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Effect of yoga on heart rate variability in shift worker

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Abstract

Night shift work causing circadian disruption of sleep has been suggested to be an important risk factor of cardiovascular disease. Heart rate variability (HRV) provides a tool to assess stress related short and long term effects on autonomic regulation of cardiovascular system. Yoga is frequently used as a lifestyle intervention to reduce stress & restore autonomic nervous system balance. The aim of study was to evaluate the effect of yoga on HRV and Blood pressure in shift workers. For this cross sectional study, a total of 70 apparently healthy shift workers were divided into two groups. 1) Study group (n=35) Night shift workers, 2) Control groups (n=35) Day shift workers. Anthropometric, Blood pressure and HRV were measured in both groups. Study group underwent yogic exercise for 8 weeks. The same parameter measured again after yogic exercise. Study group showed decrease in BMI, Waist/Hip ratio, Heart rate, SBP and DBP. HRV showed a significant parasympathetic dominance.

Keywords: Blood Pressure, Heart Rate, Impact, Yogic Exercises

Introduction

Shift work is one of the more apparent and dramatic components of the work environment. The term usually refers to an arrangement of work hours which employs two or more teams (shifts) of workers in order to extend the hours of operation beyond that of conventional office hours.[1]

According to the International labour office, Shift work is defined as 'A method of work organization under which groups of workers succeed each other at the same work stations to perform the same operations'.[1]

Already in 1949 a study on the relation between shift work and mortality was conducted by Thiis Evensen.[2] Since 1949 another seventeen studies regarding cardiovascular mortality and morbidity risk among shift workers have been found in the literature. Nevertheless, taking all results together, there seems sufficient evidence to assume an elevated cardiovascular disease risk in shift workers. Kristensen and Olsen suggested an excess risk of cardiovascular diseases, based on the methodologically most sound studies so far, as the most reasonable risk estimate.[3,4]

Several mechanisms have been proposed as an explanation for the elevated cardiovascular disease risk among shift workers. A model incorporating possible pathways has been proposed by Knutsson.[5]. This model introduces (a) disturbed physiological rhythms, (b) psycho-social and behavioral factors and (c) disturbed socio-temporal rhythms as interrelated pathways from shift work to disease.

By studying the impact of shift work on lifestyle and biological risk factors, the contribution of different pathways or risk factors to the elevated cardiovascular disease risk might be elucidated.

A study conducted by Harenstam et al. indicated the occurrence of an increased frequency of premature ventricular complexes (PVC) during days worked in night shift. [6]

As working in shifts or at night is often regarded as a potential stress factor, HRV analysis might provide a tool to evaluate the acute effect of night work on the cardiovascular regulation. Problems with family life and social relations, which might lead to social stress, have often been mentioned in relation to shift work. But also the requirement to work on hours when the circadian physiological rhythms are tuned to rest might lead to stress.

Corelation of Yoga And HRV-

Yoga is frequently used as a lifestyle intervention to reduce stress and restore autonomic nervous system (ANS) balance.[7]

Many of the slow movements in yoga are considered related to a natural synchronization between breathing and moving (vinyasa) which, in turn, promotes a slower, deeper and more even paced breathing. This, in turn, induces parasympathetic nerve activity and a feeling of relaxation which can influence heart rate, blood pressure and breathing pace. [8-10]

Heart rate variability (HRV), a method to describe beat-to-beat fluctuations in heart rate, is mainly determined by activity of the cardiac sympathetic and parasympathetic systems. HRV is therefore regarded as a non-invasive marker of cardiac autonomic control. [11]

HRV measurement is a very sensitive method of detecting changes, for example after an intervention.[12] In healthy individuals, the parasympathetic pathway is active during rest, which is reflected by an increased HRV, while low HRV indicates poor health and a higher sympathetic activity. [12,13] However, strong vagal reactivity (high HRV) is associated with good health.[12] The effects of yoga on HRV is often similar to that of physical activity.[14]

Based on the evidence above, we hypothesize that there is effect of integrated yoga on cardiac autonomic activity in shift workers. We had performed a cross sectional study to assess the effect of yoga on cardiac autonomic activity in shift workers.

