

# Utilizing Yoga in Oncologic Patients Treated with Radiotherapy: Review

Maria Tolia<sup>1#</sup>, Nikolaos Tsoukalas<sup>2#</sup>, Michail Nikolaou<sup>3</sup>, Eftychia Mosa<sup>4</sup>, Ioannis Nazos<sup>5</sup>, Antigoni Poultsidi<sup>6</sup>, Jiannis Hajioannou<sup>7</sup>, Konstantinos Tsanadis<sup>1</sup>, Despoina Spyropoulou<sup>8</sup>, Nikolaos Charalampakis<sup>9</sup>, Dimitrios Kardamakis<sup>8</sup>, Vasileios Kouloulis<sup>5</sup>, Kyriaki Pistevou-Gombaki<sup>10</sup>, George Kyrgias<sup>1</sup>

<sup>1</sup>Department of Radiotherapy, Faculty of Medicine, School of Health Sciences, University of Thessaly, <sup>6</sup>Surgery Clinic, Faculty of Medicine, School of Health Sciences, University of Thessaly, <sup>7</sup>Department of Otolaryngology, Faculty of Medicine, School of Health Sciences, University of Thessaly, University Hospital of Larissa, Larissa, <sup>2</sup>Department of Oncology, Veterans Hospital (NIMTS), <sup>3</sup>Oncology Clinic, Hippokraton University Hospital of Athens, <sup>4</sup>Athens Medical Center, Interventional Radiotherapy-Brachytherapy Unit, <sup>5</sup>Department of Radiology, Radiation Therapy Oncology Unit, University Hospital "ATTIKON", <sup>9</sup>Oncology Clinic, Hospital Center "Henry Dunant", Athens, <sup>8</sup>Department of Radiation Oncology, Medical School, University of Patras, Patra, <sup>10</sup>Radiation Oncology Clinic, University Hospital of Thessaloniki "AHEPA", Thessaloniki, Greece

#These authors contributed equally to the study

## Abstract

**Purpose:** Several trials on noncancer population indicate that yoga is associated with meaningful clinical effects. This study evaluated the physical and psychosocial outcomes of yoga in oncologic patients treated with radiotherapy. **Methods:** We focused on a research through Cochrane Register of Controlled Trials (CENTRAL), BioMed Central, and MEDLINE studies up to May 2017. **Results:** Yoga was found to have a substantial benefit in cancer patients' distress, anxiety, and depression. It also demonstrated a moderate impact on fatigue and emotional function and a small and insignificant effect on functional well-being and sleep disturbances. As far as the effects on psychological outcomes are concerned, there was insufficient evidence. **Conclusions:** This systematic review of randomized controlled trials showed that yoga has strong beneficial effects on oncologic patients' quality of life. Results of the current review must be interpreted with caution due to the relative small sample sizes of most of the included studies, while a prospective randomized study stands in need for the confirmation of our results.

**Keywords:** Radiotherapy, review, yoga

## INTRODUCTION

The role of radiation therapy (RT) is particularly important for the treatment of many malignancies, since ~60% of cancer patients receive RT as a part of their therapeutic regimen.<sup>[1]</sup> The RT success depends on the type of cancer, the anatomic affected site, the tumor staging, and the presence of comorbidities. The RT acute and late side effects are of concern, as they can significantly influence the quality of life (QoL).<sup>[2]</sup> The most common symptoms experienced by patients are mainly pain, anxiety, depression, sleep disturbance, nausea, vomiting, diarrhea, and decreased appetite. The sequelae may continue for a long period even after the RT has ended.<sup>[3]</sup> Many treated patients decide to use complementary and alternative medicine techniques as an attempt to alleviate their disturbances.<sup>[4,5]</sup>

