

A Study of Autonomic Dysfunction in Elderly Age.

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ABSTRACT

Background: Sympathetic and parasympathetic autonomic nervous system act in opposition to each other which enable us to perform our regular functions and maintain the state of the body. Disorders of the autonomic nervous system may result from disorders of the central and the peripheral nervous system. In the elderly, autonomic neuropathy, orthostatic hypotension is prevalent leading to cognitive slowing, hypo or hyperthermia, loss of sweating etc. **Methods:** 50 elderly patients with no hypertension, Diabetes mellitus, ischemic heart disease and arrhythmias, without addictions and habituations were studied for autonomic dysfunction based on clinical symptoms and using different tests including HR variability with deep respiration, HR Response to Valsalva maneuver, HR response to standing, BP response to standing and SBP response to Valsalva maneuver. **Results:** We found that the autonomic dysfunction was more prominent in the age above 60 years and more so in males than females. Postural hypotension such as dizziness, blacking out, loss of consciousness, impaired cognition, Calf Claudication was the most common symptom followed by gastric and urinary tract disturbances. There was a significant decline in the heart rate variability but not so much in the BP response test. The decline in the HRV was equal in both males and females showing no disparity between the sexes. **Conclusion:** The indices based in the heart rate differences are more suitable for assessment of autonomic disturbances in the elderly than BP response tests

Keywords: Autonomic nervous system, Claudication, Heart rate changes, Valsalva maneuver.

INTRODUCTION

Autonomic nervous system (ANS) of the human body runs bodily functions without out awareness or control. Rapid adjustments in vital physiologic mechanisms critical to survival are accomplished by ANS. It is divided into 2 parts: sympathetic and parasympathetic both of which act in synergy often opposing each other. In emergencies, one that causes stress and requires us to “fight” is evoked by sympathetic and in non emergencies which allow us to “rest” and “digest” is caused by the parasympathetic nerves. The state of the body at any given time represents a balance between these two systems. Disorders of ANS may result from central nervous system disorders or peripheral nervous system disorder.^[1-4]

Autonomic neuropathy is the term used to describe autonomic disturbances due to disease of peripheral autonomic nervous system. Peripheral neuropathies are the most common cause of chronic autonomic insufficiencies.

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In elderly, orthostatic hypotension is prevalent which leads to cognitive slowing.^[3,5] They also may develop

hypothermia and when exposed to high ambient temperatures may develop hyperthermia. Loss of sweating of lower parts of the body and increased sweating of head and arms probably reflect a senile neuropathy.

Many times, autonomic dysfunction may result from lesions in one or more areas of the central or peripheral nervous system.

The clinical problems in autonomic disorders are classified as Primary (with unknown etiology) and secondary. Primary disorders consist of acute autonomic failure syndrome including Pure Cholinergic dysautonomia, pure pandysautonomia, Pandysautonomia with neurological features.

Secondary disorders consist of congenital causes like Familial amyloid neuropathy, Porphyria, Fabry's disease, Riley-Day's Syndrome, metabolic causes like diabetes mellitus, chronic liver and renal failure, Inflammatory like Guilliane- Barre's syndrome, due to infections like tetanus, HIV, neoplasia., connective tissue disorders and surgeries like organ transplants etc.^[2,6]

Autonomic failure in the elderly may be largely central, due to wide spread of neuronal degeneration. Carotid sinus hypersensitivity maybe recognized which may be associated with neoplasia affecting the glossopharyngeal nerve.^[7,8,9]

This study was performed to identify the clinical symptoms of the elderly to autonomic nervous system disorders in the elderly and their response to various tests performed.

MATERIALS AND METHODS

This study was performed over a period of two years in the Department of General Medicine and Chest, Mallareddy Institute of Medical Sciences. Study of Clinical profile and responses to different tests were done on 50 elderly patients with age over 60 years and with no hypertension, Diabetes mellitus, Ischemic Heart Disease and Arrhythmias, without addictions and habituations.

Clinical profile was divided into asymptomatic and symptomatic with symptoms being those of Gastrointestinal tract, Cardiovascular, genitourinary, secretomotor, pupillomotor, skin and joints.

The tests for ANS included:

1. HR variability with deep respiration – (max – min) HR \geq 15 beats / min in normal subjects and $<$ 10 in patients with ANS dysfunction.
2. HR Response to Valsalva maneuver – Ratio \geq 1.4 (highest P0 PR during rest – lowest PR during test)

3. HR response to standing-increase 1-90 beats/min; 30th: 15th R-R interval ratio \geq 1.04.
4. BP response to standing-fall in SBP $<$ 30 mmHg and DBP $<$ 15 mmHg.
5. BP response to Valsalva maneuver,
6. Hand Grip Test (Isometric exercise test)
7. Cold presser test (rise in SBP by 15-20 mmHg and DBP by 10-15 mmHg).
8. Schirmer’s test (length of moistened 11 -15 mm)

RESULTS

Of the 50 patients above 60 years of age, 25 were men and 25 were women. All of them had no hypertension, diabetes mellitus, and cardiac arrhythmias. 25(50%) of the 50 patients were symptomatic with positive tests of which 14 were males and 11 were females. 11 were asymptomatic but were positive for the tests performed [Table 1].

Table 1: Symptomatic and asymptomatic cases in males and females

Total Cases = 50	Symptomatic Positive	Symptomatic Negative	Asymptomatic Positive	Asymptomatic Negative
Males	14	3	6	2
Females	11	4	4	6

Table 2: Decline in HRV and BP response tests

Variables	Patients with decline in HRV tests		Patients with decline in BP response tests	
	Males	Females	Males	Females
Symptomatic	11	11	10	7
Asymptomatic	3	3	2	1

Both sympathetic and parasympathetic activities decrease in elderly age group and the males are more effected than females [Figure 1].