Aim And Objective

1. To study the cardiac autonomic activity using HRV in shift workers and to compare with day workers.

2. To study the effect of yoga on cardiac autonomic activity in shift workers.

Material And Methods

The study was conducted in the department of physiology, Subharti Medical College in Swami Vivekanand Subharti University, Meerut. Ethical clearance was taken from the ethical committee of the medical institute. Before conducting the study, Informed written consent was taken from all the subjects.

A total of 105 apparently healthy health care professional and security personals of either sex were selected randomly from the Swami Vivekanand Subharti university campus. After medical history and relevant physical examination. The subjects were further divided into two groups.

Control group - Day shift workers (n=35)

Study group - Night shift workers (n=70)

A. Inclusion criteria:

(i) Sex- Both males and females

(ii)Age group - 18 - 60 yrs

B. Exclusion Criteria: H/O

(i) Any mode of tobacco intake

(ii) Cardio pulmonary diseases

(iii) Neuro – Endocrine disorders

(iv) Liver & Renal impairment etc.

(v) Drugs like sleeping pills/ Alcohol intake

(vi) Any psychiatric illness

Assessments

Individual measurements were carried out at the workplace at baseline, before starting the yoga program, and after 8 weeks of integrated yoga exercise (Breathing Exercise, Yoga asanas). The participants were instructed not to eat, drink tea and coffee or smoke 2–3 hours before measurement.[15]

Blood pressure (BP) and Heart rate (HR) BP and heart rate were measured with an automatic sphygmomanometer (Omron). BP was measured while sitting up after at least 5 minutes of rest. BP measurements were performed on both arms, at the upper arm at the level of heart. BP was measured under the same conditions in all participants, i.e. at the same time during the day, at the same sitting position, no talking, and when the individual was relaxed. Mean BP was computed based on readings obtained from both arms.[15]

Waist-hip ratio

Waist-hip ratio (WHR) was used as a complementary measure of body-mass index (BMI) to facilitate detection of cardiovascular diseases among participants.Waist circumference was measured by placing the measuring tape in a horizontal plane midway between the lower rib margin and the hip bone. The hip measurement was taken at the widest point between the two bony prominences at the front of the hips. The same procedure was followed throughout the study.[15]

Recording of Heart Rate Variability (HRV)

Lead II ECG recordings was done at (25 mm/s & voltage at 10 mm/mV) for 5 mins to obtain HRV, using data acquisition system, RMS Polyrite AD. For recording of short term HRV, recommendation of Task Force on HRV will follow [16]. The ECG signals were converted through a 14-bit A/D converter at a sampling frequency of 256 Hz to PC and were analyzed offline after visual checking of abnormal ECG. After acquiring the signal in lying posture, data was checked for any artifact or ectopic beats, and only those ECG signals was kept for further analysis that should be free of any artifacts or ectopic beats. High and low filters will set at 99 and 0.1 Hz respectively. The screen sweep speed was kept at 30 mm/sec. The data recorded was subjected to time domain and frequency domain analysis using the HRV analysis software (RMS Polyrite D version 2.4). It included time domain parameters: SDNN, RMSSD, PNN50, & NN50. SDNN- Standard deviations of the averages of NN intervals in all 5 min segments of the entire recording; RMSSD- the square root of the mean of the sum of the squares of differences between adjacent NN intervals; PNN50- percentage of number of instances in which two consecutive NN intervals differ by more than 50 msec. Frequency domain analysis was performed using non- parametric method of Fast Fourier Transformation. HRV software used a peak detection algorithm to find the 'R' wave, which will done at sampling rate of '4 Hz'.[15]

Lifestyle Intervention

The yoga program was 50 minutes long and standardized which was performed in the same manner every time. All participants were encouraged to practice at home between session. All classes were run by an experienced certified yoga instructor and all classes took place at the same location, on the same day of the week and at the same time in the afternoon. A breathing exercise at a rate of 6 breaths/minute was encouraged. All participants were had a 30 min assessment at their workplace before and after the intervention.[15]

BREATHING EXERCISE (PRANAYAMA):

Alternate Nostrils (Anuloma Viloma)- Subjects performed alternate nostril breathing for 10 mins. Anuloma Viloma is also called Alternate Nostril Breathing Technique. In this Breathing Technique, the subjects inhale through one nostril, retain the breathe and exhale through the other nostril in a ratio of 2:8:4.The left nostril is the path of the Nadi called ida and the right nostril is the path of Nadi called Pingala. Anuloma Viloma restores, equalizes and balances the flow of Prana in the body.

