

Original Research Article

An Interventional Study Showing Effect of Yoga on Serum Cortisol of Depression Patients Attending Psychiatric OPD, SMS Hospital, Jaipur

Dr. Indu Mandal¹, Dr. Meenakshi Sharma², Dr. Ishwar Dayal Gupta³, Dr. Nirupama Chauhan⁴

¹PG Student, ²Professor, ⁴Senior Demonstrator, Department of Physiology, SMS Medical College, Jaipur - 302004. Rajasthan, India

³Professor, Department of Psychiatry, SMS Medical College, Jaipur - 302004. Rajasthan, India

***Corresponding author**

Dr. Indu Mandal

Email: indumandal@gmail.com

Abstract: Depression is a major cause of morbidity worldwide. WHO ranked it fourth in a list of most urgent health problems of the world. Depression is twice as common in women as in men and is well known to be associated with hypercortisolemia. Stress increases cortisol level of the body and is known to precipitate depression. Time and again Yoga has been proved to be beneficial in combating such health issues. The aim of the study is to investigate the antidepressant effect of Yoga on depression patients by measuring serum cortisol level. It is an interventional study on 80 subjects clinically diagnosed as cases of mild to moderate depression. They were divided into two groups: study group (40) practising yoga for 3 months along with antidepressant medication and control group (40) taking medication alone. Serum cortisol was measured at baseline and at the end of 3 months. The data was statistically analysed by applying paired and unpaired t- test. A significant ($p < 0.05$) decrease (13.72 ± 5.72 to 9.45 ± 3.81 $\mu\text{g/dL}$) was observed in the serum cortisol level of subjects who practiced yoga. The study showed a significant ($p < 0.05$) decrease in mean serum cortisol of subjects practising yoga (9.45 ± 3.81 $\mu\text{g/dL}$) when compared with controls (12.08 ± 4.96 $\mu\text{g/dL}$) at the end of 3 month. It was concluded that patients practising Yoga had a significant drop in their cortisol level and therefore Yoga may have a beneficial role in bringing relief in depression.

Keywords: Depression, Yoga, Hypercortisolemia, Serum Cortisol

INTRODUCTION:

Depression can be defined as a state of low mood and aversion to activities which affect a person's thoughts, behavior, feelings and sense of well being [1]. People who suffer from depression may feel sad, anxious, worried, helpless, worthless, guilty, irritable, hurt, or restless. They tend to lose interest in activities which were once pleasurable, experience lack of appetite or bingeing, have problems with concentration and decision making. Severe cases have suicidal tendencies. They often experience insomnia or excessive sleepiness, fatigue and issues related to digestion [2].

There has been a rapid increase in the incidence of depression in last few decades and major depressive disorder is accounted to be the most common mood disorder at present. The incidence and prevalence of depressive disorders are reportedly higher in females than males and the average age of onset falls between the age group of 30 & 35 years. Depression is ranked at fourth position in a list of most urgent health problems worldwide by WHO [3].

The DSM-IV-TR (Diagnostic & Statistical Manual of Mental Disorders – 4th Edition, Text Revision) by American Psychiatric Association is the current reference used by mental health professionals to diagnose depressive disorders. Depression being a mood disorder results in impaired interpersonal, social and occupational functioning leading to physical and mental health issues and a heavy burden of suffering and economic loss. Depressive patients usually take anti depressive drugs which often lead to serious side effects. Yoga can be an ideal antidote to combat these types of problems without any side effect [4].

Yoga is a learning technique which aims at achieving a union of mind, body and spirit via exercise, breathing, relaxation and helps to maintain a healthy mind and body [5]. An improved mood and decreased symptoms of depression and anxiety trait have been noted in young depressive patients who practiced Yoga [6]. Recent studies on Sudarshan Kriya Yoga documented the efficacy of Yoga in management of dysthymia, melancholia and depression [7, 8].

Depression is well recognized to be associated with hypercortisolemia, a condition caused by hyperfunctioning of hypothalamo-pituitary-adrenal axis [9, 10]. It is well-known that stress either acute or chronic, increases cortisol levels in the body and itself is known to precipitate depression [11, 12]. Yoga can be used as an effective intervention to manage stress as well as depressive illnesses as it is associated with lowering of cortisol levels [13].

