

# Effect of Aging on Postural tachycardial index in healthy Subjects

K. Pujitha \*<sup>1</sup>, Arpana Bhide <sup>2</sup>.

\*<sup>1</sup> Tutor, Department of Physiology, SVIMS, SPMCW, Tirupati, Andhra Pradesh, India.

<sup>2</sup> Associate Professor, Department of Physiology, SVIMS, SPMCW, Tirupati, Andhra Pradesh, India.

## ABSTRACT

**Introduction:** The change in parasympathetic function is generally known physiological changes in aging of man. The present study was intended to evaluate Postural tachycardial index with age.

**Aim:** To measure basal parasympathetic activity by using Postural tachycardial index in younger and elderly and to observe effect of aging on it.

**Materials and Methods:** The subjects selected are 120 in number with age group 35 to >65 years of both sex and they are categorized into 4 groups based on their age. Group-I: The age of 35-45 years; Group-II: The age of 45- 55 years; Group-III: The age of 55-65 Years; Group-IV: The age of >65 years. PTI was measured by using ECG machine.

**Results:** The examination of parameters body mass index, Heart Rate during resting, immediate standing were estimated for all subjects. The data was analyzed by using descriptive and inferential statistics.

**Discussion:** The findings suggested that the mean of PTI decreases statistically in group III and IV.

**Conclusion:** This study concluded that due to autonomic dysfunction the PTI decreases with increase in age.

**KEY WORDS:** Postural tachycardial index, Body mass index, heart rate, Autonomic dysfunction.

**Address for correspondence:** K. Pujitha, Tutor, Department of Physiology, SVIMS, SPMCW, Tirupati, Andhra Pradesh, India. **E-Mail:** [k.pujithayadav@gmail.com](mailto:k.pujithayadav@gmail.com)

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## INTRODUCTION

Aging is a natural process of merely growing order in a temporal sense and should be welcomed. The different theories can be combined into two groups, according to the first group, aging is the cumulative result of random cell damage which goes throughout life, while the other group considers aging is an inevitable result of our genetic programming [1].

Most organs of the body receive dual innervations from the ANS. Eg.: Heart, Endocrine glands, and smooth muscles in the walls of

hollow viscera. Some of the organs are innervated by only one division of the ANS. Eg.: Uterus, Adrenal medulla and most arterioles are innervated by sympathetic division. Glands of the stomach and pancreas are innervated by parasympathetic division only [2]. The effects of Parasympathetic stimulation are usually short lived as Acetyl choline is degraded rapidly, whereas the effects of sympathetic stimulation are wide spread and long lasting. The Hypothalamus controls and integrates the functions of both the divisions of Autonomic nervous system.

During emotional states, limbic cortex controls the Autonomic nervous system [3]. The decline in various functions continues slowly and eventually become considerable and functionally significant as age advances. Thus physiologically, aging refers to an impaired ability to maintain homeostasis in the face of external and/or internal challenges or stresses. As a result an individual becomes more vulnerable to these challenges and stresses and may finally succumb to one of these [4]. Both parasympathetic and sympathetic nervous system which constitute the autonomic nervous system(ANS) are affected by aging. A number of tests to assess the functional status of ANS. The parasympathetic nervous system tests include beat to beat variation [5], Valsalva ratio [6] and the baroreceptor reflex sensitivity [7] and sympathetic nervous system tests include the hand grip test(8), the galvanic skin resistance [9] and the cold pressor response [10].

Thus the present study was intended to evaluate Postural tachycardial index with age which assess parasympathetic function.

**MATERIALS AND METHODS**

**Selection of Groups:** The subjects selected are 120 in number with age group 35 to >65 years of both sex and they are categorized into four groups based on their age.

