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Effectiveness of Yoga Nidra in Mitigating Stress in Women Undergoing Curative Radiotherapy for Cervical Cancer

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Abstract

Background: Cervical cancer patients undergoing chemo-radiotherapy experience considerable amounts of stress. In the present study, we attempted to ascertain the effectiveness of yoga nidra, a mind-based structured relaxation exercise, in mitigating the stress.

Method: We conducted this prospective two-arm study on 48 volunteers randomly allocated into experimental (n=24) and control groups (n=24) using simple random sampling (lottery method). We collected the pretest data using a stress scale. The experimental group was then provided with yoga nidra sessions during the course of the treatment. We collected the post-test data using the same tool at the end of the radiation treatment with 50 Gy (2 Gy for five days a week for five consecutive weeks). We presented the demographic details in frequency and percentage and analyzed the stress data using ANOVA with Tukey's multiple comparison test. $P<0.05$ was considered as significant.

Results: The volunteers in both cohorts experienced moderate to severe stress at the beginning of the study. Compared to the control group, the stress was significantly less in the groups that practiced yoga nidra (79.46 vs. 64.42) ($P<0.0001$).

Conclusion: The results of the study clearly suggested that yoga nidra was effective in reducing the stress in cervical cancer patients undergoing curative radiation therapy.

Keywords: Cervical cancer, Yoga nidra, Chemo-radiation, Stress

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Introduction

Cervical cancer is a major health issue in developing countries and more so in India that is reported to have the highest incidence (almost one-third of the world's number).[1] Similar to other cancers, the diagnosis and treatment of cervical cancer cause despair and the fact that it involves a gynecological region entails severe psychological stress such as anxiety, demoralization, and depression in the affected women. In clinics, if appropriate care and interventions are not provided at the right time, the constant psychological stress reduces the quality of life, increases emotional and physical distress, and impacts the treatment schedule, response, and survival.[2]

Scientific studies carried out with people afflicted with various ailments have shown that regular practice of relaxation facilitated regeneration and recuperation.[3] Yoga is ancient holistic Indian traditional form of mind-body exercise, which uses asana (techniques of posture), pranayama (breath control), dhyana (meditation), and practice of moral and ethical observance. This exercise has been investigated for its beneficial effects in various health conditions and myriad results pointed to its ability to increase strength, agility, and flexibility, and enhance cardio-respiratory functions; augment the ability to reduce mental and physiological stress and enhance the mood, well-being, mind-body awareness, attention, and emotions in the adults.[3-5]

Diagnosis of cancer, the cytotoxic treatment to control its growth, and post-therapy life all impose numerous psychosocial and physical difficulties in the affected individual. Relaxation is an integral part of yoga, and various studies reported yoga to be conducive to mitigating physiological and psychological stress and improving both physical and mental health in women afflicted with lymphoma,[6] lung,[7] breast,[8] and ovarian[9] cancers. On the down side, performing asanas can be physically strenuous for cancer patients; therefore, it requires the direct supervision and complete attention of a trained yogi because any error/accident can severely impact the physical mobility of the patient. This becomes particularly important when yoga has to be practiced by women afflicted with cervical cancer, because physical movements of pelvis, spine, and legs may cause pain and bleeding in the affected women.

In this regard, yoga nidra, a form of yoga developed by Swami Sathyananda Saraswathi, is beneficial, since it involves no asanas (physical movements) and focuses on yogic relaxation.[10] In this form of yoga, an individual is taught to consciously alter the states of consciousness from beta to alpha and then to delta, including controlled breathing and altering the respiratory rate.[10] Yoga nidra is easy to learn, and it is performed without the risk of physical injury.

Previous reports clearly showed that cervical cancer had a negative psychological impact on affected women, influencing their quality of life.[11-17] In the majority of women afflicted by cervical cancer, pain and bleeding were highly common and severely affected their mobility and quality of life.[12-15] From an interventional perspective, pain and physical inability are deterrents towards any physical activities and asanas. Studies further suggested that the tutor guided/trained mind-body therapies and yoga were very useful in reducing the mental distress in cancer patients.[18-25] Considering all these aspects, this study was initiated to ascertain the benefit of yoga nidra in reducing distress in women undergoing curative radiotherapy for cervical cancer.