Very few studies have been done in the past to show the effect of yoga on serum cortisol level in depression patients. The present study was aimed to scientifically study the effect of yogic practices on mild to moderate depression patients by measuring their serum cortisol level using modern techniques. Thus yoga gives a ray of hope to all the patients suffering from depression to live a complication free life with relatively less use of medication.

METHODOLOGY

Study Design

The present study was conducted in the Upgraded Department of Physiology, in collaboration with the Department of Psychiatry, S.M.S. medical college Jaipur, Rajasthan. The study involved 80 clinically diagnosed cases of mild to moderate depression in the age group of 30-40 years, recruited from Psychiatric OPD, SMS Hospital, Jaipur. Subjects were distributed as per systemic random sampling into two groups- study group which practiced yoga along with antidepressant medication and control group which only took antidepressant medication.

Subjects suffering from any medical illness/ailment which made them unfit for yoga asanas, unavailable for 12 weeks at the study location or who changed their drug regime in between the study period of 12 weeks were excluded from the study.

The study subjects were informed about the objectives of the study. An informed consent was taken from all the subjects and Institutional ethical committee approval was also taken.

Experimental protocol

The subjects (study and control) were asked to report in the Department of Physiology SMS Medical College Jaipur in the morning hours between 8 – 9.00 AM empty stomach and without their morning dose of medication. Basal blood-pressure, heart-rate and weight

were recorded using automated sphygmomanometer and weighing machine respectively. The baseline serum cortisol level were tested and recorded. After baseline investigations done, instructions were given to both the groups to continue their prescribed antidepressant medication. The control group was instructed to come for end line investigations after 12 weeks whereas the study group was selected for a 12 weeks yoga session. Subjects of study group were asked to come empty stomach at the Department of physiology between 8 – 9.00 AM wearing light clothes. Various specific yoga asanas (suryanamashkar, balasana, and savasana), pranayama (anulom vilom) and meditation were taught to them by a trained yoga instructor. Subjects were made to practice yogic exercises for 45-60 minutes a day, 5 days in a week for 3 months. All postures were performed for 2-10 minutes each adding 2 minutes per week. At the end of 3 months serum cortisol was measured for both the groups.

Sample Collection

The Serum cortisol levels were tested by the experts working at the Immunoassay laboratory, Central Lab, SMS Hospital, Jaipur. IMMULITE 2000 Systems, which work on the principle of a solid-phase, competitive chemiluminescent enzyme immunoassay to measure, the serum cortisol level was used with a reference value: 5-25µg/dL (138-690 nmol/L) in the morning.

Statistical Analysis

The entire data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Data were statistically analyzed by using paired and unpaired t-test. Level of significance was set at P=0.05. Probability P value <0.05 was considered as statistically significant.

RESULTS:

The mean value of age (years) of the subjects in the study group and control group was 34.5±4.21 and 34.25±4.28, respectively. Table 1 shows a significant decrease (p<0.05) in the mean serum cortisol values (from 13.72 ± 5.72 to 9.45 ± 3.81 µg/dL) of the study group after 3 months of yoga practice. Table 2 depicts a significant (p < 0.05) decrease in the mean serum cortisol value in the study group (9.45 ± 3.81µg/dL) when compared with the control group (12.08 ± 4.96 µg/dL) at the end of 3 months.

Table 1: Mean \pm SD values of serum cortisol at baseline and at the end of 3 month in the study group.

	N	Study group	Mean \pm SD	P value
Serum cortisol ($\mu\text{g}/\text{dL}$)	40	Baseline	13.72 \pm 5.72	0.001 (S)
	40	3 month	9.45 \pm 3.81	

SD- Standard deviation, N- number of subjects

Table 2: Mean \pm SD values of serum cortisol at the end of 3 month (end line) in both study (case) and control group.

