

Efficacy of a Nurse-led Yoga Intervention on Serum Cortisol and Psychological Health Outcomes of Patients with Breast Cancer

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Abstract

Yoga, an ancient therapy, has been proved time and again as an effective non-pharmacological intervention among breast cancer survivors. This study endeavoured to determine the effect of the nurse-led Yoga intervention on serum cortisol and psychological health outcomes in newly diagnosed breast cancer patients. Forty newly diagnosed breast cancer patients (Nurse-led Yoga Intervention 20, control 20) with stage II, III, and IV without distant metastasis, and other associated inflammatory disease, ready for neo-adjuvant chemotherapy, followed by surgery were recruited. Quasi-experimental design was adopted for the study. Assessments were carried out before the 1st, 2nd, and 3rd cycles of chemotherapy, before surgery, and two months post-surgery. The effects of nurse-led yoga intervention effect were compared with the control group. Serum cortisol levels were significantly reduced before surgery ($p=0.021$) and 2 months post-surgery ($p=0.003$) in the nurse-led yoga intervention group. Similarly notable changes in the anxiety levels were seen before the 2nd, 3rd cycle of chemotherapy, before surgery and 2 months post-surgery ($p=0.001$). Depression levels before 3rd cycle of chemotherapy, before surgery, and 2 months post-surgery were also found to be lowered ($p=0.001$). Additionally, quality of life also showed significant change before the 2nd cycle of chemotherapy ($p=.004$), the 3rd cycle of chemotherapy ($p=0.005$), before and 2 months post-surgery ($p=0.001$). To conclude, integrating yoga intervention with the conventional treatment for breast cancer has demonstrated significant changes in the psychological health outcomes in patients with Breast Cancer.

Key words: Nurse-led Yoga, Serum cortisol, Breast cancer

Cancer of the breast is the most prevailing cancer among women, constituting one-fourth of all cancers (Rojas & Stuckey, 2016). The global statistics of breast cancer (BC) report in 2020 on newly diagnosed breast cancer was 23 lakh, and 6.85 lakh deaths (Arnold et al, 2022). The National Cancer Registry Programme (NCRP) 2020 reported 13.9 lakh of BC and is likely to reach 15.7 lakh by 2025 in India (ICMR-NCDIR, 2020). In 2022 Karnataka reported the incidence of BC to be 29.5 percent, which is the highest cancer among women (The Hindu, 2022).

A person diagnosed with cancer undergoes great psychological distress. Any physiologic or psychological stress aggravates the production and release of cortisol commonly known as stress hormone (Antonova et al, 2011). Cortisol is regulated by the hypothalamic-pituitary-adrenal axis during stress and thus maintains homeostasis

(Rao et al, 2017). Though an increased level of cortisol is beneficial during acute stress, prolonged elevation of cortisol becomes detrimental to health by suppressing the immune response (Kaje et al, 2023). Increased levels of cortisol and BC progression have been demonstrated in several clinical studies (Al Sorkhy et al, 2018).

The prevalence rate of anxiety in BC ranges from 16 percent to 35 percent and depression ranges from 1 percent to 56 percent. The psychiatric disorder associated with BC is anxiety and depression (Srivastava et al, 2015). These psychological morbidities have a negative impact on their role in the family and community at large (Daniel et al, 2022). A close relation is found between depression and anxiety with physical functionality among the breast cancer subjects (Valderrama Rios & Pedraza, 2018). Clinical studies have demonstrated the association between quality of life (QoL), clinical outcome, and survival (Wisloff et al, 1996). Psychological distress risks the development of anxiety and depression. Chronic stress and depression are found to advance the progression of BC (Armaiz-pena et al, 2021). Hence there is a dire need to

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control the aggravating factors progressing the breast cancer.

Non-pharmacological interventions are known to have a positive impact among BC, of which yoga is one of the most common interventions mobilised currently. Yoga is an ancient Indian practice that incorporates the three dimensions of a man i.e., physical, mental, and spiritual. Consisting of eight limbs called yoga sutras: Ethical disciplines (Yama), Individual observances (Niyama), Postures (Asana), Breath control (Pranayama), Withdrawal of sense (Pratyahara), Concentration (Dharana), Meditation (Dhyana), Enlightenment (Samadhi).

