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RESEARCH ARTICLE

IMPACT OF NADISHUDDHI PRANAYAM ON PERCEIVED STRESS AND VASOMOTOR TONE AMONG YOUNG WOMEN - RELEVANCE TO PHASE OF MENSTRUAL CYCLE

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ABSTRACT

Background: Yoga produces consistent physiological changes and have sound scientific basis.Practice of Pranayam has been known to modulate cardiac autonomic status during follicular and late luteal phases of menstrual cycle due to fluctuations of serum estrogen and progesterone levels.

Aims and Objectives: To study the impact of Nadishuddhi pranayama on perceived stress and vasomotor tone in the different of Phase menstrual cycle before and at the end of study period among young adult females.

Materials and Methods: This study was carried out in 66medical students aged between 17–25 years. They were selected by using simple random sampling and informed consent was obtained. A pretested questionnaire perceived stress scale was used to gather the research information. In control group, there was no significant difference in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle at the beginning and end of the study period.

Results: In yoga group, there was significant difference ($p \leq 0.05$) in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle at the beginning and end of the study period compare with control group. After yoga, there was significant decreased stress in both phase of study group as compared to control group.

Conclusion: However, slow type of pranayama increased parasympathetic activity during follicular phase and decreased sympathetic activity in secretory phase. As a result, decreased stress level of the individual.

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INTRODUCTION

The modern concept of Yoga is explained in terms of integration, harmony and balance. This can be the effective methods in alternative or complementary medicine for the management of chronic functional disorders. It contributes to the holistic health through promotive, preventive and curative method (Digambar, 1984).Yoga produces consistent physiological changes and have sound scientific basis.Practice of Pranayam has been known to modulate cardiac autonomic status with an improvement in cardio-respiratory functions.

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Autonomic nerve function status may be changed during follicular and late luteal phases of menstrual cycle due to fluctuations of serum estrogen and progesterone levels. This alteration in autonomic nerve functions may affect cardio vagal control and usually associated with decreased parasympathetic activity in late luteal phase. The biological rhythmicity of the cycle is created by the interplay among hypothalamic, hypophyseal and ovarian hormones.The main stress response systems involve physiological responses of the Autonomic nervous system (ANS) and the hypothalamic-pituitary-adrenal axis (HPA). Heart rate variability (HRV) has come to be widely used as a non-invasive tool to assess autonomic function in physiological as well as disease states (2). Measurement of the aortic pressure waveform gives measurement of central arterial pressure and hall mark of systemic arterial stiffness, such as Augmentation Pressure (AP)

and index (Ossewaarde, 2010). ANS systems have been studied exhaustively, although differences in the regulation of the physiological stress response due to changes in reproductive hormones are not yet clear. In women, changes in hormonal levels induced by the menstrual cycle may modulate the changes observed with aging (Walder, 2012). However, no effects of the menstrual cycle phase have been found on heart rate and blood pressure reactivity (Kajantie, 2006 and Gordon, 2014), or heart rate variability changes in response to social stress (Kirschbaum, 1999). In view of this, the present study is planned to find out the impact of voluntary breathing technique on cardiovascular Autonomic reactivity to Social Stress in Adults- Role of Coping Styles and Menstrual Cycle.

Aims and Objectives

To study the impact of Nadishuddhi pranayama on perceived stress and vasomotor tone before and at the end of study period among young adult females in the different phase of menstrual cycle as follows

- Follicular Phase of menstrual cycle
- Secretory of menstrual cycle
- To study and compare the above mentioned parameters in both follicular and secretory of phase ofmenstrual cycle.

MATERIAL AND METHODS

Type of study design: Cross-sectional study.

Study place: The study was conducted among the students studying ina medical college, Trichy.

Sample size: A total sample of 66 were collected (Convenient sample and including 10% drop out)

Sampling Population: The sample taken was between the age group of 17 to 23 years.

Sampling unit : Subjects between the age group 17 – 23 years.

Sampling frame : Attendance register containing the subjects list.

Sampling technique : Simple random technique.

Period of study: The study was conducted over a period of 3 months.

Inclusion criteria

- Young adult female
- Age between 17-23 years, with no gynecological
- Problems and regular menstrual cycles (24–36days).

Exclusion criteria

- History of chronic systemic illness
- Subjects currently on medication against systemic diseases
- Smokers, Alcoholics,
- Psychoactive substance use.
- Irregular menstrual cycle

Drugs used if any: No

A cross-sectional study was conducted in department of Physiology, Chennai medical college hospital & research Centre, Irungalur, Trichy. After getting approval from institutional ethical committee, informed written consent was obtained from all participants. The subjects were selected by using simple randomized sampling technique based on their regular menstrual period. All the participants were invited to complete the questionnaire their participation was voluntary and anonymous.