Asanas

1. **Uttanasana**
2. **Adho Mukha Svanasana**
3. **Dhanurasana:** (Bow Pose)
4. **Bhujangasana (Kobra Pose)**

Statistical Analysis

All values were expressed as Mean±SD. Differences between the study group and controls were analysed using the Student's unpaired t- test. Preinterventional and Postinerventional data were analysed using the paired t-test. A two tailed test ($P < 0.05$) was considered statistically significant.

Results

Anthropometric measurements and Cardiovascular Parameters:: There was no significant difference between Mean Weight (kg),BMI (kg/m^2), Waist circumference (cm), Hip circumference (cm) and Waist/Hip ratio among study and control subjects and among study subjects before and after intervention. The results are shown in (table 1).

Statistically significant difference was seen between Mean Heart Rate (beats/min), SBP (mm/Hg) and DBP (mm/Hg) among study and control group's subjects. (Table 1)

There was statistically significant difference between Mean SDNN (ms) and RMSDD (ms) among study and control groups subjects. (Table.2)

There was statistically significant difference between Heart rate variability (HRV) like Mean LF (nu), HF (nu) and LF/HF among study and control subjects. (Table .2)

There was statistically significant difference between BMI, Waist/Hip ratio, Mean Heart rate (beats/min), SBP(mm/Hg) and DBP(mm/Hg) among study subjects before and after intervention.(table 3)

There was statistically significant difference between Mean SDNN (ms) and RMSDD (ms) among study subjects before and after intervention. There was statistically significant difference between mean PNN50 in percentage and NN50 among study subjects before and after intervention. (Table 4)

There was statistically significant difference between Heart rate variability (HRV) like Mean LF(nu), HF(nu) (18.57 ± 1.9 vs 21.68 ± 2.6) and LF/HF (5.56 ± 0.6 vs 2.12 ± 0.3) among study subjects before and after intervention.(Table-5)

Discussion

Night shift working influence cardiac activity by the two factors: 1) Pre-set circadian pattern of changes, 2) Activity (work) during the night requires extra energy. Energy can be mobilized by increase sympathetic activity therefore, during night shift working the normal circadian sympatho-vagal balance is upset, and sympathetic influence becomes dominant for most of the night.[17]

Cardiovascular diseases are major cause of morbidity and mortality in the developing countries. Their incidence is on the rise and is contributory to major health burden of a country. The increasing trend of these diseases can be attributed to lifestyle changes, food habits, lack of physical exercise associated with mental stress, environmental pollution, increase susceptibility to infections, and habits such as smoking and consumption of alcohol.

There are number of risk factors for cardiovascular diseases, majority of them are modifiable. Precautionary steps taken well in advance will reduce the sufferings of an individual and health burden of the country.

There is a need to objectively evaluate the perceived or the reported benefits of yogic practice. There are different tools to quantify the benefits of yoga on cardiovascular system.

HRV is a potential tool for assessing the influence of autonomic nervous system on cardiovascular system. Autonomic disturbances can adversely impact the functioning of the heart. HRV can serve as a sensitive method of evaluating the early changes in cardiac autonomic function.

The effect of short-term practice of yoga was evaluated on cardiac autonomic function. The time domain such as SDNN, RMSSD, and PNN50 were found to be significantly increased after practice of yoga for 1 month. These changes are attributed to shift of autonomic balance from the sympathetic nervous system to the parasympathetic system. SDNN indicates variability in duration of diastole which in turn influences the functioning ability of the heart. Increase in RMSSD and PNN50 suggests parasympathetic predominance evidenced by increased duration of cardiac cycle.[18]

In the present study, the most common age group amongst study population was 18 to 30 yrs (33%) followed by 31 to 40 yrs (31%), 41 to 50 yrs (26%) and 51 to 60 yrs (10%).

In the present study, most of the study population were male (56%) followed by female (44%).

In this study, there was no significant difference between Mean Weight(kg) (60 ± 5.5 vs 59 ± 4.2), BMI (kg/m^2) (24.39 ± 1.9 vs 23.39 ± 1.6), Waist circumference (cm) (95.72 ± 2.4 vs 94.23 ± 1.8), Hip circumference(cm) (99.48 ± 1.4 vs 97.84 ± 1.12) and Waist/Hip ratio (0.97 ± 0.1 vs 0.94 ± 0.1) among study subjects before and after intervention.

