Research Article

A study of sympathetic nervous system function in Manipuri patients diagnosed with generalized anxiety disorder

Nataraj Singh Loukrakpam, Punyabati Oinam, Govindaraj Y Singh, Lenin RK Singh, K.H. Ranendra, Samananda L Singh

Department of Physiology, Regional Institute of Medical Sciences, Imphal, Manipur, India.

Correspondence to: Nataraj Singh Loukrakpam, E-mail: natarajloukrak@yahoo.com

Received December 6, 2015. Accepted December 23, 2015

Abstract

Background: Anxiety disorders are becoming a common mental health problem in our society. This could be attributed to the law and order situation and the socioeconomic problems faced in our social setup. However, very few people are aware of the fact that these disorders, if not treated properly in time, can give rise to major cardiovascular health problems such as myocardial infarction, cardiac arrhythmias, and even coronary heart diseases. Sympathetic inhibition is reported as a common associated finding. **Aims and Objective:** To study involvement of autonomic nervous function, particularly sympathetic in Manipuri patients with anxiety disorders. **Materials and Methods:** Sympathetic function was tested for 38 patients with anxiety disorders and 30 age- and sex-matched normal healthy (control) subjects by using a battery of two tests, that is, (1) change in systolic blood pressure on sudden standing and (2) change in diastolic blood pressure on isometric handgrip test. Apparatus used was Polyrite. **Result:** Both values of the parameters were comparatively lower in patients, although it was statistically significant only in the former. **Conclusion:** Patients with anxiety disorders are usually associated with sympathetic inhibition making them vulnerable to different cardiovascular disorders such as myocardial infarction, cardiac arrhythmias, and coronary heart diseases.

KEY WORDS: Autonomic Nervous System; Generalized Anxiety Disorder

Introduction

Anxiety disorders are the commonest mental disorders in the Manipuri society; this could be attributed to the prevalent law and order situation and the socioeconomic turmoil. Anxiety can be defined as a hyper-response of the individual to a threatening situation. American Psychiatric Association's Diagnostics and Statistical Manual of mental disorders (DSM-IV-TR) describes anxiety as the presence of fear or apprehension that is out of proportion to the individual's life circumstances.[1]

Access this article online	
Website: http://www.njppp.com	Quick Response Code:
DOI: 10.5455/njppp.2016.6.06122015101	

The term "anxiety disorders" encompasses a group of disorders—generalized anxiety disorder (GAD), panic disorder, agoraphobia, specific phobia, social phobia, obsessive–compulsive disorder (OCD), posttraumatic stress disorder (PTSD), separation anxiety, and acute stress disorder. Anxiety can be theorized as a normal and adaptive reaction to threat that makes the organism ready for fight or flight. This preparation is accompanied by increased somatic and autonomic activity controlled by the interaction of the sympathetic and parasympathetic nervous systems.[9]

Autonomic nervous system (ANS) is an extensive neuronal network innervating every organ in the body for the regulation of homeostatic functions. It regulates the electrical and contractile functions of the myocardium through the interaction of the sympathetic and parasympathetic activities. People with autonomic dysfunction of any cause are at high risk of sudden cardiac death. Several types of anxiety disorder are related to autonomic inflexibility (rigidity), which is mainly represented by reduced heart rate (HR) variability and sympathetic inhibition. This can

result in different cardiovascular diseases that increase the morbidity and mortality rates.[3]

Materials and Methods

The study was carried out in the Department of Physiology, RIMS, Imphal, from September 2009 to July 2011, by using a battery of standard and noninvasive autonomic function tests (AFTs). The tests were performed in patients with anxiety disorders and age-matched healthy subjects who represented the control group, after getting approval from the institutional ethical committee (IEC), RIMS. A total of 68 subjects in the age range of 18–50 years were selected for the study, of which 38 subjects were patients with anxiety disorders; 30 healthy normal subjects of the same age range served as control. Exclusion criteria included people with chronic and systemic diseases such as diabetes mellitus and those with habits such as alcoholism or smoking, which will hamper autonomic function.

The patients were sent from Psychiatry Outpatient Department, RIMS Hospital, after taking proper history and examination by the consultant psychiatrist. The diagnosis was made as per the guidelines of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). The study design was a cross-sectional study. AFTs were carried out by using the Polyrite apparatus [model no. 206; Recorders and Medicare Systems (RMS), Chandigarh].