Procedure

Subjects were again sub -divided in to two groups, luteal (4 th to 8 th day before the onset of new menstrual cycle), and follicular phase (5 th to 8 th day after the onset of new menstrual cycle. The menstrual cycle phase was calculated using two estimation Procedures. First, in order to establish the date of each subject's appointment, all the cycles was converted to a standard 28 day cycle, taking as reference points the day of onset of the last menstruation and the real length of the studied cycle (8). Group 1 = Control group (33), Group 2= (Voluntary Breathing) Pranayama group (33).Supervised Nadishuddhi (6:3:6:3 Ratio) pranayama training was given for 15 min, 3 times a week by certified yoga trainer thereafter subjects were instructed to practice pranayama technique their own place with maintain a diary for the duration of 6 weeks. The following parameters were recorded for data collection in both groups before and after voluntary breathing training period.

Procedure for Nadishuddhi (6:3:6:3 Ratio) pranayama Technique

- Sitting with erect posture (Vijarasana), eye closed.
- Close the right nostril and First exhale via left nostril slowly, deeply and uniformly.
- Inhale via left nostril for 6 counts, breath hold for 3 counts.
- Exhale via right nostril for 6 counts, breath hold for 3 counts
- Start inhale via right nostril for 6 counts, breath hold for 3 counts
- Exhale via right nostril for 6 counts, breath hold for 3 counts. This is called one cycle (18 seconds) for five minutes duration followed by five min rest.

Anthropometry was conducted at the point of entry into the study using standard Protocol

Age, height, Weight, BMI, Waist, Hip circumferences, Waist hip ratio (WHR).

Instrument:Prestructured standard questionnaire were used as an instrument for collecting the data with demographic questions.

Perceived Stress Scale (PSS): The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress.

Table 1 and 2. Comparison of physiological parameters between follicular and secretory phase among two groups

Control Group	Follicular Phase				Secretory Phase			
Parameters	Before	After	P value	95% CI	Before	After	P value	95% CI
BMI	20.11 ± 0.30	20.28 ± 0.49	0.110	-0.3800 to 0.0400	20.14 ± 0.34	20.91 ± 0.38	0.393	-0.2663 to 0.1063
WHR	0.75 ± 0.05	0.76 ± 0.04	0.395	-0.0334 to 0.0134	0.76 ± 0.04	0.75 ± 0.03	0.277	-0.0083 to 0.0283
HR	73.81 ± 1.78	74.23 ± 1.80	0.39	-1.3252 to 0.5252	74.76 ± 2.00	75.37 ± 2.62	0.323	-1.8348 to 0.6148
SBP	121.45 ± 1.50	122.56 ± 1.95	0.807	-1.0091 to 0.7891	123.47 ± 2.18	124.78 ± 1.88	0.071	-2.1719 to 0.0919
DBP	75.62 ±1.73	75.47 ± 1.70	0.736	-0.7364 to 1.0364	77.42 ±1.76	80.32 ± 1.93	0.115	-1.6448 to 0.1848
Study Group	Follicular Phase				Secretory Phase			
Parameters	Before	After	P value	95% CI	Before	After	P value	95% CI
BMI	20.17 ± 0.32	19.12 ± 0.24***	0.001	0.9038 to 1.1962	20.20 ± 0.36	20.11 ± 0.27	0.277	-0.0745 to 0.2545
WHR	0.76 ± 0.04	0.72 ± 0.03***	0.001	0.0217 to 0.0583	0.76 ± 0.03	0.73 ± 0.02***	0.001	0.0168 to 0.0432
HR	74.45 ± 1.92	70.23 ± 1.68***	0.001	3.2876 to 5.1524	74.75 ± 2.09	70.50 ± 1.45***	0.001	3.3204 to 5.1796
SBP	121.67 ± 1.51	117.89 ± 1.18***	0.001	3.0796 to 4.4804	123.31 ± 2.17	118.54 ± 1.88 ***	0.001	3.7207 to 5.8193
DBP	75.46 ±1.80	70.72 ± 1.52 ***	0.001	2.8790 to 4.6010	77.87 ±1.80	69.68 ± 1.37***	0.001	7.3633 to 9.0167

Values in Mean ± SD

Paired Students t test (for parametric variables) were used to compare within the groups.

*p<0.05, **p<0.01,***p<0.001.

