It is a valid and reliable tool to assess the subjective well-being of individuals (Saipanish et al., 2009; Heun et al., 2001).

3.2.4. Data analysis

Data analysis was performed using SPSS version 10 (IBM, Chicago, USA).

Data was subjected to the Shapiro–Wilk normality test and all variables were found to be normally distributed. Descriptive statistics were presented as means and standard deviations. Paired sample *t*-tests and independent sample *t*-tests were used to compare the characteristics within-group and between-groups, respectively.

P-values (significance) of more than 0.05 was considered to depict a statistically significant difference.

4. Results

Demographic characteristics of participants did not differ between the two groups; hence, the groups were comparable at baseline (Table 2).

The yoga group consisted of 30 participants (11 men and 19 women) and the wait-listed control group consisted of 30 participants (10 men and 20 women).

The intervention was found to be feasible, which is evidenced by a regular attendance rate of more than 90%.

Shapiro-Wilk Test: Data were subjected to Shapiro-Wilk test and all the variables found to be normally distributed with a p-value of more than 0.05. Hence, we used the paired sample *t*-tests to assess the changes within each group before and after 2 months and the independent sample *t*-test were used to compare the differences between the groups.

4.1. Yoga group (Table 3)

In the yoga group, we noted significant improvement in depression ($p < 0.001$), anxiety ($p < 0.001$), psychological well-being ($p < 0.001$), fatigue ($p < 0.001$), and all domains of QoL after 2 months of yoga intervention when compared with those measures at baseline (Table 3).

4.2. Control group (Table 3)

In contrast to the yoga group, we observed a significant increase in anxiety ($p < 0.001$), depression ($p < 0.001$), and fatigue ($p < 0.005$), along with a significant decrease in all domains of QoL and well-being ($p < 0.001$), after 2 months compared with those at baseline in the control group (See Table 3).

4.3. Between-group comparison

The yoga group showed a higher improvement in anxiety ($p < 0.001$), depression ($p < 0.001$), fatigue ($p < 0.001$), psychological well-being ($p < 0.001$), and all domains of QoL. Thus, we found significant differences between the yoga and control groups (Table 3).

5. Discussion

In this study, we found a significant improvement in depression, anxiety, fatigue, well-being, and QoL following 2 months of the yoga intervention in HIV-infected participants. In contrast to the yoga group, a significant increase in depression, anxiety, and fatigue and the deterioration of QoL and well-being were observed in the control group. Worsening of the control group characteristics may be attributed to the progression of the disease. Previously, surveys have shown that the natural advancement of disease involves worsening of anxiety and depression symptoms along with reduction of CD4 counts in HIV patients. Both of these factors are known to have a reciprocal effect on each other, resulting in a vicious cycle. Addition of yoga may break this cycle by preventing or retarding progression of psychopathology (Daniels, 2002). Naoroibam et al. (2016) observed that there was an increase in anxiety and depression in HIV positive patients on ART after one month of routine conventional treatment as compared to the baseline.

This study suggests that yoga practice enhances the mental health by improving the well-being and reducing anxiety, depression, and fatigue. Further, these findings suggest the importance of yoga as an alternative intervention in conventional HIV care. This study also showed the significance of the yoga intervention as an add-on therapy to ART in HIV care.

Few studies have shown the potential use of the yoga intervention in HIV-infected persons.

Another randomized controlled trial by Mawar et al., (2015) reported significant improvement in the health related QoL domains (12% in physical health; 9% in level of independence; 11% in psychological health) (Mawar et al., 2015).

In a randomized controlled trial, Naoroibam et al. (2016) reported significant improvement in depression scores ($p = 0.04$, −13.39%) and a non-significant reduction in anxiety scores ($p = 0.13$, −8.2%) following 1 month of an integrated yoga intervention in persons with HIV; in contrast to the yoga group, the control group showed a significant increase in anxiety and depression over the same period. The findings of our study are consistent with this previous study by Naoroibam et al. (2016) with a notable difference being the longer duration of 2 months. The longer duration in our study may explain the comparatively higher

Table 2
Comparison of demographics between the groups at baseline.

Variable	Yoga group, (n = 30; 10 men; 20 women) [Mean ± SD]	Control group, (n = 30; 11 men; 19 women) [Mean ± SD]	p value
Age (years)	41.90 ± 7.02	42.1 ± 7.32	0.13
History of HIV infection (years)	6.82 ± 1.83	6.65 ± 1.36	0.15
Fatigue	47.87 ± 4.47	48.42 ± 1.18	0.51
Psychological well-being	11.26 ± 3.52	9.87 ± 1.54	0.51
Anxiety	11.29 ± 2.15	11.45 ± 2.17	0.71
Depression	9.16 ± 2.15	9.19 ± 2.04	0.92
Physical QoL	10.71 ± 1.16	10.77 ± 1.15	0.81
Psychological QoL	10.27 ± 0.85	10.01 ± 1.01	0.50
Overall QoL & General health	12.39 ± 1.41	12.32 ± 1.17	0.81
Social relations	9.58 ± 0.81	9.48 ± 0.63	0.60
Environmental	11.58 ± 0.98	11.47 ± 0.89	0.84
Spirituality	11.68 ± 1.25	11.26 ± 1.12	0.17

Table 3
Pre–post comparison of variables of yoga and wait-listed control groups.