Yoga is considered as a "mind-body" exercise due to the combination of physical action with breathing and meditation.<sup>[6]</sup> It is recognized as the sixth most commonly used alternative health practice among the U.S. adults and it stands as a complement to standard medical care treatment.<sup>[7]</sup> Although no scientific evidence exists, yoga can help protect and support patients' physical, mental, and spiritual strength.<sup>[8]</sup> Nowadays, yoga appears to be very popular among cancer patients<sup>[9]</sup> because it is thought to help manage cancer-related symptoms.<sup>[9]</sup> Several studies in the noncancer population

**Address for correspondence:** Prof. Maria Tolia, Department of Radiotherapy, Faculty of Medicine, School of Health Sciences, University of Thessaly, Biopolis, 41110, Larissa, Greece. E-mail: mariatolia@med.uth.gr

### Access this article online

#### Quick Response Code:



**Website:**  
www.jpalliativecare.com

**DOI:**  
10.4103/IJPC.IJPC\_112\_17

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** reprints@medknow.com

**How to cite this article:** Tolia M, Tsoukalas N, Nikolaou M, Mosa E, Nazos I, Poultsidi A, *et al.* Utilizing Yoga in oncologic patients treated with radiotherapy: Review. *Indian J Palliat Care* 2018;24:355-8.

reported positive effects of yoga on physical and psychological outcomes.<sup>[10-15]</sup>

The aim of the present study is to conduct a systematic review of the effects of yoga in cancer patients and survivors who underwent RT, focusing particularly on both physical and psychosocial benefits.

## METHODS

The key words used for the search were: “Yoga”, “Radiotherapy”, “Randomized Controlled Trial,” and synonyms. A literature review was performed based on database search in Cochrane Register of Controlled Trials (CENTRAL), BioMed Central, and MEDLINE up to May 2017.

Study inclusion criteria were as follows: (a) design: randomized controlled trial (RCT), (b) population: adults >18 years old, with any cancer diagnosis either during or posttreatment, (c) intervention: yoga, (d) control group: nonexercise, (e) outcome: physical and psychosocial results, and (f) text language: English.

The search of the literature identified thirty-six (36) papers. Thirty-three (33) publications were excluded after the study of their summaries, as they were not related to “Benefits of yoga in cancer patients and survivors: A systematic review of randomized controlled trials [Figure 1].”

The quality rating of included studies was based on the Cochrane Risk of Bias Tool. The quality of the studies was high [Figure 2].



Figure 1: Literature search results and study selection.

## RESULTS

From a review of all published studies up to February 2017, a total of 155 oncologic patients (sample sizes ranged from 44 to 58), treated with RT, were evaluated. They were randomly assigned to receive yoga or brief supportive therapy prior to RT treatment [Table 1].

This systematic review described and evaluated three papers examining yoga as a practice to improve psychosocial symptoms in oncologic RT patients. The study included only RCT focusing on yoga interventions with physical postures and evaluating the effectiveness on psychosocial outcomes.

Through our research, yoga was found to be a feasible modality in oncologic patients treated with RT. Beneficial effects on several physical and psychosocial symptoms and a small impact on functional well-being were reported.

Vadiraja *et al.*<sup>[16]</sup> compared the results of a 6-week integrated yoga program with the effects of a brief supportive therapy as a control intervention in early operable breast cancer patients undergoing adjuvant RT. The mean age of participants was 46 years in yoga arm group ( $N_y$ ) and 48.45 years in control arm group ( $N_c$ ) ( $N_y = 44$ ,  $N_c = 44$ ). Paired sample *t*-test done to assess within-group change showed a statistically significant decrease in self-report anxiety scores in the  $N_y$  ( $t = 7.24$ ,  $P < 0.001$ ) and  $N_c$  ( $t = 2.15$ ,  $P = 0.04$ ) following intervention. Analysis of covariance on postintervention measures using baseline anxiety as a covariate showed a significant decrease in self-report anxiety in the yoga group compared with controls ( $F(1, 73) = 15.4$ ,  $P < 0.001$ ). Paired

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Banerjee, 2007 [17]	+	+	+	+	+	+	+
Chandwani, 2014 [18]	+	+	+	+	+	+	+
Vadiraia, 2009 [16]	+	+	+	+	+	+	+

Figure 2: Risk of bias summary (Cochrane collaboration).

