

# *A CROSS SECTION STUDY OF AUTONOMIC FUNCTION TEST IN GERIATRIC POPULATION*



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# ABSTRACT

- Sympathetic and parasympathetic autonomic nervous system act in opposition to each other - maintains homeostasis.
- The aged are particularly prone to get afflictions of the ANS.  
Due to the degeneration of the ANS as part of aging.
- The aim of this study was to see the effect of aging on the ANS.

- 250 healthy elderly subjects of both the sex were selected for the study and they were compared with healthy volunteers between 25-65 years of age.
  
- Test used were -
  - HR variability with deep respiration,
  - HR response to Valsalva maneuver & HR response to standing,
  - BP response to standing
  - Cold pressor and Hand grip test.
  
- It was found that autonomic dysfunction was significant in elderly as a part of aging process.

# INTRODUCTION

- Classically ,***age of 65*** is considered the beginning of ***Geriatric period***.
- Autonomic function declines with age.
- Every organ of the human body is innervated and regulated by the ANS.
- Cardiovascular system is ***most frequently*** examined in autonomic functional diagnostics.

➤ **Functions of ANS- Involuntary “*AUTONOMOUS*”**

- Perfusion of all the body with blood through heart rate and Blood Pressure control.
- Homeothermic function through sweating control and shivering.
- Processing of nutrients through control and coordination of different parts of gut and glands.
- Urinary motility ,Pupil movement, focusing and lacrimation

➤ Age related changes results in autonomic dysfunction – ***IMPAIRED HOMEOSTASIS***

➤ Three domains of autonomic testing are ***Sudomotor, Cardio-vagal and Adrenergic.***

# MATERIAL AND METHODS

- ***Cross-sectional study***
- Conducted in ***Department of Medicine*** at ***Index Medical College and Research Centre (M.P.) INDIA.***
- ***Duration-*** over a period of **6 months** started from June 2018.
- ***PARTICIPANTS- 250*** healthy ***elderly*** individuals of both sexes aged above 65 years were compared with 250 healthy individuals aged 25 to 65 years of both sexes.
- An informed consent was taken.

# INCLUSION CRITERION

➤ We Included- ***250 healthy elderly males and elderly females.***

# EXCLUSION CRITERION

- With ***No history of hypertension, diabetes mellitus***, arthritis and other chronic diseases like tuberculosis.
- History of current medications used by the subjects was taken, steroids intake or any other drugs that can affect ANS were excluded.
- History of Chronic Alcoholics.



# Test to assess ANS function

## CARDIOVAGAL

- Resting HR
- Valsalva Ratio
- E/I Ratio

## ADRENERGIC

- Resting BP
- BP & HR response to standing
- Sustained Hand Grip Test

## SUDOMOTOR

- Cold Pressor Test
- Spoon Test

➤ **RESTING HR & BP** – Subjects were asked to take rest in supine position for 10 min. HR was determined for 1 min.

➤ **DEEP BREATHING TEST-**

- Inhale for 5 seconds and exhale for 5 seconds.
- This 10 second respiratory cycle were repeated 6 times (i.e. 6 breaths per minute).

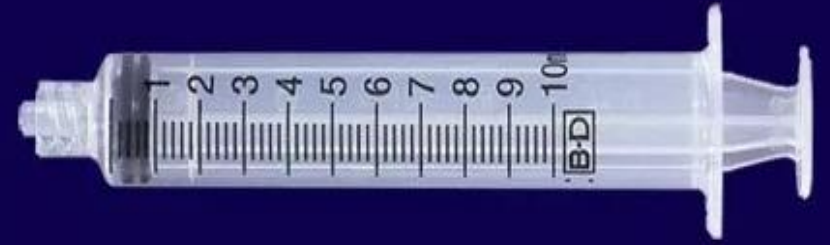
**E: I ratio** - The longest RR interval during expiration /The shortest RR interval during inspiration from 5 cycles was determined.