Serum cortisol levels were found to have a downtrend in a clinical control trial of Sudarshan kriya and pranayama among breast cancer survivors (Kumar et al, 2013). Randomised control trials on the effect of yoga were found to alleviate anxiety and depression, and improve the quality of sleep (Harder et al, 2012), quality of health, and better coping with the adverse effects of the treatments in BC (Pan et al, 2017). Yoga interventions are found to be a feasible non-pharmacological intervention, and recommended as a supportive therapy for BC women (Kaje et al, 2023). Considering the compelling evidence supporting the positive impact of yoga intervention on breast cancer survivors and those on adjuvant therapies, it was found to be imperative to explore the effect of nurse-led yoga intervention on the serum cortisol levels and other psychological parameters among patients with breast cancer undergoing treatment. This study was initiated to address the pressing need for a comprehensive understanding of the effect of nurse-led yoga intervention.

Methods

Prior to the main data collection, a pilot study was conducted among 20 subjects (10 experimental and 10 control) to determine the feasibility and practicality of implementing nurse-led yoga intervention among newly diagnosed breast cancer women. Repeated measure ANOVA revealed a significant difference between the groups in terms of anxiety and depression scores after the 2nd cycle of chemotherapy, before surgery and 2 months post-surgery. Significant improvements were observed in the Quality of Life at the 5th assessment ($p < 0.05$). Serum cortisol levels showed a downward trend though not significant which was likely due to the small sample size. The tools utilised in the study were found to be feasible for assessing the outcomes and the nurse-led yoga intervention was found to be practical and implementable within the study setting. The participants' cooperative attitude indicated the potential acceptability and inclusion

of such interventions within the population and provided a valuable insight into the feasibility and practicality of implementing nurse-led yoga interventions for women with newly diagnosed breast cancer.

Approval was obtained from the Central Ethics Committee of Nitte. Inclusion criteria were: those consenting to participate in the study with stage II, III, and IV newly diagnosed BC, without any prior breast cancer treatment, without distance metastasis and other associated inflammatory diseases, and no prior practice of yoga in the last six months, age between 20 to 60 years. Subjects for the study were recruited from the department of Onco-Surgery of KS Hedge Medical Academy Hospital.

Study design: A quasi-experimental study design was adopted for the study. A total of 40 newly diagnosed breast cancer meeting the study criteria and willing to participate in the study were recruited. The first 20 samples were grouped into the control and the following 20 samples into the nurse-led yoga intervention group.

Data collection procedure: After obtaining consent from the eligible participants for the study, demographic details were obtained through interview and from the case sheet. Psychological health outcomes namely anxiety, and depression were assessed using the Hospital Anxiety Depression Scale (HADS), and Quality of life (QoL) was assessed using the Cancer Institute-Quality of Life Questionnaire (CI-QoL-Q). Blood samples (3 mL) were collected using aseptic technique to analyse the serum cortisol levels; the collected blood samples were centrifuged at 1500xg for 10 minutes to separate the serum from the RBC. The serum samples were stored in the freezer at -80° Celsius till the desired number of samples were obtained to run the ELISA test. Calbiotech Cortisol ELISA Kit (Catalogue No. CO368S) and SPARK microplate reader, measurement wavelength at 450 nm was used to measure the serum cortisol levels.

Yoga intervention: Participants of the intervention group were administered 30 minutes each of the following yoga intervention. Breath Concentration which involved concentration on one's own normal breath, with closed eyes; Asanas (Hatha yoga) was administered with breath co-ordination, based on the ability of the patients to perform; Pranayama which involved taking a deep breath and exhaling slowly while humming at the rate of 2-3 cycles per minute, with eyes closed and deep relaxation technique (DRT), one of the commonest relaxation techniques which involves part by part relaxation, by directing the attention of mind on different

parts of the body from toes to head in supine position, on two consecutive days before the first chemotherapy cycle, to ensure that the Yoga technique was mastered properly. Subsequently, the subjects were telephonically followed up to ensure compliance during the interval until the next chemotherapy cycle. At subsequent admission to the hospital for chemotherapy, the yoga intervention was re-enforced under supervision. The supervised reinforced sessions of yoga were continued until the day of surgery. One 30 min session of yoga intervention was re-enforced on pre-surgery and on the 5th post-surgery day. The patients were encouraged to continue the yoga intervention; telephonic follow-up was done to ensure compliance of the yoga intervention. The

Table 1: Frequency and percentage distribution of subjects based on demographic characteristics (n=40)

