

# Assessment of correlation between age and the parasympathetic nervous system

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## ABSTRACT:

**Background:** *The parasympathetic division is primarily involved in relaxation, preparing the body to rest and recover. The present study assessed correlation between age and the parasympathetic nervous system.*

**Materials & Methods:** *84 individuals of both genders were assessed for heart rate variation during deep breathing (Expiration/Inspiration ratio), heart-rate response to standing (30:15 ratio) and heart-rate response to Valsalva maneuver (VM ratio).*

**Results:** *Out of 84 subjects, males were 50 and females were 34. There was highly significant negative correlation between age and E:I ratio ( $P < 0.00$ ). There was highly significant negative correlation between age and 30:15 ratio ( $P < 0.05$ ). There was non-significant negative correlation between age and VM ratio ( $P < 0.05$ ).*

**Conclusion:** *There was decline in parasympathetic functions with increasing age.*

**Key words:** *Age, parasympathetic, Valsalva maneuver*

## INTRODUCTION

The Autonomic Nervous System (ANS) is the part of the nervous system that is responsible for maintaining homeostasis along with Endocrine and Immunological systems. The ANS is of vital importance in daily life.<sup>1</sup> Its regulatory action occurs without involvement of one's conscious i.e. autonomously. The central autonomic network like insular cortex, hypothalamus, Amygdala, periaqueductal grey matter, Nucleus tractus- solitarius and ventrolateral medulla regulates different body functions like respiratory, cardiovascular, digestive, endocrine with many other functions through brain structures.<sup>2</sup>

The autonomic nervous system is divided into sympathetic and parasympathetic nervous systems. The parasympathetic division is primarily involved in relaxation, preparing the body to rest and recover. An increase in parasympathetic activity constricts the pupils, decreases the heart rate and intensifies digestion. Parasympathetic regulation also quickly changes the psychophysical mode of the human body. In old age though both sympathetic and parasympathetic systems are affected but parasympathetic involvement appears to be more frequent than sympathetic.<sup>3</sup>

American association of neurology says autonomic testing is incomplete without the assessment of all three functional domains: Sudomotor, Cardio-vagal and adrenergic.<sup>4</sup> There

have been many studies on the association of ageing with ANS assessed by conventional cardiac autonomic functions method but literature is quite scarce when we tried to find out the studies in which all the three domains of autonomic assessment got evaluated in different age groups of both sexes.<sup>5</sup> The present study assessed correlation between age and the parasympathetic nervous system.

## MATERIALS & METHODS

The present study was conducted among 84 individuals of both genders in the department of Physiology. All enrolled subjects were made aware of the purpose of the study and their written consent to participate was obtained.

Demographic profile was recorded. Subjects were checked for symptoms and signs of possible autonomic dysfunctions including orthostatic hypotension (light headedness, blurred vision, sensation of weakness and unsteadiness, fainting or syncope on standing), perspiration, palpitations. Parameters such as heart rate variation during deep breathing (Expiration/Inspiration ratio), heart-rate response to standing (30:15 ratio) and heart-rate response to Valsalva maneuver (VM ratio) was recorded. Results were statistically analyzed using chi- square test. P value less than 0.05 was considered significant.

