

Comparative Study of Autonomic Nervous System Status between Normal Individuals and Asthmatic Patients

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Abstract: Asthma is a common clinical disorder and is characterized by reversible obstruction of the bronchial airways leading to symptoms such as shortness of breath, wheezing, and coughing. Aim of present study was to compare the effect of autonomic nervous system status in normal individual and asthmatic Patients. Selected patients were divided randomly in two groups each comprised of 25 patients. Group A served as a control group. Group B served as an asthmatic group. In response to autonomic nervous system both sympathetic and parasympathetic test can be done. The result of our study showed that cold pressure test shown significant result while S/L ratio and LST (30:15) ratio shown insignificant result. Thus this study indicates that the autonomic defects seen in asthmatics could be secondary to asthma and not because of autonomic aberrations inheritance in asthmatics.

Keywords: Autonomic nervous system (ANS), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Cold pressure test (CPT), Standing to lying ratio (S/L), and Lying to standing ratio (LST).

INTRODUCTION

Asthma is a common clinical disorder and is characterized by reversible obstruction of the bronchial airways leading to symptoms such as shortness of breath, wheezing, and coughing. The obstruction of the bronchial airways can be produced by one or more of the following Contraction of bronchial smooth muscle, hypertrophy of the bronchial wall, dilatation of bronchial mucosa, and secretions in the bronchial lumina.

Airway hyper responsiveness and accompanying bronchospasm are the principal hallmarks of asthma [1].

The human airways are innervated by autonomic nerves, which regulate many aspects of airway function via its effects on smooth muscle tone, mucus secretion, microvascular permeability, blood flow, migration of inflammatory cells and release inflammatory mediators from them. Thus, autonomic nerves can influence airway caliber [2-4].

The autonomic nervous system (ANS), formerly the vegetative nervous system, is a division of the peripheral nervous system that supplies smooth muscle and glands, and thus influences the function of internal organs [5]. The autonomic nervous system is a control system that acts largely unconsciously and regulates bodily functions such as the heart rate, digestion, respiratory rate, pupillary response, urination,

and sexual arousal [6]. This system is the primary mechanism in control of the fight-or-flight response.

Within the brain, the autonomic nervous system is regulated by the hypothalamus. Autonomic functions include control of respiration, cardiac regulation (the cardiac control center), vasomotor activity (the vasomotor center), and certain reflex actions such as coughing, sneezing, swallowing and vomiting. Those are then subdivided into other areas and are also linked to ANS subsystems and nervous systems external to the brain. The hypothalamus, just above the brain stem, acts as an integrator for autonomic functions, receiving ANS regulatory input from the limbic system to do so [7].

The autonomic nervous system has three branches: the sympathetic nervous system, the parasympathetic nervous system and the enteric nervous system [8-11]. Some textbooks do not include

the enteric nervous system as part of this system [12]. The sympathetic nervous system is often considered the "fight or flight" system, while the parasympathetic nervous system is often considered the "rest and digest" or "feed and breed" system. In many cases, both of these systems have "opposite" actions where one system activates a physiological response and the other inhibits it.

Genetic factors are also known to influence not only the occurrence but also the severity of asthma. It has been found that a child's asthma or wheezing is highly associated with mother's or father's asthma, other atopic condition in mother, father or with other siblings. Many of the siblings of asthmatic children who were apparently normal with no overt clinical symptoms of asthma have positive exercise result and are prone develop asthma later in life[13,14].

MATERIALS AND METHODS

This study was conducted in the Department of Physiology, S.P. Medical College, Bikaner subjects were selected from the, Medicine Department P.B.M. Hospital Bikaner.

The study has been undertaken to observe the effect of Autonomic nervous system in normal individuals and asthmatic patients of adult group. The selected subject has a history of asthma from last 6 months.

Patients suffering from liver disease, arthritis, pulmonary tuberculosis, malabsorption, alcoholism,

myocardial infarction, heart block disease and non-operative patients will be excluded from the study.