Table 3 and 4. Comparison of physiological parameters between pre and post follicular and secretory phase among two groups

Pre Yoga Follicular Phase					Post Yoga Follicular Phase			
Parameters	Control Group	Study Group	P value	95% CI	Control Group	Study Group	P value	95% CI
BMI	20.11 ± 0.30	20.17 ± 0.32	0.456	-0.2203 to 0.1003	20.28 ± 0.49	19.12 ± 0.24***	0.001	0.9606 to 1.3594
WHR	0.75 ± 0.05	0.76 ± 0.04	0.395	-0.0334 to 0.0134	0.76 ± 0.04	0.72 ± 0.03***	0.001	0.0217 to 0.0583
HR	73.81 ± 1.78	74.45 ± 1.92	0.185	-1.5968 to 0.3168	74.23 ± 1.80	70.23 ± 1.68***	0.001	3.1002 to 4.8998
SBP	121.45 ± 1.50	121.67 ± 1.51	0.573	-0.9979 to 0.5579	122.56 ± 1.95	117.89 ± 1.18 ***	0.001	3.8370 to 5.5030
DBP	75.62 ±1.73	75.46 ±1.80	0.726	-0.7524 to 1.0724	75.47 ± 1.70	70.72 ± 1.52***	0.001	3.9166 to 5.5834
	Pre Yoga Secretory Phase				After Yoga Secretory Phase			
Parameters	Control Group	Study Group	P value	95% CI	Control Group	Study Group	P value	95% CI
BMI	20.14 ± 0.34	20.20 ± 0.36	0.509	-0.2410 to 0.1210	20.91 ± 0.38	20.11 ± 0.27***	0.001	0.6296 to 0.9704
WHR	0.76 ± 0.04	0.76 ± 0.03	1	-0.0183 to 0.0183	0.75 ± 0.03	0.73 ± 0.02***	0.003	0.0068 to 0.0332
HR	74.76 ± 2.00	74.75 ± 2.09	0.463	-1.4472 to 0.6672	75.37 ± 2.62	70.23 ± 1.68***	0.001	4.0026 to 6.2774
SBP	123.47 ± 2.18	123.31 ± 2.17	0.776	-0.9641 to 1.2841	124.78 ± 1.88	117.89 ± 1.18***	0.001	6.0788 to 7.7012
DBP	77.42 ±1.76	77.87 ±1.80	0.331	-1.3700 to 0.4700	80.32 ± 1.93	70.72 ± 1.52***	0.001	8.7022 to 10.4978

Values in Mean ± SD

Unpaired Students t test (for parametric variables) were used to comparison between the groups.

*p<0.05, **p<0.01,***p<0.001.

Table 5. Comparison of Perceived Stress Scale between pre and post follicular and secretory phase among two groups

Perceived Stress Sale								
Control Group	Follicular Phase				Secretory Phase			
Parameters	Before	After	P value	95% CI	Before	After	P value	95% CI
	20.43±3.05	20.12±3.07	0.6962	-1.2715 to 1.8915	20.80±3.49	20.84±3.45	0.9645	-1.8335 to 1.7535
Study Group	Follicular Phase				Secretory Phase			
Parameters	Before	After	P value	95% CI	Before	After	P value	95% CI
	20.52±3.13	17.21±3.60	0.001***	1.5666 to 5.0534	19.72±3.34	16.10±3.26***	0.001	1.9143 to 5.3257
Pre Yoga Follicular Phase					Post Yoga Follicular Phase			
Parameters	Control Group	Study Group	P value	95% CI	Control Group	Study Group	P value	95% CI
	20.43±3.05	20.52±3.13	0.910	-1.6872 to 1.5072	20.12±3.07	17.21±3.60***	0.001	1.1809 to 4.6391
Pre Yoga Secretory Phase					After Yoga Secretory Phase			
Parameters	Control Group	Study Group	P value	95% CI	Control Group	Study Group	P value	95% CI
	20.80±3.49	19.72±3.34	0.225	-0.6854 to 2.8454	20.84±3.45	16.10±3.26***	0.001	3.0053 to 6.4747

Values in Mean ± SD
Unpaired and paired Students t test (for parametric variables) were used to comparison between and within the groups.
*p<0.05, **p<0.01,***p<0.001.

It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The questions in the PSS ask about feelings and thoughts during the last month. Perceived Stress Scale Scoring Each item is rated on a 5-point scale ranging from never (0) to almost always (Walder, 2012). Positively worded items are reverse scored, and the ratings are summed, with higher scores indicating more perceived stress. PSS-10 scores are obtained by reversing the scores on the four positive items: For example, 0=4, 1=3, 2=2, etc. and then summing across all 10 items. Items 4, 5, 7, and 8 are the positively stated items. Scores around 13 are considered average and high stress groups usually have a stress score of around 20 points (Cohen, 1988).

