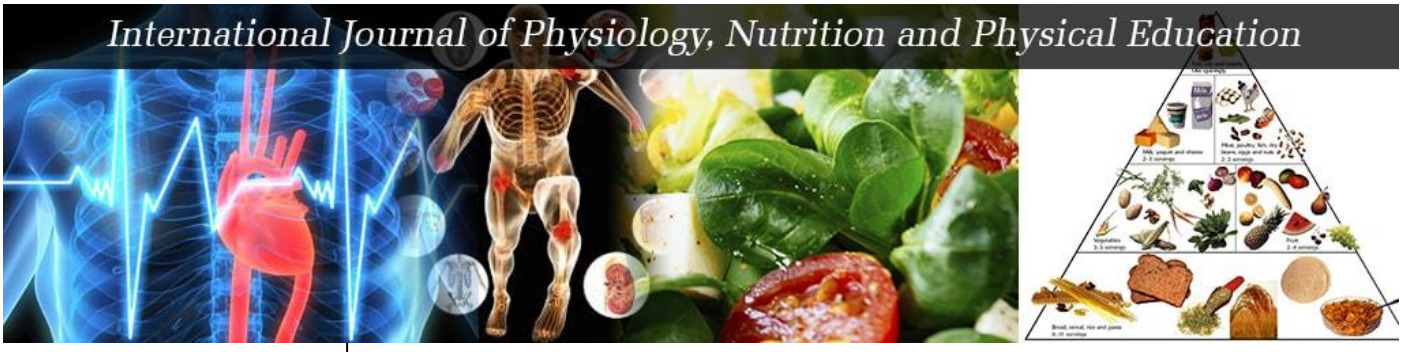

ISSN: 2456-0057
IJPNPE 2017; 2(1): 96-98

www.journalofsports.com
Received: 24/02/2017
Accepted: 25/03/2017

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Physiological effects of meditation, yogasana and pranayama on stress scores and plasma cortisol levels among nursing staff of a multispeciality hospital.

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Abstract
Background: Stress is a disruption of Homeostasis (internal balance). Stress and burnout are common among nurses, the largest group of health professionals. Maintaining a calm, compassionate attitude is a core nursing skill. Reducing the stress by various methods can improve overall health, and yoga is considered as an easily available alternative method.
Objective: To investigate effects of yoga, meditation and pranayama for three months on the level of cortisol & stress among nursing staff.
Material and Methods: The yoga group comprised 28 & control group comprised 28 nurses of 25-40 years age group. The yoga group nurses were taught yoga and pranayama for 3 continuous months and control group nurses did not undergo yoga practices. Both groups were subjected for plasma cortisol assessment and the International stress management association questionnaire. Data of serum cortisol levels and the pre-test and post-test stress scores in both groups, were compared before and after yoga exercise using smith's statistical software version 2.8., with paired t-test, *p* value <0.05 was considered statistically significant.
Result: There was significant improvement of International stress management association questionnaire test (scores ± SD) and plasma cortisol levels (µg/100 ml ± SD) before and after yoga exercise among the yoga and control groups, ($p<0.05$).
Conclusion: Meditation, yogasana and pranayama have significant physiological effects on stress management and cortisol levels among nursing staff.

Keywords: Nurses**,** Yoga, stress, cortisol.