- **Normal in Youngs is 1.2**

# Valsalva Maneuver-

- Semi recumbent position
- Blow in 10 ml syringe for 15 seconds
- **10 ml Syringe = 40mmhg**
- Ecg was recorded continuously .

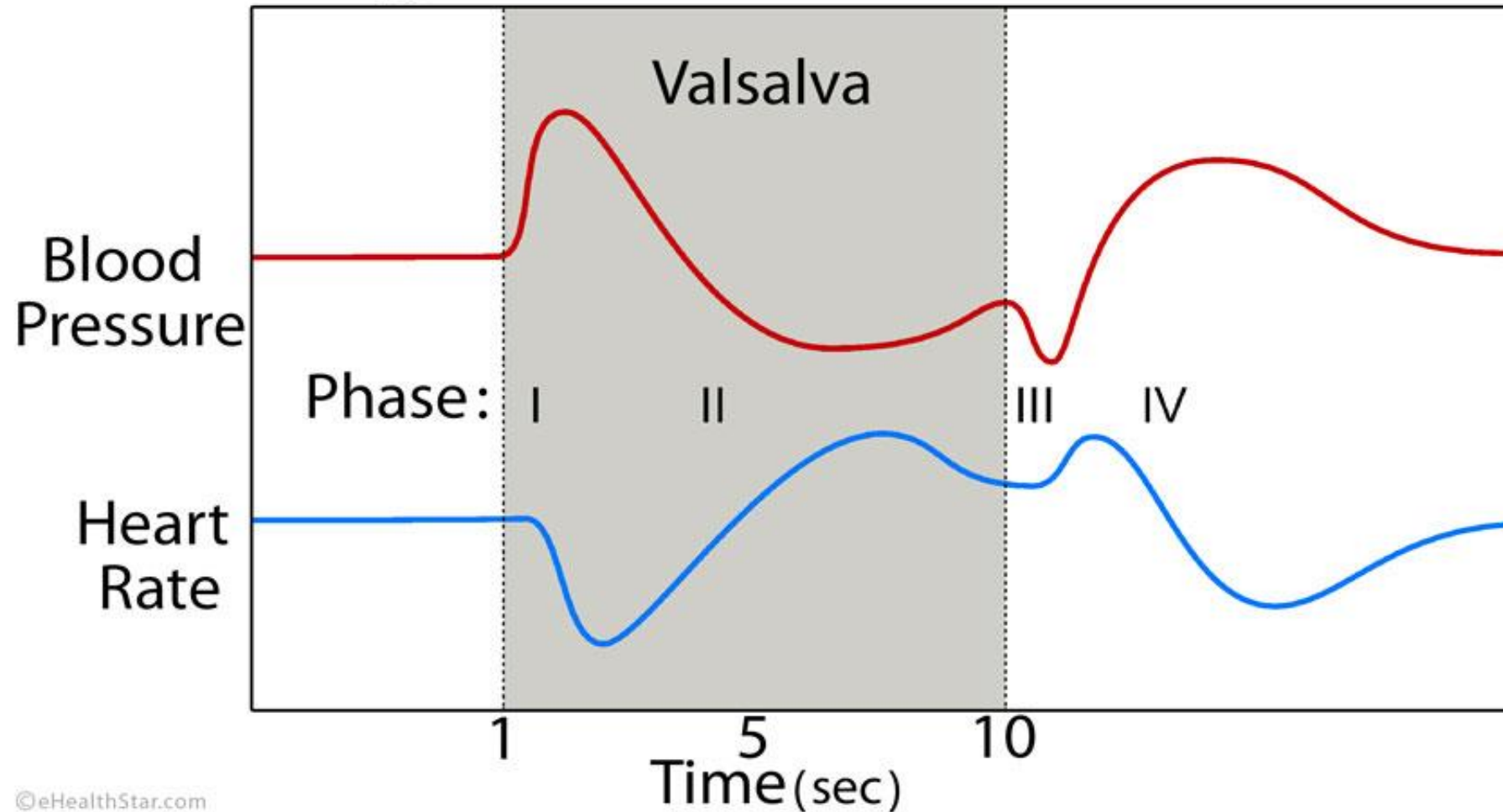
10mL Syringe = 40mmHg



# Valsalva Ratio

- Parasympathetic activity.
- Calculated during straining as the ratio between longest mean RR intervals to the shortest mean RR interval.
- Its value ***below 1.21 is considered to be abnormal.***

# Blood Pressure and Heart Rate During the Valsalva Maneuver



# HR Response to Standing

- In the Upright position a **displacement of 400-600 ml** of blood into the leg veins occur l/t decrease in venous return, cardiac stroke volume and arterial BP.
- Evaluation of change in HR is performed during the initial phase of orthostasis.

## 30:15 Ratio

- HR variability is recorded for at least 1 min of active standing.

▶ The ratio of R-R intervals corresponding to the 30<sup>th</sup> and 15<sup>th</sup> heart beat → *30:15 ratio*

$$\text{30:15 ratio} = \frac{\text{RR interval at 30}^{\text{th}} \text{ beat}}{\text{RR interval at 15}^{\text{th}} \text{ beat}}$$

▶ This ratio is a measure of parasympathetic response

Normal = 1.04

# Sustained Hand Grip Test

- Pressing of a handgrip dynamometer at approximately one third of the maximum contraction strength for 3–5 min.
- Normal response is ***rise in DBP by >10-15 mmhg*** and rise in ***HR by about 30% of the baseline.***

# Cold Pressor Test

- Immersion of hands or feet for about 60–90 s in cold water (4°C)
- Increase in blood pressure and heart rate
- Rise in ***DBP > 15 mmhg***