Patients and Methods

Patient population

This was a prospective, unblinded, randomized two-arm study performed in the oncology wards at Father Muller Medical College Hospital, Mangalore, India, with women histopathologically confirmed to have been afflicted with cervical cancer and requiring curative chemo-radiotherapy. The inclusion criteria were willing cervical cancer patients aged 19-65 years with definitive diagnosis of cervical cancer, who required curative radiation therapy, had no comorbidities, were able to understand Kannada or English or Malayalam, and diagnosed with stage I (IA and IB), stage II, and stage III cervical cancer with Karnosky's

score of above 80 at the start of the study. The exclusion criteria were history of mental illness such as bipolar disorder, depression, and schizophrenia prior to cancer diagnosis , stage IV cervical cancer, Karnosky's score of less than 80, history of neoadjuvant chemotherapy, hearing impairments, comorbidities, and unwillingness to participate. The study was initiated after obtaining the approval of the Ethics Committee (FMMC/FMIEC/1541/2013) and the permission of the hospital authorities.

Radiation treatment

We scheduled the women afflicted with cervical cancer to receive external irradiation at a maximum energy level of 6 MV from a linear accelerator (Varian Medical systems, USA) at a dose rate of 300 MU/min. The patients were planned to receive a curative target dose of 50 Gy [2 Gy for five days a week (Monday to Friday), with no more than one fraction per day for five consecutive weeks]. Patients also received cisplatin infusion (40-70 mg/m2/day IV) prior to the scheduled radiation. On a weekly basis, we evaluated complete blood counts and serum blood urea nitrogen and creatinine for toxicities caused by chemotherapy. Sometimes, the dose of cisplatin was modified based on the results of renal function tests. Cisplatin was withdrawn when creatinine levels crossed 1.1 mg/dl. Physicians and oncologists provided all patients with the standard gynecological and general healthcare.

Yoga nidra

The volunteers of the yoga nidra cohort were taught prior to the beginning of radiation by the principal investigator, who was a trained yogi. The volunteers were requested and encouraged by the investigator to perform the relaxation exercises in sleeping positions during the course of the radiation (Monday to Friday) at the same time of the day (8.00 to 8.45 PM), for four consecutive weeks.

