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Original Research Article

A Comparative study Resting Heart Rate Variability in Asymptomatic and Symptomatic Menopausal Women

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Abstract:

Background: Heart Rate Variability (HRV) is a very sensitive and specific noninvasive method to evaluate cardiac autonomic activity of humans. In the present study the focus is on using Heart Rate Variability to determine and compare cardiac autonomic status in asymptomatic and symptomatic menopausal women.

Materials and Methods: Based on 21 postmenopausal symptoms given in The Greene Climacteric Scale, the subjects were categorized as asymptomatic menopausal women (n=50) and symptomatic menopausal women (n=50). After 10 minutes of adequate mental and physical rest, ECG was recorded in a quiet room with the subject in supine position. By using National Instruments NI-DAQ 7.5 USBD 6008, Analog ECG signal was converted to digital signals. HRV software (version 1.1) was used to calculate the HRV parameters like SDNN, E: I, LF nu, HF nu, LF/HF.

Results: There was a significant ($p<0.001$) increase in LF nu, LF/HF and a significant ($p<0.001$) decrease in SDNN, E/I ratio, HF nu in symptomatic menopausal women when compared with asymptomatic women.

Conclusion: In symptomatic menopausal women our study showed significant increase in sympathetic activity and a significant reduction in parasympathetic activity. There was a shift in the sympathovagal balance towards sympathetic predominance among symptomatic menopausal women in contrast to asymptomatic menopausal women.

Keywords: Resting Heart Rate Variability, Menopausal Women.

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Introduction

Menopause starts when menstruation is terminated permanently due to loss of ovarian function [1]. A woman spends 1/3 of her life in the postmenopausal state. Health management during this period could be considered important because it affects the entire quality of life [2]. Average age of menopause is 47.5 years in Indian women [3]. The menopausal state could be broadly divided into 3 stages: pre-menopause, perimenopause, and post-menopause. Based on the last menstrual period, if the period of amenorrhea is longer than 12 months, it is considered post-menopause. First 3 months of amenorrhea is considered pre-menopause. Perimenopause is amenorrhea of 3-12 months, and the volume or frequency of menstruation becomes irregular due to estrogen deficiency during perimenopause. Many women present with diverse physical as well as psychological symptoms during perimenopause and post-menopause. They are referred to as climacteric symptoms or menopausal symptoms [4].

Heart Rate Variability (HRV) is a specific and sensitive noninvasive tool to evaluate cardiac autonomic activity. HRV is the degree of variation of the heart rate under the balanced influence of sympathetic and parasympathetic components of the cardiac autonomic nervous system. HRV also indicates the extent of neuronal damage to autonomic nervous system [5]. Until now, study of the correlation of such menopausal symptoms with heart rate variability has not been adequate. This study is an effort to compare the heart rate variability between asymptomatic and symptomatic menopausal women. In this study, the relationship of menopausal symptoms with heart rate variability was examined using a questionnaire survey method.

Materials and Methods

This study consists of 100 healthy female subjects, 50 of them were asymptomatic menopausal women and the remaining 50 were symptomatic menopausal

women. The Greene Climacteric Scale has been used as an evaluation tool for screening of menopausal syndrome**.** This tool consists of items for total 21 symptoms [6]. Data were collected by the subjects who agreed to participate in the study and filled out the questionnaire by themselves. Subject's clinical history and details were taken according to the standard proforma. Informed written consent was taken from all subjects in the study. Subjects with major illness like diabetes mellitus, hypertension and endocrinal disorders and on any drugs affecting the Autonomic Nervous System like adrenergic blockers, calcium channel blockers, others were also excluded.

Statistical Analysis: Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ±SD and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Student 't' test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis.

Results

The comparison of the basic characteristics like age, BMI, duration of amenorrhea, systolic blood pressure and the diastolic blood pressure between the two groups did not show significant difference ($p>0.05$). The two groups were similar in terms of the baseline characteristics [Table-1].

There was a significant ($p<0.001$) decrease in SDNN, E/I ratio, HF normalized units (nu) [Table2, 3] and a significant ($p<0.001$) increase in LF nu, LF/HF in symptomatic women [Table 3], compared with asymptomatic women.

Table 1: Baseline characteristics of subjects.

Characteristics	Symptomatic women (n = 50)	Asymptomatic women (n = 50)	P-value*
Age (y)	50.7 ± 1.9	49.8 ± 2.1	0.523
BMI (kg/m2)	22.75±1.73	23.19±1.31	0.157
Duration of amenorrhea (mo)	20.10 ± 4.17	18.30± 3.21	0.482
Systolic blood pressure (mm Hg)	118.2 ± 6.9	118.7 ± 10.6	0.284
Diastolic blood pressure (mm Hg)	78.5 ± 6.6	74.8 ± 5.6	0.150

Table 2: Comparison of Time domain parameters between cases and controls.

HRV	Symptomatic women	Asymptomatic women	p value
SDNN(ms)	34.22±14.00	69.10±26.09	<0.001**
E/I ratio	1.37±0.14	1.76±0.46	<0.001**

Table 3: Comparison of Frequency domain parameters between cases and controls.

HRV	Symptomatic women	Asymptomatic women	p value
LF nu	61.52±14.62	36.11±11.68	<0.001**
HF nu	38.49±14.64	63.70±11.97	<0.001**
LF/HF	2.10±1.54	0.63±0.36	<0.001**

Discussion

Heart Rate Variability is a specific and sensitive noninvasive tool to evaluate cardiac autonomic activity. HRV is the degree of variation of the heart rate during the day under the balanced influence of sympathetic and parasympathetic component of the cardiac autonomic nervous system [7]. Until now, study of the correlation of such menopausal symptoms with heart rate variability has not been adequate. The basic cause of menopausal symptoms is the complex relationship of estrogen metabolism and the autonomic nervous system. Therefore, imbalance of the autonomic nervous system may correlate with menopausal symptoms. Disharmony of the autonomic nervous system could be evaluated by measurement of heart rate variability (HRV) [8].

The SDNN values reveal the alterations in the autonomic tone that are predominantly vagally mediated [9-12]. In this study the SDNN values were significantly reduced in symptomatic menopausal women ($p<0.001$), thus suggesting the reduction in the parasympathetic activity. The E/I values also reveal the contribution of the parasympathetic component in altering the heart rate during respiratory cycles [9-12]. In this study the values of E/I ratio were also significantly reduced in symptomatic menopausal women ($p<0.001$), thus further supporting the above finding of reduced parasympathetic activity.

The LF nu values are considered as a measure of sympathetic activity [9-12]. In this study the LF nu values were significantly increased in symptomatic menopausal women ($p<0.001$), thus suggesting the presence of elevated cardiac sympathetic activity in them.

The HF nu values are considered as a measure of parasympathetic activity [9-12]. In this study the HF

nu values were significantly reduced in symptomatic menopausal women ($p<0.001$) which further adds on to the earlier finding of decreased cardiac parasympathetic activity.

The LF/HF values reveal the global sympathovagal balance [9-12]. In this study the LF/HF values were significantly higher in symptomatic menopausal women when compared to asymptomatic menopausal women ($p<0.001$) thus suggesting the alteration in the sympathovagal balance towards the sympathetic component in symptomatic menopausal women.

Conclusions

The present study showed that among the subjects studied there was altered cardiac autonomic activity in symptomatic menopausal women. Symptomatic menopausal women showed a significant reduction of parasympathetic activity and a significant increase in sympathetic activity. There was a shift in the sympathovagal balance towards sympathetic predominance among symptomatic menopausal women in contrast to asymptomatic menopausal women.

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