Of the symptoms, most of the patients (50%)suffered from postural hypotension such as dizziness, blacking out, loss of consciousness, impaired cognition, Calf Claudication, etc. 20% had gastrointestinal symptoms like constipation and diarrhoea and 13.3% had renal problem like notarial, frequency, retention, urgency, etc [Figure 2].

Of the 38 patients who were positive for heart rate variability, 28 showed HRV decline of which 14 were males and 14 were females while 7 had no decline [Figure 3].

Decline in BP response test was seen in a total of 20 patients of which 12 were males and 8 were females [Table 2].

DISCUSSION

In our study, we had observed that Autonomic Nervous System dysfunction was more prominent in males above the age of 60 rather than females of the same age group. This gender related difference in parasympathetic regulation which diminishes after 50 years of age was observed by Kuo et al in a similar study in Taiwan.^[10]

Heart rate decline was seen in 80% while only 66% of the patients showed BP response in our study. Liao D Barnes et al, found that HRV spectral indices were associated with age and sex and as age increases^[11], the sympathetic and parasympathetic activity decreases. Similar results were reported by Kuo et al in his study.^[10] In yet another study by Zhang et al, it was concluded that age had a greater impact on HRV than gender^[12] where though males were more prone to ANS dysfunction than females, it was seen only in the age above 50 years than in the young.

Among the functional parameters, we found that orthostatic R-R interval ratio was of more diagnostic

value with 80 % of the patients showing positive reactions. The other tests were decline in deep breathing beat to beat in 71.4%, decline in Valsalva ratio in 66% patients.

Guatschy et al., found that each of the functional parameters depending on cardiac parasympathetic integrity, i.e. the beat to beat variation, orthostatic 30/15 R-R ratio and Valsalva ratio, decreased progressively with increase in age. The indices based in the heart rate differences are more suitable for assessment of autonomic disturbances in the elderly than BP response tests.^[13]

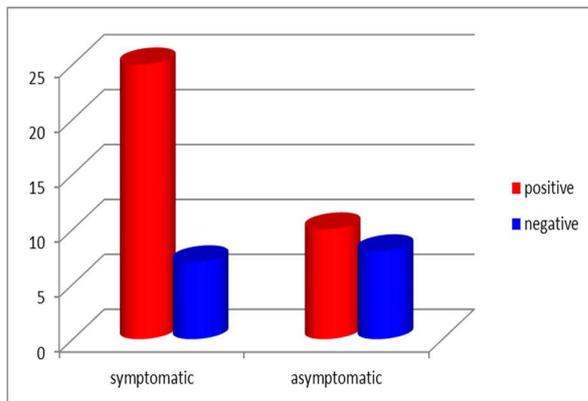


Figure 1: Sympathetic and parasympathetic activity in elderly

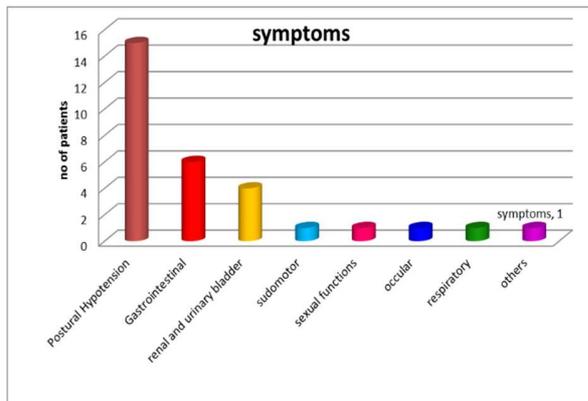


Figure 2: Symptoms in ANS dysfunction

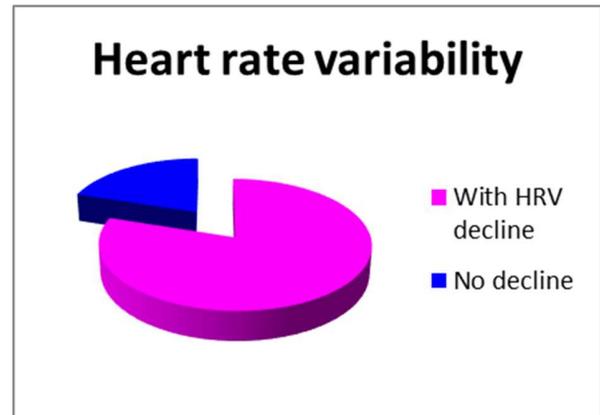


Figure 3: Heart Rate variability

The same was corroborated in a study by Vita G et al, which was performed on elderly as well as young healthy individuals.^[14] On 70 elderly, they reported RR interval variation, heart rate change with deep breathing and blood pressure response to standing were significantly on decline with age. On the other hand, blood pressure response to sustained hand grip remained unchanged. Therefore, isometric handgrip test is of little use in the assessment of autonomic function.

CONCLUSION

There is a significant decrease in autonomic function in the elderly. This increase in decline in sympathetic and parasympathetic activity with increase in age suggests that there is an age dependent degradation of the mechanisms involved in the cardiovascular reflexes. Of the symptoms, postural hypotension was the most common symptom, due to primary chronic autonomic failure, which is predominant in males than females. The decline in the HRV was equal in both males and females showing no disparity between the sexes. Of the functional parameters depending on cardiac parasympathetic indices based on heart rate differences are more useful for assessment of autonomic dysfunction with orthostatic R-R being a more useful tool. The indices based in the heart rate differences are more suitable for assessment of autonomic disturbances in the elderly than BP response tests.

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How to cite this article: Nagkumar KP, Reddy BC, Reddy MC. A Study of Autonomic Dysfunction in Elderly Age. *Ann. Int. Med. Den. Res*. 2015;1(3):209-12.

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