**Table 1: Characteristics of selected studies**

Author and year publication	Sample size	Purpose	Patients and methods	Conclusions
Vadiraja <i>et al.</i> , 2009 <sup>[16]</sup>	44	Effects of an integrated yoga program with brief supportive therapy on distressful symptoms in breast cancer outpatients undergoing adjuvant RT	Eighty-eight Stage II and III breast cancer outpatients were randomly assigned to receive yoga ( $n=44$ ) or brief supportive therapy ( $n=44$ ) prior to their RT treatment. Intervention consisted of yoga sessions lasting 60 min daily while the control group was imparted supportive therapy once in 10 days. Assessments included EORTCQoL (C30) functional scales and PANAS. Assessments were done at baseline and after 6 weeks of RT treatment	Yoga might have a role in managing self-reported psychological distress and modulating circadian patterns of stress hormones in early breast cancer patients undergoing adjuvant RT. There was a significant difference across groups over time for positive affect, negative affect, and emotional function. There was a significant improvement in positive affect, emotional function, and cognitive function, and decrease in negative affect in the yoga group as compared to controls. The results suggest beneficial effects of yoga intervention in managing cancer- and treatment-related symptoms in breast cancer patients.
Banerjee <i>et al.</i> , 2007 <sup>[17]</sup>	58	Effects of an integrated yoga program in modulating perceived stress levels, anxiety, as well as depression levels	Fifty-eight breast cancer patients undergoing RT were studied, two psychological questionnaires - HADS and PSS	The present study highlights the potential of an outpatient yoga-based program and supportive counseling to reduce adverse effects of the conventional treatment modality and to benefit cancer patients' overall survival.
Chandwani <i>et al.</i> , 2010 <sup>[18]</sup>	53	Previous research incorporating yoga into RT for women with breast cancer finds improved QoL	Patients with breast cancer Stages 0 to III were recruited before starting RT and were randomly assigned to yoga ( $n=53$ ) or stretching ( $n=56$ ) three times a week for 6 weeks during XRT or waitlist ( $n=54$ ) control. Self-report measures of QOL, fatigue, depression, and sleep quality, and five saliva samples per day for 3 consecutive days were collected at baseline, end of treatment, and 1, 3, and 6 months later	For some outcomes, yoga yielded better subjective and objective results than either stretching or usual care. There were fewer differences between active stretching and waitlist groups.

PANAS: Positive and negative affect schedule, HADS: Hospital Anxiety and Depression Scale, PSS: Perceived Stress Scale, EORTCQoL: European Organization for Research in the Treatment of Cancer-QoL, QoL: Quality of life, RT: Radiotherapy, XRT: Radiotherapy

sample *t*-test done to assess within-group change showed a significant decrease in self-report depression within the  $N_y$  ( $t = 6.26$ ,  $P < .001$ ) and  $N_c$  ( $t = 3.23$ ,  $P = 0.01$ ). Analysis of covariance on postintervention measures using baseline depression scores as a covariate showed a significant decrease in self-report depression in the  $N_y$  compared with  $N_c$  ( $F[1, 73] = 10.7$ ,  $P = 0.002$ ). Paired sample *t*-test done to assess within-group change showed a significant decrease in perceived stress in the  $N_y$  ( $t = 5.5$ ,  $P < 0.001$ ) but not in the  $N_c$  ( $t = 1.42$ ,  $P = 0.17$ ). Analysis of covariance on postintervention measures using baseline perceived stress score as a covariate showed a significant decrease in perceived stress in the  $N_y$  compared with  $N_c$  ( $F[1, 72] = 18.05$ ,  $P < 0.001$ ). The authors concluded that yoga might have a role in managing self-reported psychological distress and modulating circadian patterns of stress hormones in early breast cancer patients undergoing adjuvant RT.