Yoga nidra involved several steps such as

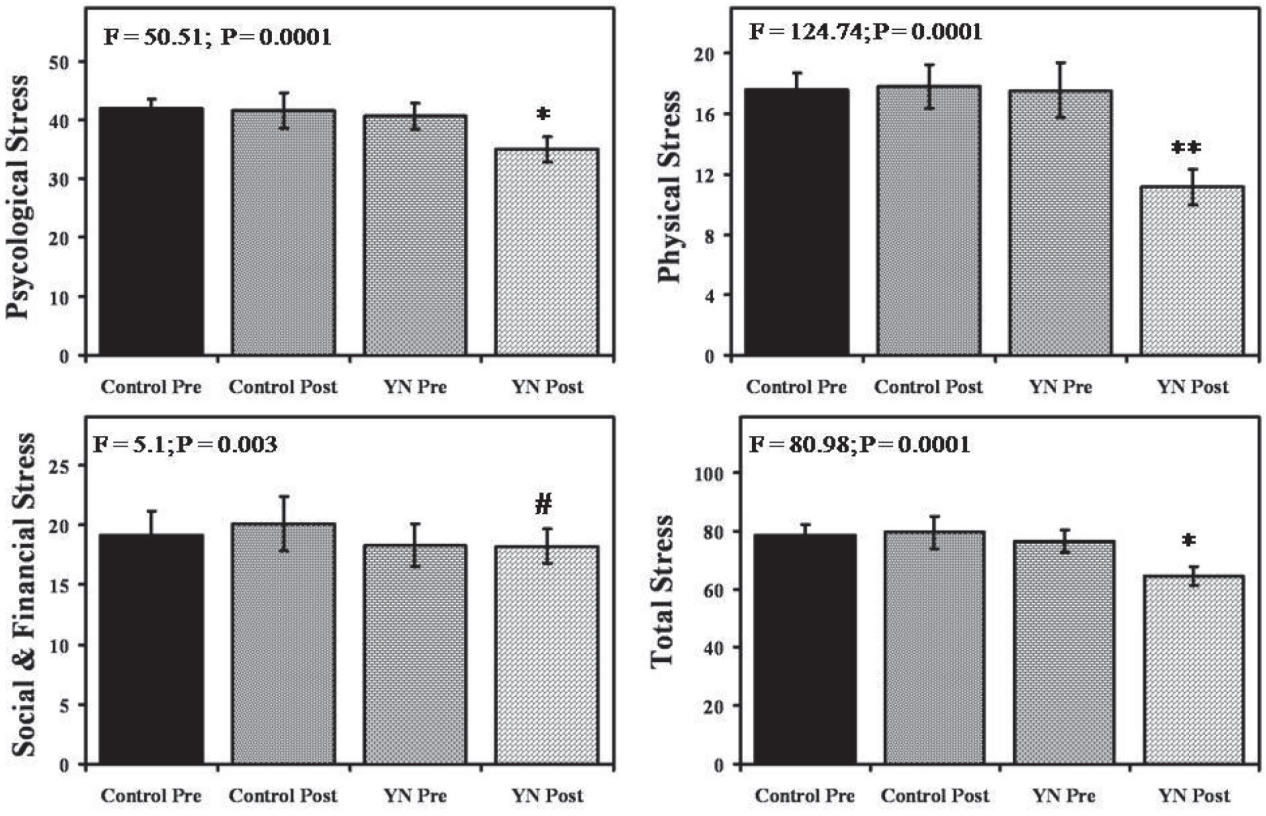

Figure 1. This figure shows the reducing effect of yoga nidra on psychological, physical, social, and financial stress as well as total stress.

Table 1. The stress questionnaire comprising the psychological, physical, social, and financial problems and grading and categorization stress indices

Domain	Questions	Never	At times	Often	Always
Psychological problems	1. I have lost confidence in my life.	1	2	3	4
	2. I feel that I am a person of worth and equal like others.	4	3	2	1
	3. Recently I have been highly irritated (Reverse scoring).	1	2	3	4
	4. I feel hopeful about my recovery with the help of medicines and radiation therapy (Reverse scoring).	4	3	2	1
	5. I do not feel difficult to take my decisions (Reverse scoring).	4	3	2	1
	6. I am worried about the outcome of the disease.	1	2	3	4
	7. I am scared about the spread of cancer.	1	2	3	4
	8. Recently I experience unexplained mental sadness.	1	2	3	4
	9. Recently I have been having low morale.	1	2	3	4
	10. Recently I am not able to get along with the situations important for my life.	1	2	3	4
	11. I feel low as my body has changed and I am not womanly as before.	1	2	3	4
	12. I feel very upset as my prayers and offerings are not answered.	1	2	3	4
	13. I often ask to God "why only me".	1	2	3	4
	14. I feel like I am burden to my family.	1	2	3	4
Physical problems	1. Recently, I feel physically and mentally exhausted.	1	2	3	4
	2. I feel difficulty in relaxing.	1	2	3	4
	3. I skip my regular meals as I get upset thinking about outcome of disease.	1	2	3	4
	4. I get tired very quickly.	1	2	3	4
	5. Recently I have not been getting sound sleep.	1	2	3	4
	6. I feel that I may not be able to have a normal sexual life in future.	1	2	3	4
Social and financial problems	1. I am upset that I am not doing my part for my family.	1	2	3	4
	2. Recently I prefer to be alone.	1	2	3	4
	3. Recently I lose my temper easily with family, friends and neighbors.	1	2	3	4
	4. I am sad that all my social activities are stopped due to this treatment schedules.	1	2	3	4
	5. I am upset due to the financial difficulties caused by my medical treatment.	1	2	3	4