Physiological Parameters

Resting cardiovascular parameters

- Heart rate (HR)
- Systolic Blood Pressure.

Statistical analysis

The data will be entered in Microsoft Excel. The continuous data will be presented as mean with standard deviation. Unpaired and paired Students t test (for parametric variables) were used to comparison between and within the groups. All the statistical analysis will be carried out at 5% level of significance and p value ≤ 0.05 will be considered as significant.

RESULTS

Their age ranged between 17- 23 years (17.63 ± 0.14), body weight between 45 – 60 kg (52.62 ± 2.14) and height between 145 – 172 cm (158.5 ± 1.14).Table I shows that, in control group, there was no significant difference in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle at the beginning and end of the study period.Table 2 depicts that, in yoga group, there was significant difference (p≤0.05) in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle at the beginning and end of the study period.

Table 3 and 4. Expressed that, comparison of physiological parameters between both pre and post follicular and secretory phase among two groups, at the beginning and end of the study period. In yoga group, there was significant difference (p≤0.05) in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle compare with control group, at the beginning and end of the study period. Table 5 shows that, after yoga, there were significantly decreased stress in both phase of study group as compared to control. Here, interestingly note that, more reduction of stress in secretory than follicular phase of menstrual cycle.

DISCUSSION

There was no significant difference in the baseline parameters of the both groups. Therefore, these groups can be considered comparable for the study. Our results demonstrate that, in yoga group, there were significant difference ($p \leq 0.05$) in the BMI, WHR, HR, SBP and DBP of both phases of menstrual cycle compare with control group, at the beginning and end of the study period. This results agreement with previous studies which have found less sympathetic activity during secretory phase (George, 1998). Similar results were observed in previous studies which found significant decrease in BP and HR with the practice of Pranayama .Resting HR is mainly determined by parasympathetic nervous system (PNS) and DBP is a function of peripheral vascular resistance (PVR) which is mainly determined by sympathetic nervous system (SNS). At the end of study period, there were significantly decreased anxiety score and perceived stress in both phase but reduction is more in secretory phase of yoga group as compared to control group. Here, interestingly note that, more reduction of phase than follicular phase of menstrual cycle. Our results are in close agreement with the previous studies of yogic practices (Madanmohan, 2005) who noted a decrease of above mentioned parameters of yoga practice. We observed significant reduction in PSS scores in both phase of menstrual cycle and therefore, pranayama practice were equally effective in reducing perceived stress. Perceived stress scores of 20 or higher are considered high stress. Reduction in stress may have occurred due to better autonomic tone (higher parasympathetic and lesser sympathetic tone) and reduced stress may have resulted in improved cardiovascular functions (SaritaKanojia, 2013).Previous study has hypothesized impact of pranayama breathing interacts with autonomic functions. Slow pranayama like Nadishuddhi, Savitri and Pranav have been shown to decrease Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (Rajajeyakumar, 2014). This can be explained on the basis that-female reproductive steroids are modulators of HPA axis, which in association with ANS, form the stress system which regulates homeostatic mechanisms of the body. This HPA axis that is CRH induced proopiomelanocortin peptide inhibits GnRH secretion from hypothalamus which in turn affects the ovarian estrogen and progesterone levels (Sharma, 2013 and Jerath, 2006). The gonadal hormones fluctuation during the menstrual cycle is associated with significant changes in multiple neurohumoral homeostatic mechanisms of the body (Suter, 1997).

Conclusion

In the present study, fluctuation of estrogen and progesterone levels may be responsible for the changes in parasympathetic activity in follicular and sympathetic activity in secretory phases of menstrual cycle. However, slow type of pranayama increased parasympathetic activity during follicular phase and decreased sympathetic activity in secretory phase. As a result, decreased stress level of the individual.

Limitation

In the present study, other supportive non-invasive investigations and non-pharmacological technique like Heart Rate Variability (HRV) and Pulse Wave Velocity (PWV) may be included. Bio-chemical parameters stress hormones and cortisol were not measured to substantiate the findings obtained during the study. Further long duration studies and larger sample size will be needed to find out the trend of autonomic and psychological changes of different phase of menstrual cycle.

Recommendation

Pranayama can be a practical tool to Body-Mind integration for the holistic healing and positive health. Understanding how the mechanisms involved in the stress response interact with mediating factors could have important benefits for future interventions, provide training in how to deal with stress.Regular practice of yoga beneficially affects both phases of menstrual cycle by improving parasympathetic activity and maintain Sympathovagal balance.

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