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EFFECT OF MODIFIED YOGASANA ON CARDIAC AUTONOMIC MODULATION IN ELDERLY: A PILOT STUDY

Geriatrics

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ABSTRACT

Introduction: Autonomic nervous system responds to various physical and psychological stressors whether endogenous or exogenous, plays a significant role in homeostasis. A strong association between autonomic dysfunction and cardiovascular morbidity/mortality, including sudden cardiac death was observed in geriatric population world over. Heart rate variability (HRV) a noninvasive marker of cardiac autonomic activity is a promising tool for early detection and progression of autonomic dysfunction. Yoga-asana an ancient Indian mind-body technique has shown to influence autonomic nervous system and thus may have potential therapeutic benefits. **Objectives:** To study the effects of modified yogasana on autonomic modulation in elderly volunteers. **Methodology:** The present pilot study is an interventional study. Total 10 volunteers of both genders above 60 years of age were enrolled in the study. All volunteers practiced modified asana for half an hour five days a week regularly for 6 weeks. The modified asanas protocol was comprised of Tadasan, Adhomukha Swanasan, Virbadhrasan, Vrukshasan, Viparitkarni, modified Shirsasan and Savasana. High sampled ECG (1Khz) was recorded for 21-minute duration (15 minutes supine rest + 5 min active stand + 1min deep breathing) before and after six weeks of modified Yogasana practice. The time and frequency domain indices of HRV were measured and descriptive statistical analysis was employed. **Results:** An improvement in heart rate variability (HRV) indices were observed after six-week practice of modified asanas protocol. **Conclusion:** Simple Modified Asana tailored for elderly shown to improve autonomic modulation as assessed by HRV in elderly.

KEYWORDS

Autonomic modulation, Heart rate variability Indices (HRV), Modified Yogasana protocol,

INTRODUCTION:

Heart rate variability (HRV) is an oscillation in intervals between two adjacent heartbeats originated from SA node (pacemaker)[1]. The oscillations in the intervals are due to various local as well as neuro-hormonal mechanisms influencing SA node. The parasympathetic division of Autonomic nervous system (ANS) via vagus nerve is the fastest amongst all influences including sympathetic system on SA node and thus responsible for short term moment to moment heart rate variability[2]. HRV is an established marker of cardiac autonomic activity and being noninvasive provides the ease of recording. Good variability reflects optimal cardiac autonomic activity thus reflects health while reduced HRV (indicates cardiac autonomic dysfunction) is shown to be associated with various non communicable diseases (NCD's) ranging from metabolic syndrome, obesity, type II diabetes, to cardio-vascular diseases including low grade inflammation [3,4]. With aging HRV declines[5] and along with NCD burden amongst elderly it puts them at greater risk of disease complication. On the other hand, practice of yogasana (postures) an ancient mind-body technique, have shown to improve HRV in various diseases[6]. It also has shown to be beneficial for improving balance and coordination and joint flexibility[7]. Preparatory postures or modified Yogasana are considered useful for yoga naïve individuals and practicing these postures prepares oneself for long term Yogasana training. Preparatory postures are simple and safe to practice even by elderly. However, whether these preparatory postures modulate ANS is not known. To best of our knowledge there is dearth of data related to effect of modified yogasana (preparatory postures) on ANS modulation, therefore we thought that it will be useful to study the effect of modified yogasana in elderly which may have potential therapeutic benefits.

MATERIALS AND METHODS:

The present study was six-week prospective interventional study, conducted at community sites and analyzed in central research lab of Smt. Kashibai Navale Medical college and General Hospital Pune. The study was approved by institutional scientific and ethics committee. 10 elderly yoga naive individuals who were ready to follow the study protocol for six weeks were enrolled after taking proper consent. Inclusion criteria were healthy volunteers of age >60years willing to do yoga for 6 weeks and no previous practice of yoga.

Exclusion criteria were volunteers on medications affecting HRV, volunteers already practicing yoga, volunteers with alcohol or smoking addiction.

METHOD:

A high sampled ECG (1Khz) was recorded using Chronovisor Tele HRV data acquisition system (make Promorphosis pvt. Ltd. Pune) in all the volunteers. The recording protocol includes 15 min supine position, active stand for 5 min and six cycles (5 sec inhalation and 5 sec exhalation) of deep breathing for 1 min duration.