Banerjee *et al.*<sup>[17]</sup> studied the effect of an intensive yoga program on psychological parameters (Hospital Anxiety and Depression Scale and Perceived Stress Scale [PSS]) as well as RT-induced DNA damage in the peripheral blood lymphocytes

derived from the breast cancer patients pre- and post-RT, using both an intervention and a supportive counseling group. A total of 58 patients completed the study. The mean age of all participants was 44 years. There was a significant decrease in the anxiety levels in the  $N_y$  intervention group from a mean of 8.5 (standard deviation [SD] = 1.6) at baseline to a mean of 4.1 (SD = 1.0) (48.2%) after the 6-week yoga program. In the  $N_c$  group, the mean anxiety score increased from 8.2 (SD = 1.1) to 10.5 (SD = 1.8) (28%). Based on repeated ANCOVA measures, controlling for baseline values of each dependent variable, the change in anxiety was significantly different between the groups ( $P < 0.001$ ). The post-RT depression score for the intervention group decreased from a mean of 8.0 (SD = 1.9) at baseline to a mean of 3.4 (SD = 0.5) (57.5%) after the yoga program. In the  $N_c$  group, the score increased from 7.8 (SD = 0.9) at baseline to 9.7 (SD = 1.2) (24%). Based on repeated ANCOVA measures, controlling for baseline values of each dependent variable, the change in depression was significantly different between the groups ( $P < 0.001$ ). In the  $N_y$ , the mean PSS decreased from 20.4 (SD = 2.8) at baseline to 14.9 (SD = 2.4) post-RT (26.9%), whereas the  $N_c$  showed no change pre- and post-RT ([mean = 19.0, SD = 2.1] at baseline

and [mean = 20.4, SD = 2.5] post-RT). The authors concluded that yoga intervention modulates the stress levels in breast cancer patients during RT.

Chandwani *et al.*<sup>[18]</sup> evaluated the hypothesis that participation in yoga three times a week during RT would have long-term effects on physical and mental health aspects of QoL (primary end points), fatigue, depression, and sleep (secondary end points) relative to an active stretching or waitlist control groups ( $N_y = 53$ ,  $N_{\text{stretching}} = 56$ ,  $N_{\text{waitlist}} = 54$ ). The mean age of all participants was 51.9 years. The authors concluded that, for some outcomes, yoga yielded better subjective and objective results than either stretching or usual care. There were fewer differences between active stretching and waitlist groups.

## DISCUSSION

The present study demonstrated that yoga has large beneficial effects on distress, anxiety, and depression; moderate beneficial effects on emotional function; and a small effect on sleep disturbance. Psychosocial effects, cognitive function, vigor, anger, hostility, spirituality, relaxation, and mental health were also studied, therefore the evidences of yoga's effects on them are insufficient.

Future prospective RCTs stand in need, to evaluate the effects of yoga on (a) physical status, (b) psychosocial situation, (c) the optimal frequency, (d) duration of yoga, (e) in types of cancer different from breast cancer, and (f) the optimal time point in the cancer and cancer treatment or rehabilitation trajectories for offering yoga interventions.

## CONCLUSION

The present study has some limitations. We included articles published only in the English language and we may have missed important findings from yoga in Asia, in which yoga practicing is much more common than in Western countries. However, in this retrospective study, we included two trials that were conducted in Asia. We should note that evidence of physical effects of yoga was generally insufficient to draw firm conclusions, because of the limited number of studies per physical result. Nevertheless, the small effect of yoga on physical function and functional well-being maybe related to the short intervention duration. To improve physical function and fitness, longer duration of intervention may be required.