Introduction
The World Health Organization (WHO) defines health as physical, mental, social welfare and not just lack of diseases and disability. Mental health plays an important role in dynamism and efficacy of each society [1, 2]. Stress may be defined as any situation which tends to disturb the equilibrium between a living organism and its environment. In day-to-day life there are many stressful situations such as stress of work pressure, examinations, psychosocial stress and physical stresses due to trauma, surgery and various medical disorders. Reactions to stress are associated with enhanced secretion of a number of hormones including cortisol, catecholamines, growth hormone and prolactin, the effect of which is to increase mobilization of energy sources and adapt the individual to its new circumstance.[3]Stress is a significant common risk factor for diabetes mellitus, cardiovascular diseases, altered immune response, preterm delivery, and osteoporosis.[4]Stress and burnout are common among nurses, the largest group of health professionals. Maintaining a calm, compassionate attitude is a core nursing skill. [5]Occupational stress among nurses is important because it can adversely affect attitudes, staff morale, communication, cognition, and quality of care. Nurses can present relevant changes in their health and their social and personal life in response to variations in cortisol levels. These changes in cortisol can be induced by everyday situations, such as occupational stress. The potentially stressful work situations that nurses are subjected to include unsanitary conditions, exhausting work hours and an intense work pace. [6, 7, 8]One of the evidence suggesting that nurses experience job-related stress in one international study, which included the United Kingdom, 40% of hospital nurses were found to have levels of burnout that were

higher than the norms for healthcare staff and in the US, job dissatisfaction in nurses was four times higher than that of the average worker. Stress within the trained nursing workforce can also lead to patient dissatisfaction and reduced quality of care. [9] In another study conducted in Brazil found that salivary cortisol identified that the nurses' stress level, and differences were found between a work day and day off. On the nurses' day off, their salivary cortisol levels and stress scores were lower. [10]Training in mind-body practices, such as meditation, can reduce stress and burnout and improve health outcomes. Reducing the psychosocial stress by various methods can improve overall health, and yoga is considered as an easily available alternative method.[11, 12, 13]The ancient Indian science of yoga is a way of life which includes changes in mental attitude, diet, and the practice of specific techniques such as yoga postures (asanas), breathing practices (pranayamas), and meditation. [14] Yoga is regarded as a holistic approach to health and is classified by the National Institutes of Health (NIH) as a form of Complementary and Alternative Medicine (CAM) [15]. Few studies have been conducted regarding the effects of meditation, yoga and pranayama on stress scores and serum cortisol levels among nursing staff, hence the present study has been conducted.

Materials and methods

The present case-control study was conducted from August 2016 to February 2017 in Department of Physiology, Dr. B R Ambedkar Medical College, Kadugondana Halli, Bangalore and Sakaria hospital and Yoga Centre, Bangalore, India. Ethical clearance was obtained from institutional ethics committee, Dr. B R Ambedkar Medical College, Kadugondana Halli, Bangalore, India and consent was obtained from the participants and were informed of their right to withdraw anytime during the course of the study.

Study protocol

56 female nursing staff (aged from 25 to 40 years) working were selected from a multispeciality hospital and divided into yoga group (n = 28) and control group (n = 28). They had similar dietary habits as well as physical and mental activities at work and home. Informed consent was obtained and basic characteristics like age, body weight, height, BMI, general and systemic examination findings were recorded and also their menstrual history was noted. Stress score was determined by International stress management association questionnaire (UK). The yoga group nurses were taught yoga and pranayama for 3 continuous months, 1 hour every day by yoga expert in the morning between 7.00 am and 8.00 am or 8.00 am to 9.00 am or evening 6.00 pm to 7.00 pm in batches as per the time/batchchosen by the nurses. Control group nurses did not undergo yoga practices. A single morning blood sample (around 8 O'clock in the morning) was taken from all the nurses at the beginning of the study and plasma cortisol concentrations were measured by Enzyme-Linked Immunosorbent Assay (ELISA), using a commercial ELISA kit (IBL-Hamburg GmbH).

After the period of three months, the nurses in the both groups were subjected again for cortisol assessment and the International stress management association questionnaire. Obtained data as mean ± SD of serum cortisol levels and the pre-test and post-test stress scores in the yoga and control groups, were compared before and after yoga exercise. The data was analyzed using smith's statistical software version 2.8. Data related to control and experimental groups were compared using paired t-test and ANOVA test, and *p* - value <0.05 was considered statistically significant.