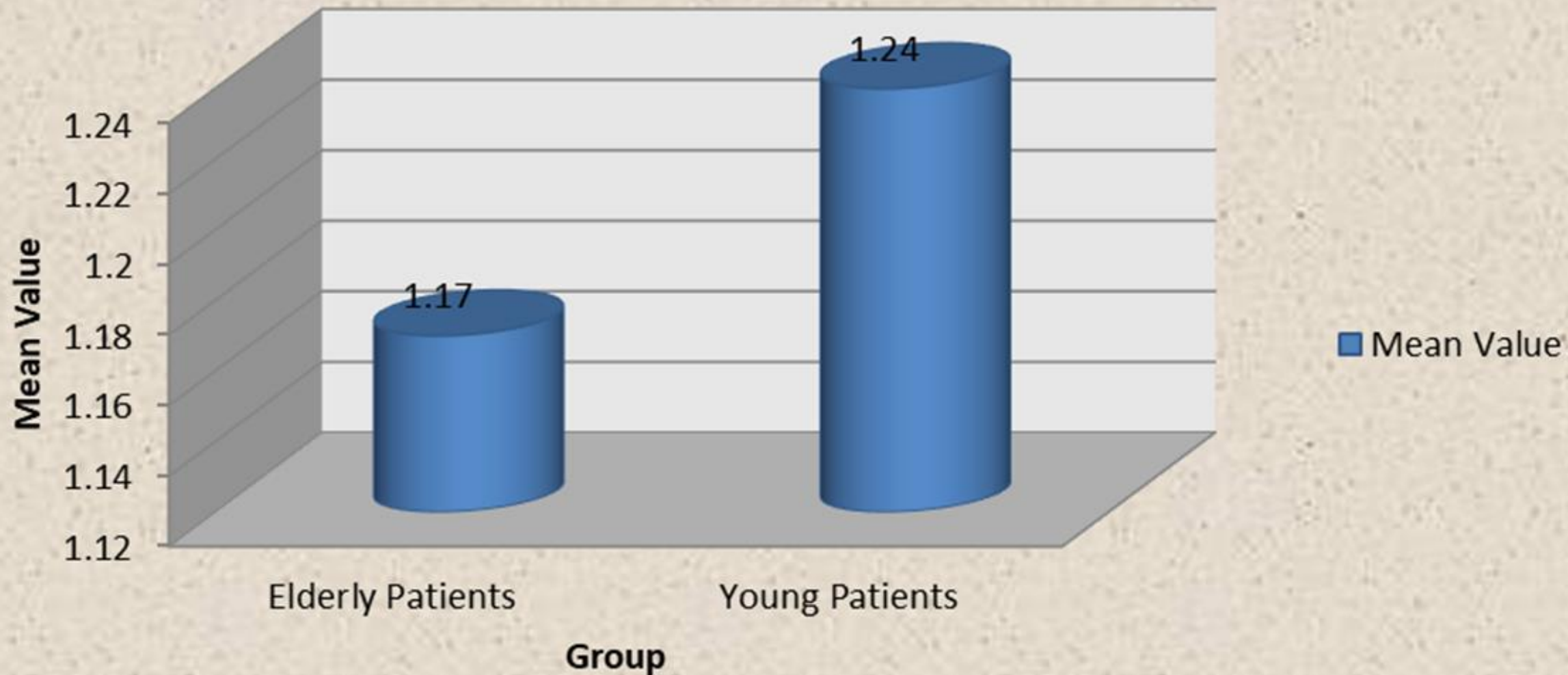


# Results

➤ We found that the test were statistically significant in the elderly subjects showing :-