In the present study, there was statistically significant difference between Mean Heart rate(beats/min)(83.33 ± 12.32 vs 73.44 ± 11.37) , SBP(mmHg) (134.32 ± 15.13 vs 118.97 ± 12.81) and DBP(mmHg) (92.86 ± 17.741 vs 78.32 ± 16.13) among study subjects before and after intervention.

In our study,there was statistically significant difference between Mean SDNN (35.63 ± 10.33 vs 43.55 ± 13.37) ms and RMSDD (22.98 ± 4.9 vs 26.88 ± 6.6) ms among study subjects before and after intervention. Similarly in the study conducted by AV Vinay et al., time domain among study subjects , the preinterventional value of SDNN was 33.60 (31.41–44.82) ms and postinterventional value was 42.11 (34.43–57.51) ms. The preinterventional value of RMSSD 22.0 (16.0–33.8) and postinterventional value was 25.6 (17.0–34.8).[19]

In this study, there was statistically significant difference between mean PNN50 in percentage (2.27 ± 0.8 vs 6.91 ± 1.2) and NN50 (26.4 ± 2.9 vs 56.98 ± 7.7) among study subjects before and after intervention.The preinterventional value of PNN50 2.45 (0.80–15.38) and postinterventional value was 7.35 (1.40–18.57). The preinterventional value of NN50 was 28.5 (9.0–101.0) and postinterventional value was 65.0 (15.0–112.25). However, the difference was not statistically significant.[19]

In our study, there was statistically significant difference between Heart rate variability (HRV) like Mean LF(nu) (35.46 ± 5.9 vs 31.43 ± 3.4) , HF (nu) (18.57 ± 1.9 vs 21.68 ± 2.6) and LF/HF (5.56 ± 0.6 vs 2.12 ± 0.3) among study subjects before and after intervention. Preinterventional value of LF (nu) was 39.30 (25.1–46.25) and postinterventional value was 30.40 (22.75–40.62). The preinterventional value of LF/HF ratio was 2.62 (1.91–4.07) and postinterventional value was 2.28 (1.4–3.07). The postinterventional value of LF and LF/HF ratio was significantly lower ($P < 0.05$). The preinterventional value of HF (nu) was 13.25 (8.02–20.0) and postinterventional value was 16.0 (8.30–23.07). HF showed an increasing trend but was not found to be statistically significant. [19]

Practice of yoga for a month significantly reduced LF power spectrum. This may be attributed to inhibition of posterior or sympathetic area of the hypothalamus which optimizes the body's sympathetic responses to stressful stimuli. This helps restore autonomic regulatory reflex mechanisms associated with stress.

LF/HF ratio, a marker of autonomic balance, was found to be significantly reduced suggesting the shift of autonomic balance towards parasympathetic predominance. Woodyard C has reported the beneficial effects of yoga such as reduced respiratory and heart rate, reduced blood pressure, low cortisol levels, increased blood flow to the intestines, and vital organs on practice of yoga due to increased parasympathetic activity.[20]

There was a fall in average heart rate in subjects after intervention but was not statistically significant.

Taskforce of the European society of Cardiology and the North American society of Pacing and Electrophysiology describes HF as a representative of vagal modulation activity and LF as a representative of sympathetic or mixed sympathetic and vagal modulation activities.[21] There is general opinion that the ratio between LF and HF components of HRV spectra (LF/HF ratio) represents a measure of balance of sympathovagal activity. [22] LF/HF ratio higher than 4.8 was considered to reflect predominant sympathetic and those lower than 1.3 predominant vagal modulation activity.[23] It can be comprehended that these parameters eventually modulate the heart rate.

In view of significant reduction in LF/HF ratio and their resultant effect on heart rate, it can be concluded that short-term practice of yoga reduces sympathetic activity to greater extent than increasing parasympathetic activity.

The present study establishes the fact that HRV changes can be demonstrated after practice of yoga for a month. Time domain and frequency domain parameters exhibited a favorable change with short-term practice of yoga.