Categorization of stress: No stress = less than 25; Mild stress 26- 50; Moderate stress =51-75 and Severe stress = greater than 75

relaxation (awareness of the breath and the sounds outside and inside the room,); resolve (thoughts of success, health, and more relaxation); rotation of consciousness (parts of the body's right side, left side, back, and head region, and major parts of the body); breath awareness (awareness of breath in abdomen, chest, throat, and external nostrils, with each time counting from 27 to 1); image visualization; and resolve (repeated three times). The investigator conducted each session, which lasted for 23 minutes, in the presence of a physician and an oncology nurse.

The questionnaire development

The university and the department mandated that the students be trained in the construction of psychological questionnaire and the protocol was adhered in agreement with the rule. We conducted a one-to-one discussion with cervical cancer survivors and newly-diagnosed women undergoing radiation treatment. We further referred to the published qualitative and validated questionnaires. For the validation of the tool, we developed a criteria checklist in terms of 'agree' 'disagree' and remarks for each item. Ten experts in the field of psychiatric nursing, psychiatry, clinical and general psychology, and biostatistics ascertained the content validity. The experts were requested to assess the items for relevance and appropriateness of the questions. The agreement

Table 2. The demographic and clinical information of the subjects in the two groups

Demographic and Clinical Details		Control Frequency (%)	Yoga Nidra Frequency (%)
Age	35 – 54	18 (75)	11(45.8)
	55 – 74	6 (25)	13(54.2)
Religion	Hindu	17 (70.8)	20(83.3)
	Muslim	6 (25)	2(8.35)
	Christian	1 (4.2)	2(8.35)
Education	No formal education	10 (41.7)	11(45.8)
	Primary	9 (37.5)	8(33.3)
	High school	5 (20.8)	4(16.7)
	PUC / higher secondary	0 (0)	1(4.2)
	Graduated	0 (0)	0(0)
Occupation	Unemployed	0 (0)	0(0)
	Homemaker	11 (45.8)	13(54.2)
	Private employee	3 (12.5)	5(20.8)
	Government employee	0 (0)	0(0)
	Self employed	0 (0)	1(4.2)
	Others	10 (41.7)	5(20.8)
Marital status	Single	0 (0)	0(0)
	Married	20 (83.3)	16(66.7)
	Divorced	0 (0)	0(0)
	Widow	4 (16.7)	8(33.3)
Monthly income (INR)	5000 – 15,000	9 (37.5)	15(62.5)
	15,001 – 25,000	4 (16.6)	6(25)
	25,001 – 35,000	10 (41.7)	2(8.3)
	35,001 – 45,000	1 (4.2)	1(4.2)
Type of the family	Nuclear	23 (95.8)	8(33.3)
	Joint	1 (4.2)	16(66.7)
Health insurance	Complete coverage	10 (41.7)	15(62.5)
	Partial coverage	14 (58.3)	9(37.5)
	No coverage	0 (0)	0(0)
Known case of cancer since	1 – 12 months	23 (95.8)	19(79.2)
	13 – 24 months	1 (4.2)	4(16.6)
	25 – 36 months	0 (0)	1(4.2)
FIGO classification	1st stage	8 (33.3)	9(37.5)
	2nd stage	15 (62.5)	12(50)
	3rd stage	1 (4.2)	3(12.5)
	4th stage	0 (0)	0(0)

percentage of each item was considered, and accordingly, the given suggestions were accepted, and the items were modified. Afterwards, the English questionnaire was translated into Kannada and Malayalam, and back translation was done by two different language experts, and suitably modified with the consensus of all the language experts.