**Group- I:** Subjects of 35-45 years,

**Group-II:** Subjects of 45-55 years,

**Group-III:** Subjects of 55-65 years,

**Group-IV:** subjects of >65 years.

**Inclusion criteria:** The study includes healthy subjects, subjects of mixed socioeconomic status.

**RESULTS**

**Table 1:** Mean ±SD of Age among Group I, Group II, Group III & Group IV.

Parameter	Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		GI-GII	GII-III	GIII-IV	GI-IV
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	'p' value	'p' value	'p' value	'p' value
Age (yrs)	40.06	3.03	50.7	2.98	60.8	2.68	73.46	5.18	0	0	0	0

It indicates mean and standard deviation and P values of the group I,II,III & IV. The age among all groups are found to be statistically significant

**Table 2:** Mean and SD of BMI in Group I, Group II, Group III & Group IV.

Parameter	Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		GI-GII	GII-III	GIII-IV	GI-IV
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	'p' value	'p' value	'p' value	'p' value
BMI (kg/m2)	23.59	1.77	23.44	2.85	23.31	2.65	22.9	1.69	0.13	0.35	0.21	0.09

It indicates the mean BMI,SD and P values of Group I,II,III & IV. There is no statistical difference

**Exclusion criteria:** Subjects with diabetes mellitus, hypertension, any other debillating illness, cardio-respiratory diseases and other diseases, Subjects with obesity were excluded, Subjects with smoking and alcoholism, Subjects who are on medication were excluded, who unable to stand were excluded. The participants were carried out the physical examinations including measurement of height and weight, and body mass index (BMI). BMI was calculated as weight (in kilograms) divided by height (in squaremeters) (Quetelet’s index) [11]. The test was performed between 7.30 AM and 9.00 AM before breakfast. Questionnaires evaluated about smoking habits, medication use and history of past illness. ECG machine is used to measure heart rate by calculation of R-R interval. It is recorded by using L II lead. Normal HR is calculated by the R-R interval at a paper speed of 25 mm/sec. As per speed of the paper, one minute is equals to 1500 small squares. So, the number of cycles that could be inscribed with in this length of paper will be the heart rate.(Heart rate=1500/number of small squares in one RR interval) [12].

**Heart rate response to standing (postural tachycardial index (PTI):** The subject was asked to rest in a supine position for atleast 2 min and to stand unaided and remain standing for about a minute while ECG was being recorded continuously.

PTI=RR interval at 30<sup>th</sup> beat/RR interval at 15<sup>th</sup> beat

A ratio of 1.00 or less was defined as an abnormal response.1.01-1.03 as borderline and 1.04 as normal response [13].

among all the age groups but a slight decrease in Group-IV when compared with Group-I

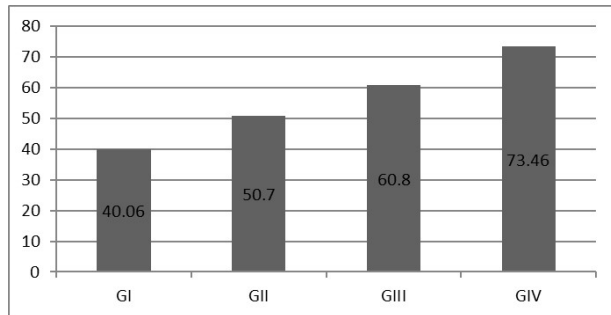


Figure 1: Age mean.

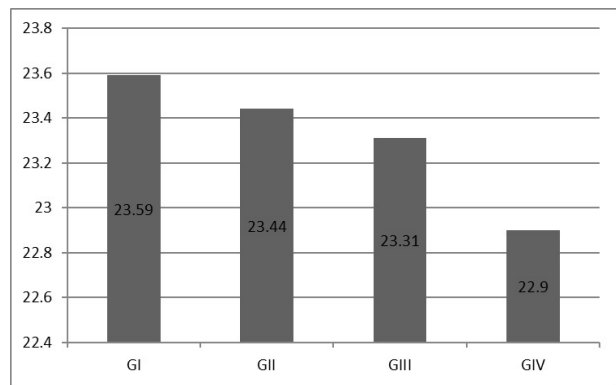


Fig. 2: BMI MEAN

Table 3: Mean and SD of PTI in Group I, Group II, Group III & Group IV.

Parameter	Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		Group-1(n=30)		GI-II	GII-III	GIII-IV	GI-IV
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	'p' value	'p' value	'p' value	'p' value
PTI	1.03	0.01	1.03	0.01	1.01	0.008	0.98	0.03	0.15	0	0	0

Table 3 shows mean and SD of PTI in all groups. This value gradually decrease with increase in age. PTI decrease significantly in Group III & IV. The P value is statistically highly significant.