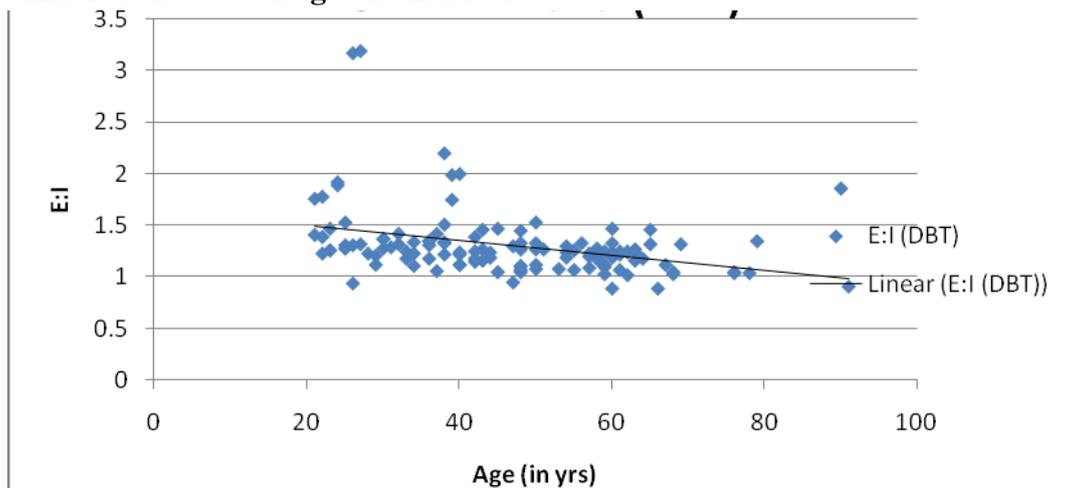
## RESULTS

**Table I Distribution of subjects**

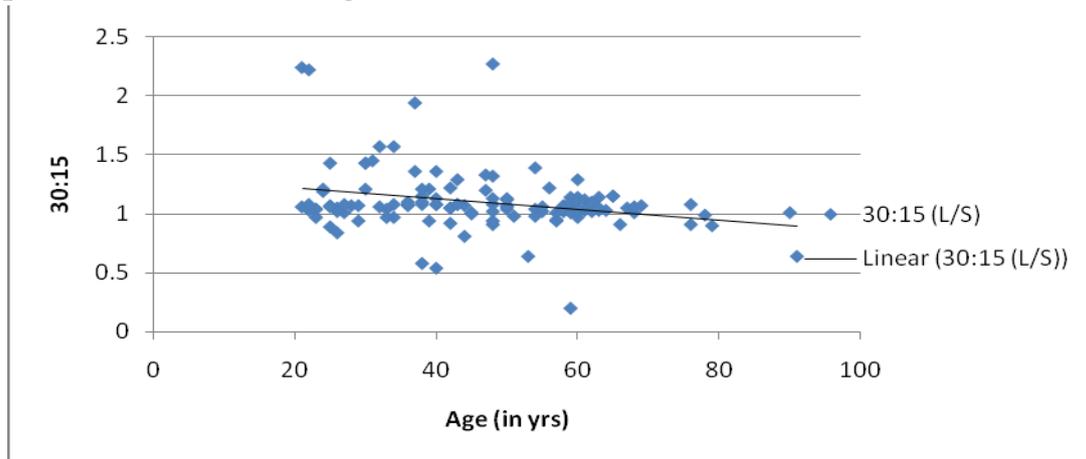
Total- 84		
Gender	Males	Females
Number	50	34

Table I shows that out of 84 subjects, males were 50 and females were 34.

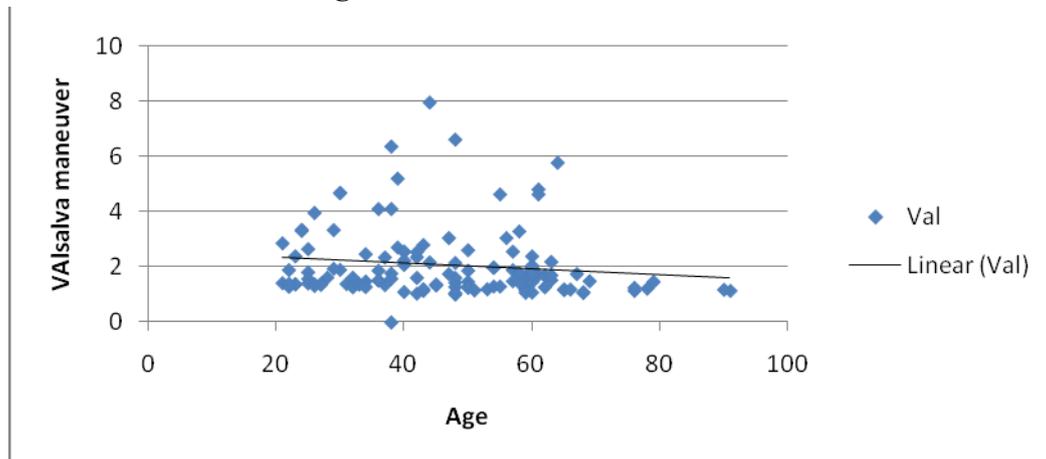
**Table II Relation between age and E:I ratio**



Graph I shows that there was highly significant negative correlation between age and E:I ratio ( $P < 0.00$ ).