Following modification, the final draft of baseline pro forma consisted of 11 items, and the

Table 3. The results of psychological, physical, social, and financial problems in the two groups

	Time point	Psychological Problems Mean± Std Dev. (Lower-Upper band)	Physical Problems Mean± Std Dev. (Lower-Upper band)	Social and Financial Problems Mean± Std Dev. (Lower-Upper band)	Total Mean± Std Dev. (Lower-Upper bands)
Group	At the start	41.96±1.6	17.58±1.1	19.13±2.03	78.67±3.47
Control	of treatment	(38-45)	(16-20)	(16-23)	(71-84)
	At the end of	41.54±3.05	17.83±1.46	20.08±2.24	79.46±5.63
	treatment	(34-47)	(15-20)	(16-24)	(66-88)
	Percentage	99.06±7.11	101.69±9.49	105.27±8.55	101.06±6.5
	change	(83.33-110.53)	(88.24-118.75)	(90-121.05)	(86.59-111.27)
Yoga	At the start	40.67±2.24	17.54±1.84	18.29±1.76	76.5±3.87
Nidra	of treatment	(37-44)	(13-20)	(15-22)	(70-84)
	At the end	35.04±2.12	11.17±1.17	18.21±1.47	64.42±3.28
	of treatment	(32-40)	(10-14)	(15-21)	(58-71)
	Percentage change	86.31±5.31	64±6.41	99.92±7.15	84.29±3.93
		(74.42-94.87)	(52.63-76.92)	(89.47-118.75)	(75.61-90.14)
Difference in percent change between the two cohorts		12.76±7.64 (0.71-26.6)	37.69±10.52 (16.83-59.76)	5.35±11.33 (13.75-31.58)	16.76±7.04 (3.75-27.25)

stress scale comprised 25 items. The final data collection questionnaire, prepared based on the objectives of the study, consisted of two sections, namely demographic and stress scales. The demographic part included 11 items (age, religion, education level, occupation, marital status, monthly income of the family, duration of cancer, FIGO classification or stage of disease, and radiation dose). The stress scale consisted of 25 items and was measured on a 4-point Likert scale (never – 1, sometimes – 2, often – 3, and always – 4) to obtain a total score of 100. The final scale comprised three domains: psychological, physical, and social and financial problems. Of the 25 questions, 22 were positively scored, while three items were scored in the reverse pattern. A high score indicated increase in the level of psychological stress (Table 1).

Pretesting of the translated tool with cervical patients

Pretesting of the tool helps researchers to i) determine whether respondents are able to understand the items and ii) establish reliability and validity. The purpose of pretesting in the current research was to find the problems related to the instrument and reveal the weaknesses in the administration, organization, and distribution of the instrument to the 10 cervical cancer patients undergoing radiation therapy. The focus was on the comprehension and understanding of the volunteers. The average time to complete the tool was 10-15 minutes. It was found that the language used in the demographic and stress scale was intelligible because the subjects were able to understand and effectively respond to the items. We examined the reliability of the stress scale by use of the test-retest method and used the Spearman's rank-order correlation to determine the internal consistency of the items. The tool had a reliability of 0.98 (ranging from 0.0-1.0), hence reliable for the study.

Pilot study with cancer patients

A pilot study, which is a smaller version of a proposed or planned study, is conducted to refine the methodology for a larger study. A pilot work can be employed to develop, examine, or refine a study protocol, including the treatment or intervention to be used in an experimental study. The objective of a pilot study is to obtain information for improving the project or assessing the feasibility. Ten cervical cancer patients undergoing radiation therapy were selected via simple random sampling (Lottery method) technique and allotted into the experimental group (n=5) and the control group (n = 5). The patients of the experimental and control groups were

Table 4. Distribution of samples according to the level of stress in the two groups before and after the intervention