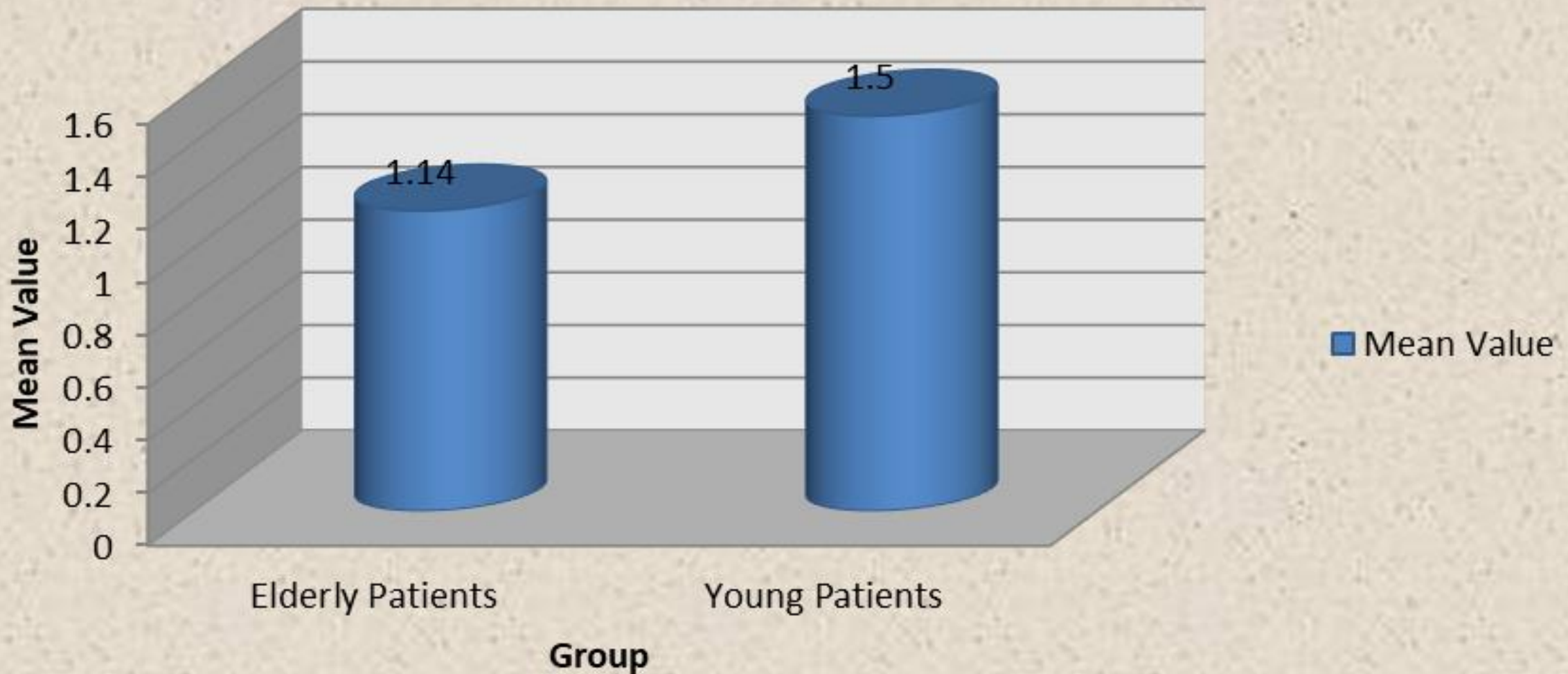


# COMPARISON OF MEAN E:I RATIO BETWEEN ELDERLY PATIENTS AND YOUNG PATIENTS