**Graph II Relation between age and 30:15 ratio**

Graph II shows highly significant negative correlation between age and 30:15 ratio ( $P < 0.05$ ).

**Graph III Relation between age with VALSALVA MANOEUVUR**

Graph III shows that there was non-significant negative correlation between age and VM ratio ( $P < 0.05$ ).

## DISCUSSION

The Autonomic Nervous System (ANS) is the part of the nervous system that is responsible for maintaining homeostasis along with Endocrine and Immunological systems. The ANS is of vital importance in daily life.<sup>6</sup> Its regulatory action occurs without involvement of one's conscious i.e. autonomously. The central autonomic network like insular cortex, hypothalamus, Amygdala, periaqueductal grey matter, Nucleus tractus solitarius and Ventrolateral medulla regulates different body functions like respiratory, cardiovascular, digestive, endocrine with many other functions through brain structures.<sup>7</sup> Disorders of ANS were described in multiple and diverse diseases that may be primary or secondary to other disorders, originates from peripheral and central nervous system which means it can directly afflict the nervous system as well as other organs where they can trigger or enhance

pathological symptoms.<sup>8</sup>The present study assessed correlation between age and the parasympathetic nervous system.

In present study, out of 84 subjects, males were 50 and females were 34. Goyal et al<sup>9</sup> observed correlation between age and parasympathetic nervous system on 125 healthy subjects. 3 parasympathetic tests –heart rate response to standing (30:15 ratio), heart rate response to deep breathing (E:I ratio) and Valsalva maneuver were performed. In this study, E:I ratio, 30:15 ratio and Valsalva maneuver were negatively correlated with age. But relationships of E:I ratio and 30:15 ratio with age were statistically significant ( $P < 0.05$ ).

We found that there was highly significant negative correlation between age and E:I ratio ( $P < 0.00$ ). There was highly significant negative correlation between age and 30:15 ratio ( $P < 0.05$ ). According to American neurology academy and study suggested by Jaradeh SS et al<sup>10</sup>, that autonomic functions should be evaluated in all the three domains cardio vagal, adrenergic and sudomotor functions. However, very few age- related data on autonomic functions is available with controversial findings or with use of technique touching one domain alone such as HRV.

Parashar et al<sup>11</sup> evaluated association of different Age-groups with autonomic functions. A cross-sectional study was conducted in 62 healthy volunteers in Department of Physiology LLRM Medical College Meerut, India. Volunteers were divided into three groups as younger (15-45 years), middle (45-60) and elder age (above 60), Autonomic functions were tested in three domains viz. Cardio-vagal, adrenergic and sudomotor functions. Mean  $\pm$  standard deviation OHT (Orthostatic Hypotension Test) among of younger, middle and elder age groups were  $8.80 \pm 2.28$ ,  $13.40 \pm 4.64$  and  $21.82 \pm 6.04$  respectively which represent decrease in sympathetic functions with age ( $p < 0.001$ ). Cardio-vagal or parasympathetic responses indicated by DBT (Deep Breathing Test) Valsalva and 30:15 ratio of HR response to standing tests has shown statistically significant ( $p < 0.001$ ) decrease in mean response with increasing age. Sudomotor response appeared normal in younger and middle group but was interrupted in more than half of elderly people ( $p < 0.001$ ).

Different researchers suggested that the vagal tone is reduced or loss of vagal tone occurs gradually as age advances. Again vagal damage causes reduction of heart rate to various stimuli. Due to this, baroreflex activity may be decreased with increase in age. The cause for the decline in autonomic control of the heart is thought to be a result deterioration of cardiovagal baroreflex sensitivity.<sup>12</sup>

## CONCLUSION

Authors found that there was decline in parasympathetic functions with increasing age.

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