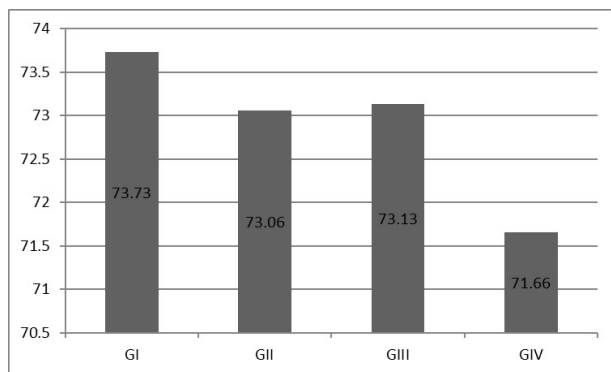


Fig. 3: Resting HR Mean.

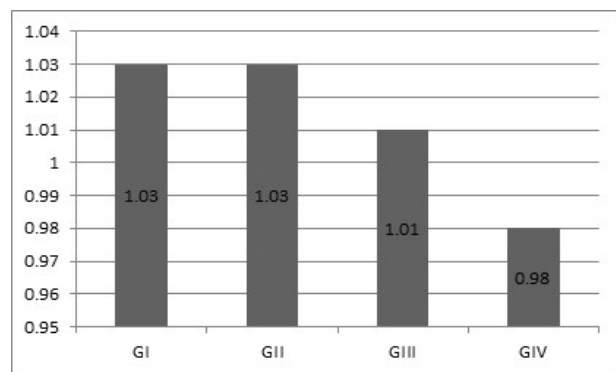


Fig. 4: PTI MEAN

## DISCUSSION

BMI has no significant variation among all the age groups (table 1) but a slight decrease in Group-IV when compared with Group-I. Body composition (BC) is relatively stable in good health conditions (Forbes GB et.al.). There are studies (Fukagawa NK et.al., Nassis GP et.al.) that have reported a stable free fatty mass (FFM) until 60-70 years of age in men and women after which only a decline was seen in male subjects. On the contrary, some studies (Fukagawa NK) have shown loss of FFM after 40 years of age while a few others have reported peaking of FFM between 35 and 45 years. Such variations in Body Composition changes and peaking time points may be explained on the basis of differences in ethnicity, method of Body composition determination, diet and life style, socio-economic conditions and so on [14].

Figure 4 shows variation in resting heart rate

among 4 groups. A slight decrease in heart rate was observed but it is not statistically significant.

Table 3 shows mean and SD of all groups. This value gradually decreases with increase in age. The variance of PTI between Group I and II are less and not significant. PTI decreases significantly in group III and IV. For this the P value is highly significant. In elderly the immediate postural reflexes are controlled neurally by sympathetic and parasympathetic nerves. Since the parasympathetic nervous system is more prone to the effect of aging than sympathetic, it is likely that the transient dysregulation of postural reflexes in older subjects is due to decrease in parasympathetic activity [15].

This study is in conformity with earlier studies done by G.Vita, J. [16] Gert Van Dijk [17], S J Piha and C Neumann [18]. This study differs from study of Ewing D J et.al., who

initially promoted PTI as an age-independent test of parasympathetic function, may be due to smaller sample size of older control (10 subjects) and younger age of the older group (48-67 years) [19].

When subject assumes an erect posture, from supine posture, gravity causes pooling of blood in the lower limbs. As a result venous return, cardiac output and arterial BP decreases. This leads to decreased stretch of baroreceptors, activation of vasomotor center, which leads to increased sympathetic discharge, decreased vagal tone and an instantaneous increase in HR. On standing the heart rate increases until it reaches a maximum at about the 15th beat, after which it slows down to a stable state at about 30th beat. The ratio of R-R intervals corresponding to the 30th and 15th heart beat is called the 30:15 ratio. The 30:15 ratio is a measure of parasympathetic function. The ratio decreases with age [20].

## CONCLUSION

The autonomic function tests can be used to assess the status of autonomic nervous system in the elderly, as these tests are simple, non-invasive and inexpensive. Physicians have to bear in mind the age related impairment of autonomic function while evaluating cardiovascular diseases in elderly.

In this study PTI was performed among four groups. Due to autonomic dysfunction the PTI decreases with increase in age. It is important that a diagnosis of autonomic neuropathy cannot be substantiated on the basis of results from a single test. This is one of the limitation of study. Further studies are required to confirm these findings using other autonomic function tests with a large sample size of geriatric healthy subjects.

**Conflicts of interest: None**

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