Serum cortisol ($\mu\text{g}/\text{dL}$)			
	N	(Mean \pm SD)	P value
Study Group	40	9.45 \pm 3.81	0.01 (S)
Control Group	40	12.08 \pm 4.96	

S- Significant

DISCUSSION

Cortisol is one of the most important hormone and indicator of stress released from the cortical portion of adrenal gland. It affects various parts of the body, both physically and psychologically. A suppressed immune system, insomnia, severe mood swings, depression and severe hypotension are some of the disorders caused by increased level of cortisol in the body [14].

In present study subjects from both the groups had serum cortisol levels within the reference range of 5-25 $\mu\text{g}/\text{dL}$. There was a significant decrease in the serum cortisol value in those who practiced yoga for 3 months when compared with those who only took their standard treatment without practising yoga. A statistically significant ($p < 0.05$) decrease (from 13.72 \pm 5.72 to 9.45 \pm 3.81 $\mu\text{g}/\text{dL}$) was observed in the mean serum cortisol value of the study group after 3 months of yoga practice (table 1). There was no significant change in the control group. On comparative evaluation at the end of 3 months, a significant ($p < 0.05$) decrease in the mean serum cortisol was found in the study group (9.45 \pm 3.81 $\mu\text{g}/\text{dL}$) when compared with control group (12.08 \pm 4.96 $\mu\text{g}/\text{dL}$) [table 2].

A similar study by Thirthalli J. *et al.*; documented that serum cortisol was higher in depression patients when compared with healthy controls. The change in serum cortisol level was significant (111.9 ng/ml \pm 58.4-91.7 ng/ml \pm 47.3; $t=2.94$; $P=0.006$) in patients who received yoga with or without medication [15]. After analysing the results of present study, it can be said that our findings were consistent with the above study.

There are studies which have reported that hypercortisolemia found in patients of depression corrects after treatment [16]. This decrease in the cortisol level may be due to the reduction in stress. Thus the effect of yoga on reduction of cortisol may be considered as an attribute to the reduction of

stress-related consequences. The exact cause of decrease in cortisol level is yet to be explored, possible mechanisms may be: 1) Yoga causes enhancement of the parasympathetic (vagal) tone [17]. Increased parasympathetic activity may cause reduced firing of the paraventricular nucleus of medulla which may lead to decreased stimulation of locus ceruleus. This may cause decrease in the norepinephrine release causing relaxation, quiescence and reduced respiratory rate and heart rate [15]. 2) Reduced input of norepinephrine to paraventricular nucleus of hypothalamus may explain the decreased corticotropin-releasing hormone and cortisol [17]. 3) Physical postures of yoga may increase GABA activity in the brain, causing less anxiety and depression [18].

Zeinab Z. *et al.*; studied the effect of yoga on secretion of cortisol in 30 women with average age of 19 to 30 years. The results indicated that yoga training reduced the cortisol level significantly in the study group practising yoga for 3 months [19]. The findings of the present study are in concert with the above study, which demonstrate a reduction in serum cortisol level in depression patients practising yoga.

Streeter *et al.*; speculated that the physical postures of yoga would increase GABA activity levels in the brain, thus decreasing anxious and depressive symptoms [18]. In present study the out-patients of depression had increased levels of cortisol and regular yoga practise for 3 months had a significant influence on their cortisol response. All the subjects in the study group practising yoga gradually developed a sense of wellbeing without any side effect during the course. They became more relaxed, satisfied with a sense of relief and were self-motivated to continue yoga practice as a daily routine in their lives.

CONCLUSION:

People often seek alternative ways to manage their anxiety and depression; self-help treatments such

as Yoga seem to offer desirable physical and mental benefits, especially when conventional treatments for depression may not always be desirable or effective. The present study concludes that yogic practices along with standard prescribed medicines for depression are very effective in correcting and relieving the signs and symptoms of this disorder. The out-patients with depression had increased levels of cortisol and regular practice of Yoga produced an antidepressant effect. Moreover by extending the findings of our study we may suggest that Yoga may be applied as an adjuvant to conventional therapy in the management of mild to moderate depression. Therefore addressing depression through meditation and physical postures of yoga may be an additional way for mental health professionals to treat it effectively. Further studies can be done in future with a larger sample size to observe the long term beneficial effects of Yoga on depression patients.