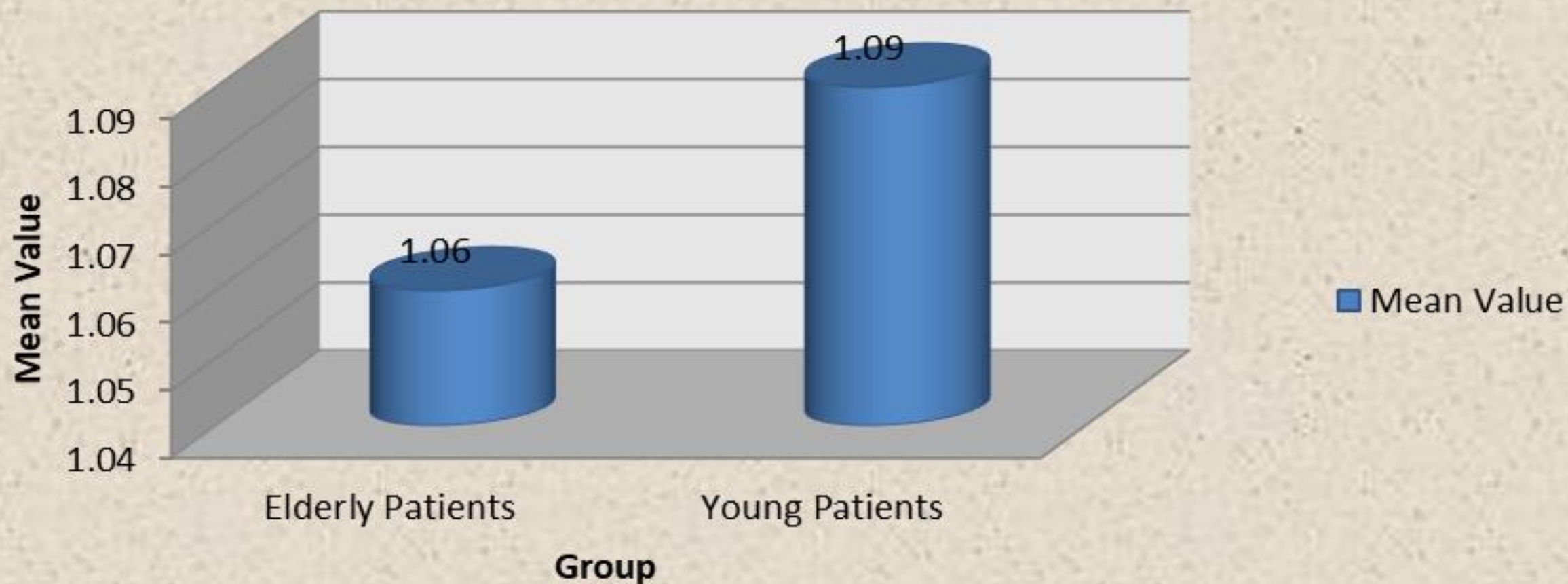




# COMPARISON OF VALSALVA VR BETWEEN ELDERLY PATIENTS AND YOUNG PATIENTS