A study by Bharshankar et al., Birkel and Edgren et al. reported low resting heart rate, increased endurance, improved maximum uptake, and utilization of oxygen during exercise in subjects practicing yoga.[24-26]

Practice of yoga helps achieve emotional balance, inhibits the areas in amygdala responsible for fear, aggression and rage. It stimulates the reward or pleasure centers in the median forebrain and other areas leading to a state of bliss and pleasure. This in turn lowers anxiety, respiratory rate, heart rate, and blood pressure. [24,25,27,28] It is reasonable to postulate that the practice of yoga not only influences the autonomic balance at subconscious level but also controls this balance by regulating emotional changes.

In our study, there was a demonstrable improvement in the cardiac autonomic function. Yoga has a noticeable benefit on general health status of the individual and thus promoting positive health. These beneficial effects were observed even with short-term practice of yoga. It is reasonable to believe that regular and long-term practice of yoga will help reduce the incidence of non-communicable diseases resulting in better quality of life.

Conclusion

Yogic exercise may be recommended as an adjunt therapy to tilt the autonomic balance to parasympathetic dominance to improve the cardiovascular profile.

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References

1. International Labour office. Conditions of work digest (geneva) 1986;5:390.
2. Thiis-Evensen E: Skiftarbeid og helse (Shift work and health). Porsgrunn, Andreas Jabkosens boktrykkeri, 1949
3. Kristensen TS: Cardiovascular diseases and the work environment. A critical review of the epidemiologic literature on nonchemical factors. Scand.f.Work Environ.Health 1989;15:165-179

4. Olsen O, Kristensen TS: Impact of work environment on cardiovascular diseases in Denmark. f.Epidemiol.Community Health 1991 ;45:4-10

5. Knutsson A: Shift work and coronary disease. Scand.J.Social.Med.suppl. 1989;l-36

6. Harenstam A, Theorell T, Orth-Gomer K, Palm UB, Unden AL: Shift work, decision latitude and ventricular ectopic activity: a study of;24-hour electrocardiograms in Swedish prison personnel. Work and Stress 1987;1:341-350

7. Raub JA. Psychophysiologic effects of Hatha Yoga on musculoskeletal and cardiopulmonary function: a literature review. J Altern Complement Med. 2002;8(6):797–812.

8. Bernardi L, Gabutti A, Porta C, Spicuzza L. Slow breathing reduces chemoreflex response to hypoxia and hypercapnia, and increases baroreflex sensitivity. J Hypertens. 2001;19 (12):2221–2229.doi:10.1097/00004872-200112000-00016.

9. Bernardi L, Sleight P, Bandinelli G et al. Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study. BMJ. 2001;323(7327):1446–1449. doi: 10.1136/bmj.323.7327.1446.

10. Sovik R. The science of breathing–the yogic view. Prog Brain Res. 2000;122:491–505.

11. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology: Heart rate variability: standards of measurement, physiological interpretation and clinical use. Circulation 1996;93:1043-1065

12. Pahlm O, Sörnmo L. Special methods in electrocardiography (specialmetoder inom elektrokardiografi; in swedish) Lund: Studentlitteratur; 1998.

13. Sookan T, McKune AJ. Heart rate variability in physically active individuals: reliability and gender characteristics. Cardiovasc J Afr. 2011;22:1–7. doi: 10.5830/CVJA-2010-076.

14. Ross A, Thomas S. The health benefits of yoga and exercise: a review of comparison studies. J Altern Complement Med. 2010;16(1):3–12. doi: 10.1089/acm.2009.0044.

15. Nabel EG, Braunwald E. A tale of coronary artery disease and myocardial infarction. N. Engl. J. Med. 2012;366:54-63.

16. Cole RJ. Nonpharmacologic techniques for promoting sleep. Clin Sports Med. 2005;24(2):343–353.

17. Ana sliskovic, Ilija Manenica, changes in heart rate variability during working and non- working nights: Med Jad 2011;41(1-2):15-22.

18. McCall T. 1st ed. New York: Bantam Publishers; 2007. Yoga as Medicine: The Yogic Prescription for Health and Living.

19. Vinay A V, Venkatesh D, Ambarish V. Impact of short-term practice of yoga on heart rate variability. Int J Yoga 2016;9:62-6

20. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. Int J Yoga. 2011;4:49–54

21. Heart rate variability. Standards of measurement, physiological interpretation, and clinical use. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Eur Heart J. 1996;17:354–81.