On the day of the test, no cigarette, nicotine, coffee, food, or drugs per oral or other route were permitted for 3 h before the test. The drugs that were not allowed included short acting alpha and beta antagonist, antihistamines, over the counter cough and cold medication, sympathomimetics, and parasympathomimetics. On reaching the department, detailed history of the patients were taken, and they were made to rest in a comfortable manner for at least 15 min in the research laboratory room.

Sympathetic reactivity was assessed by using a battery of two tests, that is, change in systolic blood pressure on sudden change in posture from supine to standing and change in diastolic blood pressure on isometric handgrip (IHG) test. The data were processed statistically by using SPSS software, followed by *t*-test and χ^2-test.

Result

This study was based on the primary data of 67 subjects, of which 37 were diagnosed as patients with GAD, and the remaining 30 were age- and sex-matched normal healthy controls. A pre-designed pro forma designed for the purpose was used as a tool for data collection.

The mean rise in diastolic blood pressure after 4 min of IHG test is comparatively less in patients than in the control group, although not statistically significant. However, the mean fall in systolic pressure 1 min after standing is comparatively less in patients than in the control group and statistically significant as well [Table 1].

Discussion

Anxiety disorders are the most prevalent mental disorders in the general population of Manipur. Among the nine disorders comprising "anxiety disorders," GAD is the most common. GAD is often accompanied by somatic manifestations that suggest morbid changes in ANS activity, such as rapid HR, shortness of breath, sweating, and restlessness. Thirty-eight subjects (age range of 18–50 years) diagnosed with GAD were enrolled for the study and assessed; but, only 37 constituted the study group as the result of one patient did not fall within any of the classification criteria. The majority of the subjects was married and were male subjects. A battery of two noninvasive tests to assess sympathetic reactivity was deployed for both the patients and control subjects. In our study, the mean fall in systolic blood pressure 1 min after standing was found to be comparatively less in patients than in the control group, and it was statistically significant. However, the mean rise in diastolic blood pressure on IHG test, although comparatively lower in patients, was not statistically significant. The quantitatively lower values of the sympathetic parameters in patients with GAD reveal inhibition of sympathetic function. This finding is similar to that of other studies conducted by Deepak et al. (2011) and Saric et al. (2004). Whereas Deepak et al. conducted the study on 34 children and adolescents (age range of 8–18 years) using the standard battery of five tests, Saric et al., conducted the study on GAD patients in the adult population (36 in number; age range of 19–55 years) using skin conductance and interbeat intervals. The findings are suggestive of autonomic rigidity or diminished physiologic flexibility in patients with anxiety disorder. This loss of variability in autonomic control system has recently been linked with a number of cardiovascular diseases and dysfunctions, particularly, coronary heart diseases, myocardial infarction, and cardiac arrhythmias, which can be potentially fatal.

Table 1: Change in blood pressure in study groups

Variable	Category		Mean	SD	*t*	Significance value	*P*
ΔDBP	Sympathetic	Case	15.13514	6.936867	1.366	0.177	>0.05
		Control	17.93333	9.804761			
ΔSBP	Sympathetic	Case	-0.21622	5.672228	1.954	0.049	<0.05
		Control	2.40000	5.156850			

Clinical Implications

Anxiety disorders are associated with significant morbidity. They are related to inhibition of the sympathetic function. Sympathetic control of the cardiovascular system is effective in modulating changes in blood pressure and would allow for enhanced responsivity and sensitivity with an associated increase in blood pressure and complexity. The loss of complexity and variability in physiological systems in general, and in the cardiovascular system, in particular, has recently been linked to a number of diseases and dysfunctions. Besides physiological disorders such as fetal distress syndrome, sudden cardiac death, ventricular fibrillation, hypertension, diabetes mellitus, and coronary atherosclerosis, several behavioral and psychological states such as acute and chronic smoking, acute and chronic alcohol ingestion, sedentary lifestyle, depression, panic disorder, and aging have all been associated with a loss of modulation of blood pressure and complexity. These indicate that the "decomplexification" of physiologic dynamics is a generic functional response associated with various pathological states. GAD can also be added to this list now.

Limitations

The study used a sample of convenience for logistical reasons. This would mean that certain cases would have been missed in between. Moreover, this is unlikely to have an adverse impact on the findings, because an adequately matched control group was chosen, and the assessor chose the first suitable subject meeting the study criteria on every clinic day. This prevented the possibility of the selection being biased by the severity of disorder or other potential confounders. There is also a need of following up these individuals and then subjecting them to the battery of tests once the clinical symptoms remit to observe the impact of the therapeutic interventions. This could not be achieved in this study owing to time constraints.