Protocol of mediataion, yogic practices and pranayama used in the present study

1. Loosening exercise: 5 minutes
2. Yogasanas-20 minutes (Dhanurasana (Bow Pose), Matsyasana (Fish Pose), Janu Shirsasana (One Legged Forward Bend), Setubandhasana (Bridge Pose), Marjariasana (Cat Stretch), Paschimottanasana (Two-Legged Forward Bend), Hastapadasana (Standing Forward Bend), Adhomukha Shwanasana (Downward Facing Dog), Shavasana (Corpse Pose), Ardhachakrasana.
3. Pranayama-15 minutes (Anulom - vilom, bhramari, kapalabhati)
4. Meditation-20 minutes (Concentrative Meditation, Mindful Meditation)

Inclusion criteria

- Female staff aged between 25-40 years
- Working in the hospital for more than 5 years
- Not taking any medication
- No past history of any chronic illness
- Not practicing any known stress relieving or relaxation technique previously.

Exclusion criteria

- Type 2 DM patients
- Hypertensives
- Endocrine disorder of thyroid, adrenals, pituitary.
- Psychiatric disorders
- Menstrual disorders

Results

Table1**.** International stress management association questionnaire test scores and plasma cortisol levels among nursing staff.

Group (n = 28 in each)	Stress test score	Serum cortisol level (µg/100 ml)
Control group pre-test	12.34 ± 3.3	32.54 ± 3.1
Yoga group pre-test	11.87± 5.3	33.1± 3.5
Control group post test	12.20 ± 7.6	31.8 ± 2.8
Yoga group post test	8.12 ± 4.2*	20.1 ± 1.6**

* (p<0.05) ** (p<0.01)

Discussion

In the present case control study the practice of meditation, yogasana and pranayama had significant improvement of International stress management association questionnaire test (scores ± SD) and plasma cortisol levels (µg/100 ml ± SD) before and after yoga exercise among the yoga and control groups, were compared by paired t-test and ANOVA test with (p<0.05).

In a quasi-experimental two-group three-step study conducted on 38 male nursing students in the nursing and midwifery school of Isfahan University of Medical Sciences in 2012 in which the study group, underwent eight 1 hour sessions of laughter Yoga (two sessions a week), and in the control group, no intervention was conducted, found that significant difference in the mean scores of general health before and after laughter Yoga intervention in the two groups of study and control.[16]Ashoke Mukherjee and Jayarajan David, in a study have revealed and established significant differential training effect of regular Yogic practices (Suryanamaskar&

Meditation) on mental stress management of women high school teachers of Coochbehar district, West Bengal, India.[17]In a study conducted by Thomas Jefferson Medical College in Philadelphia and the Yoga Research Society, 16 healthy new yogis participated in a 50-minute yoga class every day for seven days. On the day prior to their first class, they were instructed to sit quietly reading and writing for 50 minutes. The subjects' cortisol levels didn't change appreciably during the sitting period; they showed just the normal decrease that usually takes place in the late morning. But when the researchers measured the cortisol levels before and after the yoga class—which included postures such as Sarvangasana (Shoulderstand), Salabhasana(Locust Pose), Vrksasana (Tree Pose) and Halasana (Plow Pose)—they discovered a significant decrease after the class.[18]A case-control cohort study designed to investigate the effects of yoga training on stress and plasma levels of cortisol in young (20 to 35 years) Iranian women revealed that Cooper-Smith stress test score and plasma cortisol levels examined in yoga and control groups at the beginning and the end of the yoga training reduced both stress and plasma cortisol levels significantly and concluded that yoga has beneficial effects on mentally distressed individuals.[19]A study conducted involving yoga group(n = 20) & control group (n = 20) healthy subjects of 18-20 years age group found that regular practice of yoga for 3 months significantly reduced the cardiovascular reactivity to examination stress basal blood pressure, pulse rate & cortisol level.[20]

Conclusion

Meditation, yogasana and pranayama have significant physiological effects on stress scores and cortisol levels among nursing staff.

Acknowledgement

We are very thankful to all the nurses who took part in the present study.

Source of Support: Nil.
Conflict of Interest: Nil.

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