Demographic data	Nurse-led Yoga intervention (n=20)		Control group (n=20)	
	f	%	f	%
<i>Age in years</i>				
31-40	4	10	3	7.5
41-50	5	12.5	6	15
51-60	11	27.5	11	27.5
<i>Family income/month (Rs)</i>				
<10000	5	12.5	6	15
10001-20000	6	15	7	17.5
>20001	9	22.5	7	17.5
<i>Marital status</i>				
Married	16	40	14	35
Widow	3	7.5	5	12.5
Divorced	1	2.5	1	2.5
<i>Occupation</i>				
Home maker	10	25	15	37.5
Agriculturist	7	17.5	3	7.5
Self employed	2	5	1	2.5
Employed	1	2.5	1	2.5
<i>Religion</i>				
Hindu	16	40	18	45
Muslim	3	7.5	1	2.5
Jain	1	2.5	1	2.5
<i>Education</i>				
Primary	7	17.5	10	25
Secondary	9	22.5	6	15
Higher Secondary	4	10	4	10
<i>Stage of BC</i>				
II	8	20	9	22.5
III	8	20	7	17.5
IV	4	10	4	10

participants in the control group received regular nursing care without the yoga intervention.

Analysis of the Data

Data were analysed using SPSS 20 version. Frequency and percentage were used to project the demographic variables. A general linear model (repeated measures) was used to assess the outcomes within the group. Independent t-test and Mann-Whitney U test were employed to compare the outcome between the nurse-led yoga intervention and the control group.

Results

The demographic data (Table 1) depicts the mean age of the participants in the nurse-led yoga intervention group and the control group as 48.35 ± 8.62 and 50.95 ± 8.28 years respectively. The average family income per month in the nurse-led yoga group was Rs 18900 $\pm$ 7100 and Rs. 18500 $\pm$ 7972 in the control group. Most of the participants were married with 2.5 percent of each divorced case in both the groups. Most of the participants in the nurse-led yoga intervention and control group (25% and 37.5% respectively) were homemakers, with the least 5 percent and 2.5 percent self-employed and employed in the nurse-led yoga intervention group and 2.5 percent each self-employed and employed in the control group. Most of the participants in the intervention and control group belonged to the Hindu religion (40% and 45 % respectively) with the least being Muslim and Jain. Majority in the yoga intervention group (22.5%) had completed their secondary while 25 percent in the control group had only primary education. The stages of BC in the Yoga intervention and control group were as follows: stage II (20% and 22.5%), stage III (20% and 17.5 %), and stage IV (10%) each.

Effectiveness of Nurse-led Yoga on the Serum Cortisol levels of subjects with Breast Cancer

The line chart (Fig 1) clearly depicts the trend of the serum cortisol levels between the control and the nurse-led yoga intervention group. The level of serum cortisol shows a downtrend in both the groups. The nurse-led yoga intervention group has a steeper decline in the serum cortisol levels (237.35 ng/mL) before the first cycle of chemotherapy to the third cycle of chemotherapy (167.69 ng/mL) compared to the control group where the serum cortisol levels have slightly diminished (234.65 ng/mL vs 218.40 ng/mL). An obvious elevation of the serum cortisol level (233.28 ng/mL) in the control group, and a negligible elevation in the nurse-led yoga intervention group before the surgery is seen. By the fifth assessment (two months post-surgery) the levels of serum cortisol have drastically