All the volunteers practiced Yoga training Protocol comprised of modified asana as per following sequence. Tadasan, Adhomukha Swanasan, Virbadhrasan, Vrukshasan, Viparitkarni, modified Shirsasan and Savasana. The protocol was followed for 6 weeks at home with weekly supervision. After completion of six week modified yogasana protocol ECG recording protocol same as baseline was recorded.

HRV indices from both pre and post ECG records were calculated after preprocessing and denoising of ECG data using Chronovisor software (make Promorphosis pvt. Ltd. Pune). as per the guidelines established by Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology[2]

The HRV indices used for statistical analysis were Time domain indices that included Standard deviation of NN intervals (SDNN) and Frequency domain indices Total power, low frequency (LF) and high frequency (HF) absolute powers in millisecond square (ms2), Normalized (nu) LF and HF powers, LF/HF ratio and Non-linear indices like Detrended fluctuation analysis (DFA) alpha 1, Sample entropy etc.

Statistical analysis:

Out of 10 participants HRV data of three participant was not analyzable, four participants were not able to complete six-week training protocol there for were not included for analysis. Only three participants were able to complete six-week schedule were included for analysis.

Therefore, in this pilot study we are reporting the observations using descriptive statistics. Mean and standard deviation of time and frequency domain HRV indices was measured.

OBSERVATION& RESULTS:

Table 1: demographic profile

Total volunteers	10
Males	3 (30%)
Females	7 (70%)
Age (years)	69.6± 5.48
Resting Systolic BP	126.9± 12.3
Resting Diastolic BP	73.6± 12.2
Resting Heart Rate	81±15
BMI (Kg/ m2)	27.7± 3.1

Table:2 Pre Intervention HRV indices

	Male n=3		Female n=7	
	Mean	SD	Mean	SD
MEAN RRI	932.6	110	685.5	92.9
SDNN	70	15	17.2	7.03
Total Power	3654.2	2028	183.9	125.8
LF(ms2)	367.7	534.6	43.91	31.81
HF(ms2)	589.63	337	38.3	26.91
LF(nu)	50.6	13.9	55.6	11.2
HF(nu)	49.3	13.9	44.6	10.7
LF/HF	1.12	0.5	1.3	0.6
AVG HR	64.4	7.2	88.4	12.8
DFAα1	0.99	0.4	0.9	0.1

Table3: Post Intervention HRV indices

	Female n=3		Female n=3	
	Mean	SD	Mean	SD
	Pre intervention		Post Intervention	
MEAN RRI	588.8	36	677.5	90
SDNN	10.4	3.8	22.03	21.8
TP	60.1	47	390.1	566
LF(ms2)	15.8	11.5	132.2	209
HF(ms2)	16.6	20	77	112
LF(nu)	57.9	15	53.59	11.8
HF(nu)	42.6	14	46.4	11.8
LF/HF	1.6	0.9	1.2	0.5
AVG HR	101.4	6.4	89	10
DFAα1	0.9	0.1	1	0.007

Demographic profile of ten volunteers is presented in table: 1. The resting mean systolic and diastolic blood pressure as well as heart rate were within normal range, however the group mean BMI indicates overweight category

Baseline pre intervention HRV indices are presented in table:2 The mean overall variability as reflected by SDNN and Total power in females were less compared to males, this may also be due to higher mean heart rate in females compared to males. Moreover, Parasympathetic modulation reflected by HF (ms2) and HF (nu) was also less in females compared to males.Table:3 depicts the pre and post observations of HRV indices in three female participants those who were able to complete the Yoga protocol.

An increase in Mean RR interval (reflect decrease in resting heart rate), improvement in SDNN and Total power (indicative of overall heart rate variability) and improvement in cardiac parasympathetic influence (reflected by increase in HF ms2 & HF nu) after six weeks of modified Yogasana intervention.

Limitations:

Attrition in sample size may be due to six months protocol resulted limited sample size for analysis.

CONCLUSION:

The present pilot project, demonstrated that after 6 weeks of regular practice of simple modified yogasana tailored for elderly showed improvement in HRV indices reflecting better cardiac parasympathetic modulation. As modified yogasana are also safe and easy to practice to practice plus the observation that they can modulate cardiac parasympathetic activity may pave the way for their futuristic therapeutic applications in elderly.

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