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KEY WORDS: Generalised Anxiety Disorder (GAD), Heart Rate Variability, Coronary Artery Disease (CAD)

GENERALISED ANXIETY DISORDER (GAD), ONE OF THE MAJOR RISK FACTOR OF CAD, CAN BE DETECTED BY HEART RATE VARIABILITY (HRV) AT AN EARLY STAGE.

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ABSTRACT

Mental health problems are on rise in modern competitive world of dead-lines. And out of all the mental health issues Generalised Anxiety Disorder (GAD) is among the most common. Generalised Anxiety Disorder (GAD) is one of the major culprits as well as the most neglected one of cardiovascular morbidity. Autonomic cardiac function tests, especially Heart Rate Variability (HRV), can assess any changes in the imbalance between sympathetic and parasympathetic activity of the heart occuring due to GAD. Heart Rate Variability (HRV) is primarily controlled by continuous interplay of sympathetic and vagal activity. Therefore HRV reflects fluctuation in sympathetic and parasympathetic impulses rather than the absolute values as the heart rate reflects. In our study we observed the reduced HRV among GAD patient prior to the severe clinical manifestation of the disease.

Introduction:

Mental health problems are relatively common in general population. The prevalence of these disorders is soaring peak in this cut throat competition of the modern world. Out of all the negative emotions, Generalised Anxiety Disorder (GAD) is one of the major culprit as well as the most neglected one of cardiovascular morbidity. Anxiety disorders have been associated with increased risk of cardiovascular morbidity and mortality. Several studies have predicted the increased risk of CHD in patients with phobic anxiety or panic disorders[1] One of the hypothesis predicts this association as a dysregulation of autonomic nervous system control activity[2-6]. Anxiety has also been linked up with some chronic diseases like diabetes, hypertension and hypercholesterolemia. Possible mechanisms for the association of anxiety with CVD include changes in autonomic tone manifested as decreased vagal and increased sympathetic tone[7].

Generalised Anxiety Disorder (GAD) is an anxiety disorder that is characterized by excessive, uncontrollable and often irrational worry about everyday things that is disproportionate to the actual source of worry. Cardiac automaticity is intrinsic to various pacemaker tissues but heart rate and rhythm is mainly under the control of autonomic nervous system. Most organs of our body exhibit dual innervations from sympathetic and parasympathetic divisions of autonomic nervous system, often mediating opposite effects. The activity and relative balance between sympathetic and parasympathetic nervous system is regulated by afferent input directed primarily to the brain[8,9].

Autonomic cardiac function tests, especially Heart Rate Variability (HRV), can assess any changes in the imbalance between sympathetic and parasympathetic activity of the heart. Heart Rate Variability (HRV) is primarily controlled by continuous interplay of sympathetic and vagal activity. Therefore, HRV reflects fluctuation in sympathetic and parasympathetic impulses rather than the absolute values as the heart rate reflects. Both time and frequency domain measures were used to assess HRV.

Material and Method

The present study was conducted in Department of Physiology in collaboration with Department of Psychiatry, Pt. B. D. Sharma University of Health Sciences, Rohtak. The study was carried out on 30 patients of Generalised Anxiety Disorder (**GAD**) of 18-45 years of age of either sex. The normal age and sex matched subjects were selected from our staff members, medical students and healthy attendants accompanying the patients to the institute. The subjects and patients were divided into following two groups:

GROUP I- 30 male healthy subjects.
GROUP II- 30 male GAD patients diagnosed as per ICD-10 guidelines with Hamilton Anxiety Scale score of 28 (moderate anxiety).

Basal heart rate variability was recorded by digitalised polygraph (POLYRITE D system).

Both time domain variables
- SDNN (standard deviation of NN intervals)
- RMSSD (root mean square of standard deviation of adjacent RR interval difference)
- NN50(number of pairs of adjacent NN intervals differing by more than 50 ms) and

& frequency domain variables were recorded.
- LF (low frequency) in NU(normalised unit) and ms^2 (millisecond squared),
- HF (high frequency)
- LF/HF (ratio of low frequency & high frequency), of HRV were recorded

Results and Discussion

As shown in Table 1 the observed changes were significantly low values of Time domain parameters (SDNN, RMSSD & NN50) among Group II (male GAD patients) as compared to Group I (male controls) suggesting decreased HRV in GAD patients. This statistical significant result is represented in Figure 1 &2. Both low frequency variables-LF (ms^2) and high frequency variables- HF (PP) and HF (ms^2) are significantly less in Group II (male GAD patients) as compared to Group I (male controls) as shown in Table 2 & Fig. 3,4. LF/HF ratio is significantly high in Group II as compared to Group I as depicted in Table 2 & Fig.5.

The time domain parameters of HRV such as SDNN, RMSSD & NN50 are qualitative markers of vagal activity. SDNN (standard deviation of NN intervals) is a qualitative marker of vagal activity[10]. RMSSD (root mean square of standard deviation of adjacent RR interval difference) is also a marker of parasympathetic activity like SDNN. Kleiger et al had documented that RMSSD and NN50 are correlated with SDNN and are marker of parasympathetic activity[11]. Decreased value of time domain variables are suggestive of reduced HRV because of reduced vagal tone (reduced parasympathetic tone) as compared to male controls. In our study we have observed decreased values of these time domain parameters (Table 1 & Fig. 2,3).