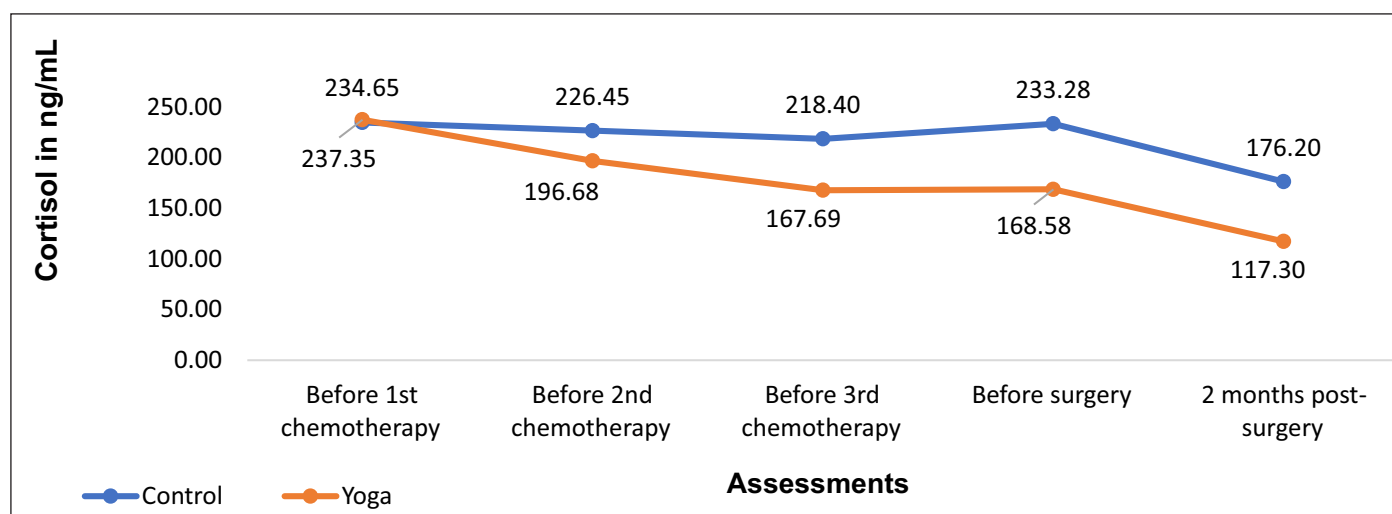


Fig 1: Mean serum cortisol levels of the Nurse-led yoga intervention and control group at different points of assessment.

decreased in both the groups compared to the first assessment (before the first cycle of chemotherapy). The evidence shown in the line chart demonstrates the effectiveness of nurse-led yoga intervention in reducing the level of cortisol among breast cancer subjects.

Table 2: Comparison of Anxiety scores between Nurse-led Yoga intervention and the control groups (n=20+20=40)

Assessments	Group	Median	IQR	p value
Before 1st Chemotherapy	Control group	13	12, 13	0.796
	Yoga group	13	12, 14	
Before 2nd chemotherapy	Control group	12	12, 13	0.001*
	Yoga group	11	10.25, 12	
Before 3rd chemotherapy	Control group	13	11.25, 14	0.001*
	Yoga group	10	9.25, 11	
Before surgery	Control group	13.5	13, 14	0.001*
	Yoga group	11	11, 12	
2 months post-surgery	Control group	12	11, 13	0.001*
	Yoga group	10	9, 10	

*Significant $p < 0.05$, Max anxiety score -21, Minimum score -0; Inference – a score of > 8 indicates a state of anxiety.

Effectiveness of Nurse-led Yoga on the Anxiety Scores of Subjects with Breast Cancer

Between the nurse-led yoga intervention and control group a highly significant difference in the anxiety

scores was noted at 0.05 level of significance before the 2nd and 3rd cycle of chemotherapy, before the surgery and 2 months post-surgery ($p=0.001$) (Table 2).

Table 3: Comparison of Depression scores between the Nurse -led Yoga Intervention and the Control group (n = 20+20 =40)

Assessments	Group	Median	IQR	p value
Before 1st chemotherapy	Control group	10	10, 11	0.742
	Yoga group	10	9, 11	
Before 2nd chemotherapy	Control group	9	9, 9.75	0.710
	Yoga group	9	9, 9	
Before 3rd chemotherapy	Control group	10	10, 11	0.001*
	Yoga group	8	8, 9	
Before surgery	Control group	9	9, 10	0.001*
	Yoga group	8	8, 9	
2 months post-surgery	Control group	10	9, 11	0.001*
	Yoga group	6	6, 6	

*Significant $p < 0.05$, Max Depression score -21, Minimum score -0

Inference -A score of > 8 indicates a state of Depression

Effectiveness of Nurse-led Yoga on the Depression scores of Subjects with Breast Cancer

Between-groups, analysis using the Mann-Whitney U test showed a significant difference before the 3rd cycle of chemotherapy, before the surgery and 2 months post-surgery ($p < 0.001$) (Table 3).