22. Malliani A, Pagani M, Lombardi F, Cerutti S. Cardiovascular neural regulation explored in the frequency domain. Circulation. 1991;84:482–92.

23. Milicevic G. Low to high frequency ratio of heart rate variability spectra fails to describe sympatho-vagal balance in cardiac patients. Coll Antropol. 2005;29:295–300.

24. Birkel DA, Edgren L. Hatha yoga: Improved vital capacity of college students. Altern Ther Health Med. 2000;6:55–63.

25. Bharshankar JR, Bharshankar RN, Deshpande VN, Kaore SB, Gosavi GB. Effect of yoga on cardiovascular system in subjects above 40 years. Indian J Physiol Pharmacol. 2003;47:202–6.

26. Harinath K, Malhotra AS, Pal K, Prasad R, Kumar R, Kain TC, et al. Effects of Hatha yoga and Omkar meditation on cardiorespiratory performance, psychologic profile, and melatonin secretion. J Altern Complement Med. 2004;10:261–8.

27. Desikachar K, Bragdon L, Bossart C. The yoga of healing: Exploring yoga's holistic model for health and well-being. Int J Yoga Ther. 2005;15:17–39.

28. Javnbakht M, Hejazi Kenari R, Ghasemi M. Effects of yoga on depression and anxiety of women. Complement Ther Clin Pract. 2009;15:102–4.

Table 1: Anthropometric measurements and Cardiovascular Parameters: in study (n=70) and control (n=35) group

Anthropometeric Measurements Cardiovascular Parameters:	Study group (Mean±SD)	Control Group (Mean±SD)	p value
BMI (kg/m^2)	24.39 ± 1.9	26.39 ± 2.1	0.452
Waist/Hip ratio	0.97 ± 0.1	0.96 ± 0.1	0.21
Heart Rate (Beats/min)	83.33 ± 12.32	76.42 ± 11.31	0.01
SBP (mmHg)	134.32 ±15.13	124 ± 14.55	0.002
DBP (mmHg)	92.86 ±17.74	84.97 ± 16.78	0.04

Table 2 .Mean ± S.D of Time domain (HRV) among study (n=70) & control (n=35) subjects

PARAMETERS	Study group (Mean±SD)	Control group (Mean±SD)	p value
SDNN (ms)	35.63 ± 10.33	27.65 ± 6.5	0.01
RMSDD (ms)	22.98 ± 4.9	15.90 ± 3.3	0.01
LF(nu)	35.46 ± 5.9	40.14 ± 4.9	0.001
HF(nu)	18.57 ± 1.9	13.89 ±1.2	0.001
LF/HF	5.56 ± 0.6	2.22 ±0.4	0.141

Table 3: Anthropometric measurements in study (n=70) subjects before and after intervention

Anthropometeric Measurements	Preinterventional (Mean ± SD)	Postinterventional (Mean ± SD)	p value
BMI(kg/m^2)	24.39 ± 1.9	23.39 ±1.6	0.165
Waist/Hip ratio	0.97 ± 0.1	0.94 ± 0.1	0.981
Heart Rate (Beats/min)	83.33 ±12.32	73.44 ±11.37	0.001
SBP (mmHg)	134.32 ±15.13	118.97 ±12.81	0.001
DBP (mmHg)	92.86 ±17.74	78.32 ±16.13	0.001

Table no. 4 : Mean ± S.D of Time domain (HRV) among study (n=70) subjects before and after intervention

PARAMETERS	Preinterventional		Postinterventional		p value
	Mean	SD	Mean	SD	
SDNN(ms)	35.63	10.33	43.55	13.37	0.001
RMSDD(ms)	22.98	4.9	26.88	6.6	0.001
PNN50(%)	2.27	0.8	6.91	1.2	0.001
NN50	26.45	2.9	56.98	7.7	0.001

Table no. 5: Frequency domain among study (n=70) subjects before and after intervention

PARAMETERS	Preinterventional		Postinterventional		
	Mean	SD	Mean	SD	p value
LF(nu)	35.46	5.9	31.43	3.4	0.001
HF(nu)	18.57	1.9	21.68	2.6	0.001
LF/HF	5.56	0.6	2.12	0.3	0.001