Table 1 Comparison of Time domain variables of basal HRV among Normal Healthy Males (Group I) and Male GAD Patients (Group II)

Parameter	GROUP I (MEAN ± SD)	GROUP II (MEAN ± SD)	p VALUE
SDNN (ms)	64.343 ± 25.310	46.943 ± 24.006	0.008**
RMSSD	39.840 ± 17.454	29.107 ± 18.975	0.026*
NN 50	55.233 ± 45.515	28.233 ± 29.325	0.008**

* -Statistical significant (p value <0.05)
** -Statistical highly significant (p value <0.01)

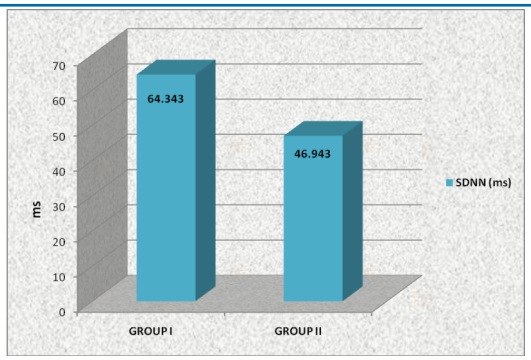

Figure: 1

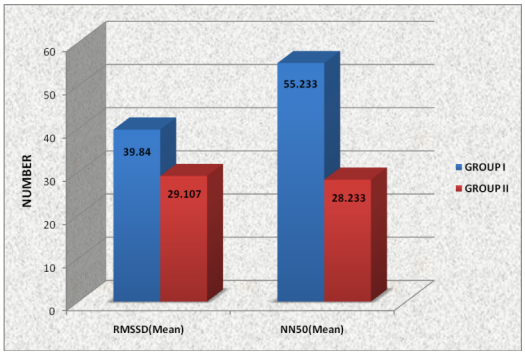

Figure: 2

Frequency domain analysis of HRV partitions total variability of heart rate into components that reflect different autonomic influences on heart rate. The high frequency (HF) band of HRV power spectrum estimates the cardiac vagal control and the low frequency (LF) band spectrum reflects both sympathetic and parasympathetic tone[12-17]. Malliani and associates have proposed that LF/HF ratio is better predictor of relative levels of sympathetic as well as parasympathetic activity, as opposed to absolute values of either[18].

Table 2 Comparison of Frequency domain variables of basal HRV among Normal Healthy Males (Group I) and Male GAD Patients (Group II)

PARAMETER	GROUP I (MEAN ± SD)	GROUP II (MEAN ± SD)	p VALUE
LF (NU)	74.736 ± 8.614	79.336 ± 5.749	0.018*
LF (ms^2)	544.066 ±476.820	331.333 ±235.852	0.032*
HF (NU)	24.78 ± 8.134	20.483 ± 5.891	0.022*
HF (ms^2)	203.666 ±165.014	103.066 ± 73.338	0.003**
LF/HF	3.4468 ± 1.4188	4.2998 ± 1.670	0.037*

* -Statistical significant (p value <0.05)
** -Statistical highly significant (p value <0.01)

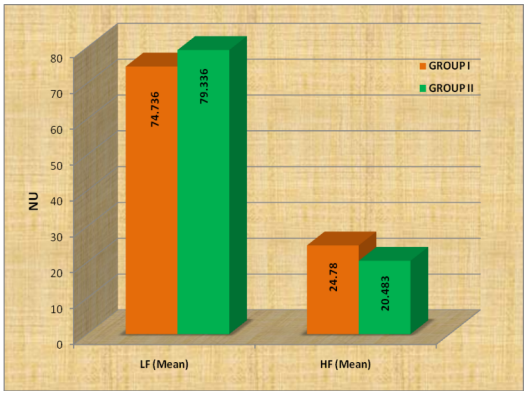

Figure: 3

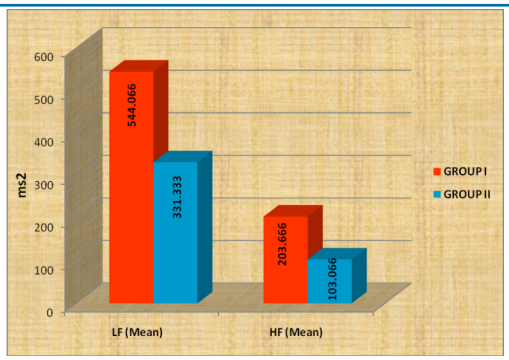

Figure: 4

As shown in table 2 and Figures 4,5 & 6 we observed the statistically significantly increased value of LF/HF ratio indicating reduced level of parasympathetic activity among GAD patients as compared to controls.

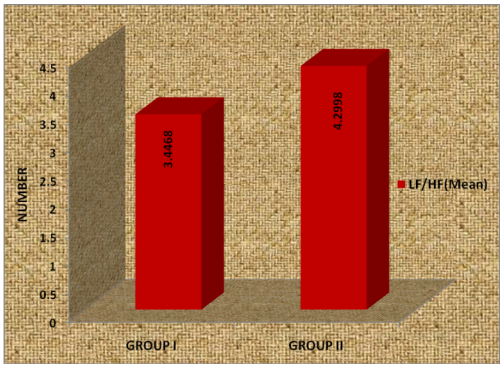

Figure: 5

Conclusion:
In GAD male patients, heart rate variability findings show reduction of parasympathetic activity and relative increase in sympathetic activity. HRV is a good diagnostic tool for early detection of the effects of GAD on cardiovascular system. In conclusion, one can detect the effects of generalised anxiety disorder among susceptible people, like stressful work professionals, on cardiovascular system prior to its manifestation as clinial symptoms.

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