Table 4: Comparison of QoL levels between the Nurse-led Yoga intervention and the control group [n=40 (20+20)]

Assessments	Group	Mean	SD	t	p	95% CI	
						Lower	Upper
Before 1st chemotherapy	Control	134.50	5.35	-0.24	.812	-3.78	2.98
	Nurse-led Yoga	134.90	5.20				
Before 2nd chemotherapy	Control	125.10	4.20	-3.10	.004	-7.36	-1.54
	Nurse-led Yoga	129.55	4.86				
Before 3rd chemotherapy	Control	122.90	3.60	-3.00	.005	-6.53	-1.27
	Nurse-led Yoga	126.80	4.57				
Before surgery	Control	120.10	3.32	-3.58	.001	-7.28	-2.02
	Nurse-led Yoga	124.75	4.77				
2 months post-surgery	Control	117.00	4.33	-5.07	.001	-10.84	-4.66
	Nurse-led Yoga	124.75	5.29				

*Computed at alpha = 0.05; Maximum QoL score -180, Min score -42. Higher score indicates better QoL

Effectiveness of Nurse-led Yoga on the Quality of Life of Subjects with Breast Cancer

Comparison of the quality of life between the nurse-led Yoga intervention group and the control also revealed significant changes before the 2nd cycle of chemotherapy [$p=0.004$, <0.05 ($t=-3.10$); before the third cycle of chemotherapy ($p=0.005$), <0.05 ($t=-3.00$); before the surgery ($p=0.001$) <0.05 ($t=-3.58$); and 2 months post-surgery ($p=0.001$) <0.05 ($t=-5.07$) (Table 4).

Discussion

The positive findings of this study add further evidence to the existing accumulation of the evidence on the beneficial effect of Yoga intervention on serum cortisol levels (Kaje et al, 2023). Beneficial effect of yoga intervention on salivary cortisol levels were reported among BC survivors and those undergoing adjuvant radiotherapy (Chandwani et al, 2014; Banasik et al, 2011; Raghavendra et al, 2009). A randomised control trial on the effect of Sudarshan Kriya and Pranayama vs regular treatment conducted among the advanced stage of BC survivors, on serum cortisol levels showed a positive result at 3rd month and at 6th month of the intervention. The present study findings on the impact on anxiety and depression, and quality of life concur with the findings of a systematic review among breast cancer patients and survivors on the effect of Yoga on psychological health by Buffart et al

(2012), which reports a decrease in the anxiety and depression levels ($d = -0.69$ to -0.75) and quality of life ($d = 0.33$ to 0.49) post yoga intervention. This calls for integration of yoga interventions as a complementary therapy from the time of diagnosis and throughout the conventional treatment of BC.

The strength and limitation of the present study need to be taken into consideration. The participants were homogenous as only those without distant metastasis and other associated inflammatory conditions, with same treatment regimen plan i.e., neoadjuvant chemotherapy followed by surgery were recruited in the study, thereby reducing the effect of confounding variables. A quasi-experimental design and the small sample size of 40 limits the generalisation of the findings to a larger population. This is the only study that integrated yoga intervention throughout the conventional treatment of breast cancer and was led by a nursing personnel certified as a Yoga teacher.

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Conclusion

Integration of yoga intervention as a supportive therapy in the conventional treatment of breast cancer can facilitate the treatment outcome positively. Nurses being the primary healthcare givers in the clinical and community settings, play a vital role in administering yoga intervention as a supportive (cost-effective) therapy, to improve the physical and psychosocial health outcome in breast cancer patients.

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अनेक लाभ हैं योगिक क्रियाएं दैनंदिन जीवन में अपनाने के

भारतीय उद्गम की योग पद्धति मानव समाज को अमूल्य उपहार है। यह शरीर, मन और मनुष्य के आध्यात्मिक स्वरूप को तालमेल में बैठाए रखता है। ताकि वह समग्र तौर पर विकसित कर सके। योग केवल शारीरिक व्यायामों तक सीमित नहीं है बल्कि मनुष्य को प्रकृति के अनुकूल रहने, सोचने के तौर-तरीके प्रस्तुत करता है। हमारी बदलती जीवन-शैली में यह चेतना बनकर, हमें जलवायु परिवर्तन के जोखिमों से निपटने में सहायक हो सकता है।