Stress Grading	Range of score	Control		Yoga Nidra	
		Pretest N (%)	Post-test N (%)	Pretest N (%)	Post-test N (%)
Mild	25–50	0(0)	0(0)	0(0)	0(0)
Moderate	51–75	4(16.6)	4(16.6)	11(45.8)	24(100)
Severe	76-100	20(83.4)	20(83.4)	13(54.2)	0(0)

admitted to different wards. The objectives of the study were explained to each subject and confidentiality was assured. The subjects of the pilot study had the same characteristics as those of the main study sample. The pilot study attempted to determine the effectiveness of yoga nidra in mitigating the stress among cervical cancer patients undergoing radiation therapy, by administering 21 sessions of intervention lasting 23 minutes. We collected the pre- and post-test data using the interview schedule of the demographic pro forma and stress scale.

The main study

The main study was conducted to confirm the suitability of the questionnaires and the effectiveness of the yoga nidra from the pilot study. We selected the sample size of the main study using the following formula, where p_1=0.2, p_2=0.75, p=0.2+0.75÷2, Z_α=1.96 at 95% confidence interval, and Z_β=1.28 at 90% power to give a sample size of 18 in each group. Considering the possible attrition, we rounded up the number to 24 subjects in each cohort.

Prior to the start of the radiation treatment, the investigator introduced himself and explained the study objectives to the subjects and their family caregivers. He assured the participants of the confidentiality of the provided information, and written consent was obtained from the subjects and their principal caregivers. Using the lottery method, we randomly allocated the participants into experimental group (n=24) and control group (n = 24). The patients of the experimental and control group were admitted to different wards in the oncology section. The participants in the control group were not provided with any relaxation procedures; whereas, the experimental group exercised yoga nidra using pre-recorded voice instructions as earlier described over the course of radiation treatment. The investigators collected the post-test data at the end of the treatment (one day before the discharge).

Statistical analysis

Data was entered into Microsoft Excel and analyzed using computer software Microsoft Excel and SPSS version 23 for windows (Chicago, USA). We subjected the demographic data to frequency and percentages and compared the pre- and post-mean scores using ANOVA and Tukey's multiple comparisons. $P<0.05$ was considered statistically significant.

Results

All the participants volunteering to take part in this study completed the whole procedure. Table 2 shows all the demographic and cancer details. Statistical analysis indicated no significant difference between the two groups. At the beginning of this study, there was no difference between the two cohorts concerning psychological, physical, social, and financial problems and the total stress. Most importantly, in the cohorts practicing yoga nidra over the course of the radiation therapy, we observed a significant reduction in psychological (41.54±3.05 vs. 35.04±2.12), physical (17.83±1.46 vs. 11.17±1.17), and total stress (79.46±5.63 vs. 64.42±3.2). However, there was no significant difference regarding the social and financial problems (20.08±2.24 vs. 18.21±1.47) (Table 3, Figure 1).

In this study, 13 (54.2%) participants in the experimental group and 20 (83.3%) in the control group had severe levels of stress prior to the intervention; whereas, the remaining 11 (45.8%) and 4 (16.6%) from the experimental and control

groups had moderate levels of stress, respectively. Following the yoga nidra intervention, all of the 24 (100%) participants in the experimental group and 4 (16.6%) in the control group had moderate stress levels, while the remaining 20 (83.3%) participants in the control group had severe stress (Table 4). The results also indicated no association between the preinterventional level of stress in the control group and the selected variables: age, religion, education, occupation, marital status, monthly income, type of family, health insurance coverage, known case of cancer, and FIGO classification and cycle of radiotherapy at 0.05 level of significance.