Conclusion

Anxiety disorders are the most prevalent mental disorders in the general population of Manipur. This could be because of the socioeconomic problems and the law and order situation. Not only do they cause physical and mental distress but also interfere with the day-to-day life, interpersonal relationship, and hamper work performance of the individual. Recent research works have found autonomic changes in patients with anxiety. Many literatures of repute have explained this on the basis that anxiety is associated with physiological hyperarousal and excessive cardiovascular reactivity.

Among the anxiety disorders, GAD is found to be associated with inhibition of sympathetic function as found in this study. Similar findings have also been reported in various literatures of international and national repute. Clinicians can now intervene well in advance and effectively treat the disorder, thereby preventing the associated morbidities and mortalities.

References

1. Pine DS, McClure EB. Anxiety disorders In Comprehensive Textbook of Psychiatry. 8th edn Philadelphia: Lippincott Williams and Wilkins, 2005. pp. 1768–79.
2. Hoehn-Saric R, McLeod DR, Funderburk F, Kowalski P. Somatic symptoms and physiologic responses in generalized anxiety disorder and panic disorder: an ambulatory monitor study. Arch Gen Psychiatry. 2004;61:913–21.
3. Wieling W, Karemaker JM. Measurement of heart rate and blood pressure to evaluate disturbances in neurovascular control In:(Eds.) Autonomic Failure. A TextBook of Clinical Disorders of the Autonomic Nervous System. 4th edn Oxford: Oxford University Press, 2005. pp. 196–210.
4. Brownley KA, Hurwitz B E, Schneiderman N. Cardiovascular psychophysiology In(Eds) Handbook of Psychophysiology. 2nd edn Cambridge, UK: Cambridge University Press, 2000224.
5. Kendler KS Hettema JM, Butera F, Gardner CO, Prescott CA. Life event dimensions of loss, humiliation, entrapment, and danger in the prediction of onsets of major depression and generalized anxiety. Arch Gen Psychiatry. 2003;60(8):789–96.
6. Mauss IB, Wilhelm FH, Gross JJ. Autonomic recovery and habituation in social anxiety. Psychophysiology. 2003;40(4):648–53.
7. Mussgay L, Ruddel H. Autonomic dysfunctions in patients with anxiety throughout therapy. J Psychophysiol. 2004;18(1):27–37.
8. Nutt DJ, Ballenger JC. Generalized anxiety disorder In:(Eds.) *Anxiety Disorders*, 1st edn. Oxford: Blackwell Publishing Limited, 2005. pp. 15–21.
9. Cohen H, Benjamin J. Power spectrum analysis and cardiovascular morbidity in anxiety disorders. Auton Neurosci. 2006;128(1–2):1–8.
10. Cameron OG. Anxious-depressive comorbidity: effects on HPA axis and CNS noradrenergic functions. Essent Psychopharmacol. 2006; 7(1):24–34.
11. Yeragani VK, Kumar R, Bar KJ, Chokka P, Tancer M. Exaggerated differences in pulse wave velocity between left and right sides among patients with anxiety disorders and cardiovascular disease. Psychosom Med. 2007;69(8):717–22.
12. Grillon C, Duncko R, Covington MF, Kopperman L, Kling MA. Acute stress potentiates anxiety in humans. Biol Psychiatry. 2007;62 (10):1183–6.
13. Yang TT, Simmons AN, Matthews SC, Tapert SF, Bischoff-Grethe A, Frank GK, et al. Increased amygdala activation is related to heart rate during emotion processing in adolescent subjects. Neurosci Lett. 2007;428(2–3):109–14.
14. Grippo AJ, Lamb DJ, Carter CS, Porges SW. Social isolation disrupts autonomic regulation of the heart and influences negative affective behaviors. Biol Psychiatry. 2007;62(10):1162–70.
15. Mujica-Parodi LR, Korgaonkar M, Ravindranath B, Greenberg T, Tomasi D, Wagshul M, et al. Limbic dysregulation is associated with lowered heart rate variability and increased trait anxiety in healthy subjects. Hum Brain Mapp. 2007;30(1):47–58.
16. Price RB, Mohlman J. Inhibitory control and symptom severity in late life generalized anxiety disorder. Behav Res Ther. 2007;45(11):2628–39.

How to cite this article: Loukrakpam NS, Oinam P, Singh YG, Singh RKL, Ranendra KH, Singh LS. A study of sympathetic nervous system function in Manipuri patients diagnosed with generalized anxiety disorder. Natl J Physiol Pharm Pharmacol 2016;6:155-157

Source of Support: Nil, **Conflict of Interest:** None declared.