This systematic review of RCTs showed that yoga has an important beneficial effect on cancer patients' distress, anxiety, and depression; a moderate effect on fatigue and emotional function; and an insignificant effect on functional well-being and sleep disturbances. Regarding the effects on psychological outcomes, there was insufficient evidence. Results of the current review must be interpreted with caution due to the relatively small sample sizes of most of the included studies.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Moding EJ, Kastan MB, Kirsch DG. Strategies for optimizing the response of cancer and normal tissues to radiation. *Nat Rev Drug Discov* 2013;12:526-42.
2. Berkey FJ. Managing the adverse effects of radiation therapy. *Am Fam Physician* 2010;82:381-8, 394.
3. Patrick DL, Ferketich SL, Frame PS, Harris JJ, Hendricks CB, Levin B, *et al.* National institutes of health state-of-the-science conference statement: Symptom management in cancer: Pain, depression, and fatigue, July 15-17, 2002. *J Natl Cancer Inst* 2003;95:1110-7.
4. Molassiotis A, Fernandez-Ortega P, Pud D, Ozden G, Scott JA, Panteli V, *et al.* Use of complementary and alternative medicine in cancer patients: A European survey. *Ann Oncol* 2005;16:655-63.
5. Bernstein BJ, Grasso T. Prevalence of complementary and alternative medicine use in cancer patients. *Oncology (Williston Park)* 2001;15:1267-72.
6. Lipton L. Using yoga to treat disease: An evidence-based review. *JAAPA* 2008;21:34-6, 38, 41.
7. National Center for Complementary and Alternative Medicine. Yoga for Health; 2013. Available from: <http://www.nccam.nih.gov/health/yoga/introduction.htm>. [Last accessed on 2017 Nov 04].
8. Culos-Reed SN, Carlson LE, Daroux LM, Hatley-Aldous S. Discovering the physical and psychological benefits of yoga for cancer survivors. *Int J Yoga Ther* 2004;14:45-53.
9. Cramer H, Lange S, Klose P, Paul A, Dobos G. Yoga for breast cancer patients and survivors: A systematic review and meta-analysis. *BMC Cancer* 2012;12:412.
10. Telles S, Ramaprabhu V, Reddy SK. Effect of yoga training on maze learning. *Indian J Physiol Pharmacol* 2000;44:197-201.
11. Raub JA. Psychophysiological effects of hatha yoga on musculoskeletal and cardiopulmonary function: A literature review. *J Altern Complement Med* 2002;8:797-812.
12. Tran MD, Holly RG, Lashbrook J, Amsterdam EA. Effects of hatha yoga practice on the health-related aspects of physical fitness. *Prev Cardiol* 2001;4:165-70.
13. Blank SE, Kittel J, Haberman MR. Active practice of Iyengar yoga as an intervention for breast cancer survivors. *Int J Yoga Ther* 2010;15:51-9.
14. Carson JW, Carson KM, Porter LS, Keefe FJ, Seewaldt VL. Yoga of awareness program for menopausal symptoms in breast cancer survivors: Results from a randomized trial. *Support Care Cancer* 2009;17:1301-9.
15. Galantino M, Cannon N, Hoelker T, Iannaco J, Quinn L. Potential benefits of walking and yoga on perceived level of cognitive decline and persistent fatigue in women with breast cancer. *Rehabil Oncol* 2007;25:3-16.
16. Vadiraja HS, Raghavendra RM, Nagarathna R, Nagendra HR, Rekha M, Vanitha N, *et al.* Effects of a yoga program on cortisol rhythm and mood states in early breast cancer patients undergoing adjuvant radiotherapy: A randomized controlled trial. *Integr Cancer Ther* 2009;8:37-46.
17. Banerjee B, Vadiraj HS, Ram A, Rao R, Jayapal M, Gopinath KS, *et al.* Effects of an integrated yoga program in modulating psychological stress and radiation-induced genotoxic stress in breast cancer patients undergoing radiotherapy. *Integr Cancer Ther* 2007;6:242-50.
18. Chandwani KD, Thornton B, Perkins GH, Arun B, Raghuram NV, Nagendra HR, *et al.* Yoga improves quality of life and benefit finding in women undergoing radiotherapy for breast cancer. *J Soc Integr Oncol* 2010;8:43-55.