Discussion

The results of our study clearly showed that yoga nidra effectively reduced the psychological, physical, and total stress in the women undergoing curative radiotherapy. As far as the authors are aware, there is no research on the beneficial effects of yoga nidra in women undergoing curative radiotherapy for cervical cancer. However, studies reported that this type of yoga was effective in improving the quality of sleep among cancer patients.[26] To further substantiate our observations, previous studies clearly showed that regular yoga nidra was conducive to reducing anxiety and stress levels in college professors,[27] decreasing depression symptoms in older adults,[28] lowering life stress and symptoms of subjective tinnitus,[29] reducing pain and disability in patients with lumbar spondylitis,[30] enhancing sleep and decreasing pain in healthcare workers,[31] and improving the self-esteem and body image of burn patients.[32]

Yoga nidra is also effective in improving gynecological health and mitigating various ailments afflicting women. In this connection, a series of seminal studies by Rani et al. clearly indicated that this kind of yoga was beneficial in rectifying menstrual abnormalities such as dysmenorrhea, oligomenorrhea, menorrhagia, metrorrhagia, and hypomenorrhea through reducing the levels of thyroid-stimulating hormone, follicle-stimulating hormone, luteinizing hormone, and prolactin,[33] lowering anxiety and depressive symptoms,[34] modulating psycho-biological changes,[35] improving somatoform symptoms (pain, gastrointestinal symptoms, cardiovascular symptoms, and urogenital symptoms),[36] and enhancing psychological general well-being in patients with menstrual irregularities.[37] Studies further showed that in addition to mitigating the menstrual disturbances, yoga nidra was effective in improving blood pressure, postural hypotension, sustained hand grip, heart rate expiration/inspiration ratio, and 30:15 beat ratios,[38] and reducing the symptoms of post-traumatic stress disorder, self-blame, and depression in women with sexual trauma.[39]

Yoga nidra is considered to be a mind-body therapy, which from a healthcare perspective, is able to harness the power of the mind to influence physical and psychological symptoms and is shown to be extremely useful in various ailments afflicting the humans.[18, 19] From a terminological perspective, "mind-body practices can be defined as techniques which help modify the biological, physiological, or psychosocial processes, as well as, improve the quality of life outcomes".[20] Mind-body practices date back to thousands of years and are based on the belief that our thinking and feeling can influence our health and healing.[20] Underscoring the role of mind, thoughts, emotions, behaviors, and life-style in health and well-being, mind-body therapies are a vital component in the Chinese, Tibetan, Greek, and Ayurvedic systems of medicine.[20] Studies on people afflicted with breast cancer have shown that mindfulness-based stress reduction mitigated the anxiety and depression,[21] improved the mood, reduced the stress,[22] and imparted psychological benefits for over a year.[23]

Yoga and meditation are one of the oldest mind-body therapies, and scientific studies revealed that its regular practice improved the well-being of people suffering from various ailments and cancers.[24, 25] Mechanistic studies reported that yoga nidra was effective in reducing the secretion of gluco-corticoids such as cortisol into blood stream as a reaction to intrapsychic stressors.[40] Elevated levels of cortisol act as an

inhibitor of immune response, compromise the body's ability to resist cancer development, and fight the pre-existing cancer in the body.[41] By reducing the levels of cortisol, yoga nidra improves the systemic health and enables individuals to combat the illness.[40, 41]

Moreover, compared to conventional sleep, yoga nidra was also reported to be an effective form of psychic and physiological rest and rejuvenation.[40, 41] This is proposed as the reason behind the beneficial effects of this practice on myriad ailments, particularly degenerative and stress related conditions (hypertension, CHD, and arthritis) and illnesses with high psychosomatic components (asthma, peptic ulcer, and migraine).[40, 41] Cumulatively, all these observations clearly suggest that yoga nidra triggers numerous biochemical and physiological mechanism/s to induce its beneficial effects irrespective of the ailment and the underlying pathogenesis and severity of mental or physical distress.[40, 41] Yoga nidra is a facile and safe mind-body therapy capable of mitigating diverse ailments. All these beneficial aspects necessitate the incorporation of this practice in cancer care, so as to mitigate stress and provide health benefits to the patients and survivors.

Conclusion

For the first time, the present study showed the effectiveness of yoga nidra in mitigating stress in women undergoing curative radiotherapy. The most important outcome of present research was that this type of yoga, practiced by women on hospital beds, could be easily performed without subjecting the volunteer to any undue stress or risk.

Conflict of Interest

None declared.

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