Group		Yoga group				Control group				
		Pre M ± SD	Post M ± SD	p-value	% change	Pre M ± SD	Post M ± SD	p-value	% change	Between-group comparison p-value
Fatigue		47.87 ± 4.47	22.77 ± 2.51	<0.001	−52	48.42 ± 1.18	49 ± 35	0.005	2	<0.001
Well-being		11.26 ± 3.52	19.03 ± 1.97	<0.001	69	9.87 ± 1.54	8.61 ± 2.56	0.001	−13	<0.001
Anxiety		11.29 ± 2.15	5.45 ± 1.34	<0.001	−52	11.45 ± 2.17	12.48 ± 2.20	<0.001	9	<0.001
Depression		9.16 ± 2.15	4.74 ± 1.12	<0.001	−48	9.19 ± 2.04	10.23 ± 1.93	<0.001	11	<0.001
QOL	PH	10.71 ± 1.16	15.77 ± 1.12	<0.001	47	10.77 ± 1.15	9.84 ± 1.1	<0.001	−9	<0.001
	Psy	10.27 ± 0.85	14.94 ± 0.84	<0.001	45	10.01 ± 1.01	9.08 ± 0.91	<0.001	−9	<0.001
	LOInd	12.39 ± 1.41	15.68 ± 1.17	<0.001	27	12.32 ± 1.17	10.97 ± 1.49	<0.001	−11	<0.001
	SRln	9.58 ± 0.81	13.29 ± 0.59	<0.001	39	9.48 ± 0.63	9.26 ± 0.58	0.03	−2	<0.001
	Envmt	11.58 ± 0.98	15.71 ± 0.57	<0.001	36	11.47 ± 0.89	10.87 ± 0.67	0.002	−5	<0.001
	PBlfs	11.68 ± 1.25	15.94 ± 0.96	<0.001	36	11.26 ± 1.12	10.84 ± 1.07	0.11	−4	<0.001

Abbreviations: QOL PH, QOL Physical; QOLPsy, QOL Psychological; QOL LOInd, QOL Level of Independence; QOL SRln, QOL Social Relation; QOL Envmt, QOL Environment; QOL PBlfs, QOL Personal Beliefs.

improvement in depression (48%) and anxiety (52%) in the yoga intervention group. Similarly, asignificant increase in anxiety and depression in the control group was observed at post-assessment; which may be attributed to HIV-associated depression and anxiety.

In another randomized controlled trial, Agarwal et al. (2015) reported significant improvement in QoL domains following 4 months of the yoga intervention in HIV persons with cocaine addiction (Agarwal et al., 2015). Consistent with this study, our study also found significant improvement in QoL domains following 2 months of yoga intervention. However, the frequency of the yoga intervention in our study was 5 days per week, as compared to 1 session per week in the previous study. Also the type of yoga module differed from the previous study. These variations could explain the greater improvement in QoL domains observed in our study.

Our findings are also supported by a pilot RCT study by Menon and Glazebrook (2013) in which there was a significant improvement in physical health, psychological well-being, and CD4 count following 10 weeks of yoga intervention among the adolescents with HIV positive (Menon and Glazebrook, 2013).

The exact mechanism of action of yoga is not known. However, based on earlier findings, we can hypothesize that yoga practice leads to decreased stress response through down-regulation of the HPA (hypothalamus-pituitary-adrenal axis) (Ross and Thomas, 2010), which could have contributed to a reduction in anxiety. Most of the yoga postures involve active stretching, which might have contributed to increased parasympathetic activity and enhanced secretion of positive Neuro-hormones such as serotonin, oxytocin which have anti-depressant action (Sharma et al., 2005). Decreased anxiety and depression is shown to improve QoL (Chandwani et al., 2010).

This study has a few limitations such as a small sample size, with no sample size calculation done prior to the study. Additionally, the control-group has not had any type of intervention, while the yoga group is a short term intervention.

6. Conclusion

This study indicates that yoga intervention appears to improve the psychological health and QoL of individuals infected with HIV. Therefore, based on these findings, yoga may be recommended as a complementary therapy to enhance conventional HIV care.

Conflicts of interest

Authors declare no conflict of interest.

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