REFERENCES:

1. Salmans, Sandra; Depression: Questions You Have – Answers You Need. People's Medical Society, 1997; 14-6.
2. Depression. National Institute of Mental Health. Available from <http://www.nimh.nih.gov/health/publications/depression/complete-index.shtml>. Retrieved 2010-05-22.
3. Kaplan HI, Sadock BJ; Comprehensive Text Book of Psychiatry. 6th edition 1995; 1284–997.
4. Bhaduri T, Ekta, Sharma K, Mahapatra Dass K; Role of yoga in management of depression. Journal of Biological & Scientific Opinion, 2013; 1(1): 38-40.
5. Chanavirut R., Khaidjapho K., Jareep P, Pongnaratorn P; Yoga exercise increases chest wall expansion and lung volumes in young healthy Thais. Thai Journal of physiological sciences 2006; (19):1-7.
6. Woolery A, Myers H, Sternlieb B, Zeltzer L; A yoga intervention for young adults with elevated symptoms of depression. Altern Ther Health Med 2004; 10(2): 60–63.
7. Janakiramaiah N, Gangadhar BN, Naga Venkatesha Murthy PJ, Harish MG, Subba Krishna DK, Vedamurthachar A; Antidepressant efficacy of Sudarshan Kriya Yoga (SKY) in melancholia: a randomized comparison with electroconvulsive therapy (ECT) and imipramine. Journal of Affective Disorders 2000; 51: 255–259.
8. Janakiramaiah N, Gangadhar BN, Naga Venkatesha Murthy PJ, Harish MG, Shetty KT, Subba Krishna DK *et al.*; Therapeutic Efficacy of Sudarshan Kriya Yoga (SKY) in Dysthymic disorder. Nimhans Journal 1998; 17: 21–28.
9. Gillespie CF, Nemeroff CB; Hypercortisolemia and depression. Psychosom Med 2005; 67(1):S26-8.
10. Christensen MV, Kessing LV; The hypothalamo-pituitary-adrenal axis in major affective disorder: A review. Nord J Psychiatry 2001; 55:359-63.
11. Miller GE, Rohleder N, Stetler C, Kirschbaum C; Clinical depression and regulation of the inflammatory response during acute stress. Psychosom Med 2005; 67:679-87.
12. Raison CL, Miller AH; when not enough is too much: The role of insufficient glucocorticoid signaling in the pathophysiology of stress related disorders. Am J Psychiatry 2003; 160:1554-65.
13. Vedamurthachar A, Janakiramaiah N, Hegde JM, Shetty TK, Subba krishna DK, Sureshbabu SV, *et al.*; Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga (SKY) in alcohol dependent individuals. J Affect Disord 2006; 94:249-53.
14. Kandhalu P; Effects of cortisol on physical and psychological aspects of the body and effective ways by which one can reduce stress. Berkeley Scientific Journal, Stress, 2013; 18(1).
15. Thirthalli J, Naveen GH, Rao MG, Varambally S, Christopher R, Gangadhar BN; Cortisol and antidepressant effects of yoga. Indian Journal of Psychiatry 2013; 55:405-8.
16. Schüle C, Baghai TC, Eser D, Zwanzger P, Jordan M, Buechs R, *et al.*; Time course of hypothalamic-pituitary-adrenocortical axis activity during treatment with reboxetine and mirtazapine in depressed patients. Psychopharmacology (Berl) 2006; 186:601-11.
17. Mohandas E; Neurobiology of spirituality. Mens Sana Monogr 2008; 6:63-80.
18. Streeter C.C, Gerbarg P.L, Saper R.B, Ciraulo DA, Brown RP; Effects of yoga on the autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. Medical Hypotheses 2012; 78(5):571-9.
19. Zeinab Z., Batol Z; The effect of yoga exercise on secretion of cortisol in women. International Journal of Sport Studies. 2014; 4 (10): 1262-1265.