METHODS

A total 50 subjects will be enrolled in this study and divided in two groups of 25 each:-

- Group A – Control group
- Group B – Asthmatic group

PROCEDURE-

The autonomic nervous system was tested by performing the following tests:- The following standard autonomic function tests were conducted with the help of an ECG machine. A standard limb lead II was recorded and R-R intervals were calculated manually.

- Blood Pressure response to standing to supine posture (S/L) Ratio- Longest R-R interval during 5 beats before lying down/Shortest R-R interval during 10 beats after lying down.
- Blood pressure response to 30:15 Ratio- R-R intervals at beat 30/ R-R interval at beat 15 .
- Blood pressure response to Cold pressure test-Subjects were asked to immerse both feet in ice water (1–4C) for 1 min (20). The blood pressure was recorded just before the test and at 1 min, after the immersion of feet in the water. The systolic and diastolic pressure difference at 1 min from the baseline was calculated.

RESULTS

Table-1: Comparison of Mean value of S/L Ratio in study and control group

S/L Ratio	Control Group	Study Group
Mean	13.00	14.64
SD	4.06	4.44
P-value	> 0.05 (Not Significant)	

Table 1 shows the standing to Lying ratio (S/L) in study and control group. It is observed that

there is no significant rise in blood pressure in (S/L) ratio in study as compared to control group.

Table-2: Comparison of Mean value of LST 30:15 Ratio in study and control group

LST 30/15	Control Group	Study Group
Mean	1.02	1.02
SD	0.01	0.02
P-value	> 0.05 (Not Significant)	

Table 2 shows the Lying to standing test (LST) 30/15 Ratio in study and control group. It is observed

that there is no significant rise in blood pressure in (LST) in study as compared to control group.

Table-3: Comparison of Mean value of SBP in Cold pressure test in study and control group

Systolic BP	Control Group	Study Group
Mean	124.64	124.32
SD	5.56	6.37
P-value	> 0.05 (Not Significant)	

Table 3 shows the Cold pressure test results in study and controls. It is observed that there is no

significant rise in Systolic blood pressure (SBP) in study group as compared to control group.

Table-4: Comparison of Mean value of DBP in Cold pressure test in study and control group

Diastolic BP	Control Group	Study Group
Mean	80.68	83.68
SD	3.50	4.23
P-value	< 0.05 (Significant)	

Table 4 shows the cold pressure test results in study and controls. It is observed that there is significant rise in Diastolic blood pressure (DBP) in study group as compared to control group.

DISCUSSION

Autonomic function tests for sympathetic division and parasympathetic division which were carried out in this study have been extensively used in the past. They are all standard, noninvasive, safe and easily reproducible.

Asthma represents an imbalance of the autonomic nervous system. Several types of autonomic defects have been proposed in asthma; enhanced cholinergic, α -adrenergic, excitatory non-adrenergic non-cholinergic mechanisms promoting bronchoconstriction and glandular secretion [15,16]. Hyposensitivity at β -adrenergic receptors promote bronchodilation, reduction in bronchial secretions and impairment of IgE-mediated mast cell degranulation [17,18].

In our study we have taken asthmatic subjects and assessed their autonomic nervous status by comparing it with controls. The autonomic tests shows that the mean value of S/L ratio and LST ratio did not shown any significant rise in study group when compare with control group. In cold pressure test SBP did not shown any significant result but DBP shows significant result.

The rise in diastolic blood pressure in these tests is a measure of sympathetic efferent vasoconstrictor function mediated via α -adrenergic receptor [19]. In asthma, where adrenergic hyperresponsiveness has been proposed [20], there should be an exaggerated blood pressure response with these tests.

This increased adrenergic drive to combat parasympathetic hyperactivity causing bronchoconstriction is also supported by the fact that in asthmatics β -receptor blockade causes severe bronchoconstriction's, whereas in normal subjects no significant effect on airway caliber occurs[21,22]. This bronchoconstriction can be inhibited by the anticholinergic pretreatment [23]. From this observation it is concluded that there is increased cholinergic input in asthmatics causing up regulation of the adrenergic system. When this is blocked therapeutically it results in bronchoconstriction.

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