योग दिवस प्रति वर्ष 21 जून को मनाए जाने के पीछे यह सत्य है कि यह दिन पृथ्वी के उत्तरी गोलार्ध में वर्ष का सबसे लम्बा दिन होता है। योग का उद्देश्य भी मनुष्य को स्वस्थ रखना और उसे दीर्घायु बनाता है। भारत की पहल पर संयुक्त राष्ट्र ने 11 दिसम्बर 2014 को के 177 सदस्यों द्वारा अनुमोदन के बाद 21 जून को इस तारीख को अंतर्राष्ट्रीय योग दिवस बतौर मनाने की घोषणा की। इतने अधिक बहुमत से योग के पक्ष में प्रस्ताव पारित किया जाना अभूतपूर्व घटना थी। इस अवसर पर प्रधानमंत्री नरेंद्र मोदी ने कहा था, “योग मात्र शारीरिक हरकत का नाम नहीं है। यह एक ऐसी प्रणाली है जिसके माध्यम से स्वयं से, विश्व से तथा प्रकृति से सामंजस्य बैठाया जा सकता है।

योग व्यक्ति के शरीर, मन, भावना के तालमेल से व्यक्ति को आवश्यक ऊर्जा प्रदान करता है ताकि वह अपने कार्य बेहतरीन तरीके से संपन्न करने में सक्षम हो। योग के चार व्यापक वर्ग हैं: कर्म योग, जिसके तहत हम शरीर का उपयोग करते हैं। भक्ति योग, जिसमें भावनाओं का उपयोग किया जाता है, ज्ञान योग, इसमें हम मन और बुद्धि का उपयोग किया जाता है। और क्रिया योग, जहां हम विभिन्न कार्यों के लिए ऊर्जा को उपयोग में लाते हैं। योग के आठ अंग बताए गए हैं – यम (संयम), नियम (पालन), आसन (योग मुद्राएं), प्राणायाम (सांस पर नियंत्रण), प्रत्याहार (इंद्रियों को वापस लेना), धारणा (एकाग्रता), ध्यान (ध्यान) और समाधि (अवशोषण)।

योगिक क्रियाओं से मिलने वाले प्रमुख लाभ इस प्रकार हैं:

1. तनाव मुक्त जीवन

तनाव वर्तमान जीवनशैली की प्रमुख समस्या बन चुकी है, करीब हर दूसरा व्यक्ति तनाव में है। विभिन्न शोधों से पुष्टि हुई है कि जो व्यक्ति दैनिक चर्या में योग का समावेश कर लेते हैं वे निस्संदेह तनावमुक्त जीवन जी सकते हैं। यही कारण है कि हमारे देश में ही नहीं, बाहरी देशों के अनेक शैक्षिक संस्थानों और कार्यस्थलों में योग को नियमित दिनचर्या में शामिल कर लिया गया है।

2. शारीरिक थकान का निराकरण

योगिक क्रियाओं में सहभागिता से मांसपेशियों में खिंचाव, मरोड़, आदि उत्पन्न होता है तथा विकृत हड्डियां और मांसपेशियां सामान्य हो जाती हैं। फलस्वरूप हमारे शरीर की थकान दूर होती है और हम सदा तरोताजा महसूस करते हैं, शरीर में सतत ऊर्जा का संचार होता रहता है।

3. मन की शांति

योग करते रहने से न केवल हमारे शरीर की मांसपेशियां सक्रिय रहती हैं बल्कि यह मन और चित्त भी शांत अवस्था में रहते हैं। योग करने वालों की पाचन क्रिया बेहतर रहती है, भूख ठीक लगती है, पाचन क्रिया में सुधार आता है, नींद अच्छी आती है, मन शांत और संतुष्ट रहता है।

4. नीरोग काया

योगिक क्रियाओं का नियमित अभ्यास शरीर को तरोताजा और स्वस्थ बनाए रखता है, शरीर की रोग-प्रतिरोधी सामर्थ्य में बढ़त होती है। हृदय रोग, मधुमेह और अस्थमा जैसी कई अन्य बीमारियों के लिए योग की सलाह दी जाती है। योग रक्त शूगर को नियंत्रण में रखने में मददगार है। योग करने से सांस संबंधी विकारों की संभावना भी कम रहती है।

5. वजन पर नियंत्रण

योग का एक बड़ा लाभ वजन को नियंत्रित रखने का है। संप्रति विश्व की तीन-चौथाई जनसंख्या मोटापे से ग्रस्त है जो स्वयं में अनेक रोगों की जननी है। अनेक शोधों से पता चला है कि योग के नियमित अभ्यास से वजन बढ़ने को रोका जा सकता है। इसके अतिरिक्त इन क्रियाओं से शरीर लचीला रहता है।