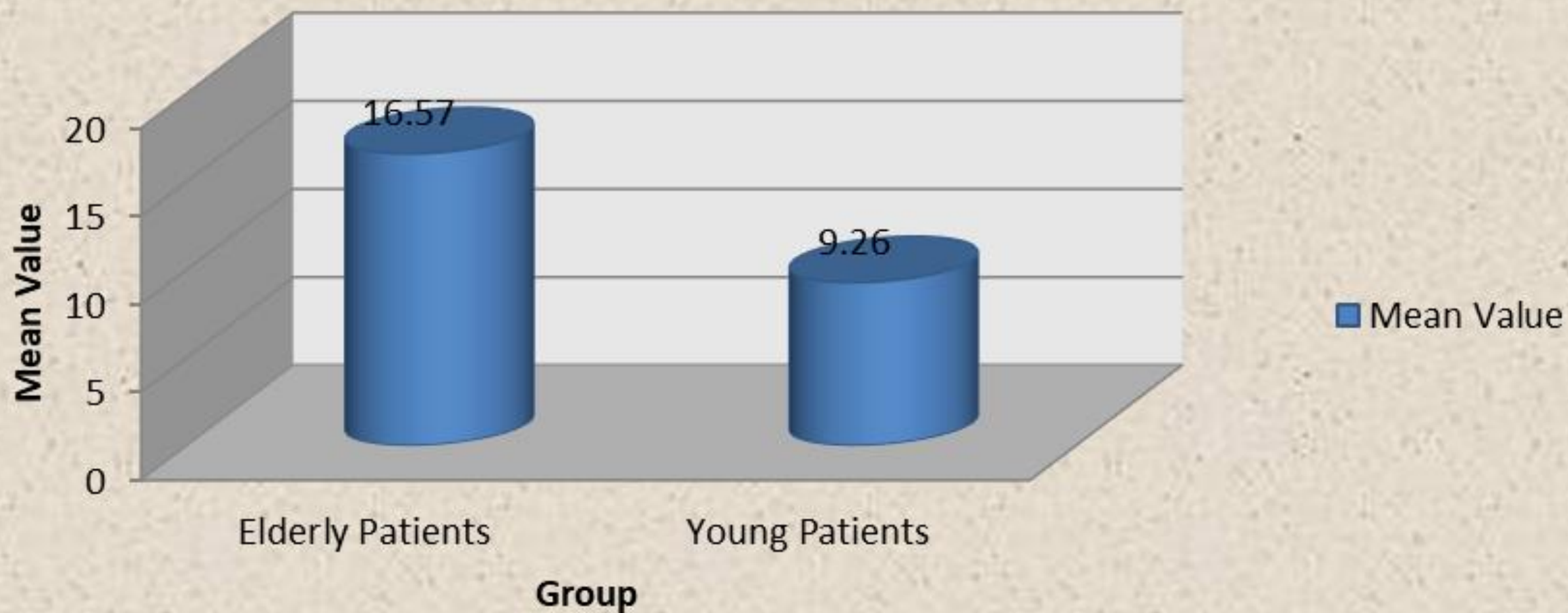


# COMPARISON OF STANDING HEART RATE BETWEEN ELDERLY PATIENTS AND YOUNG PATIENTS

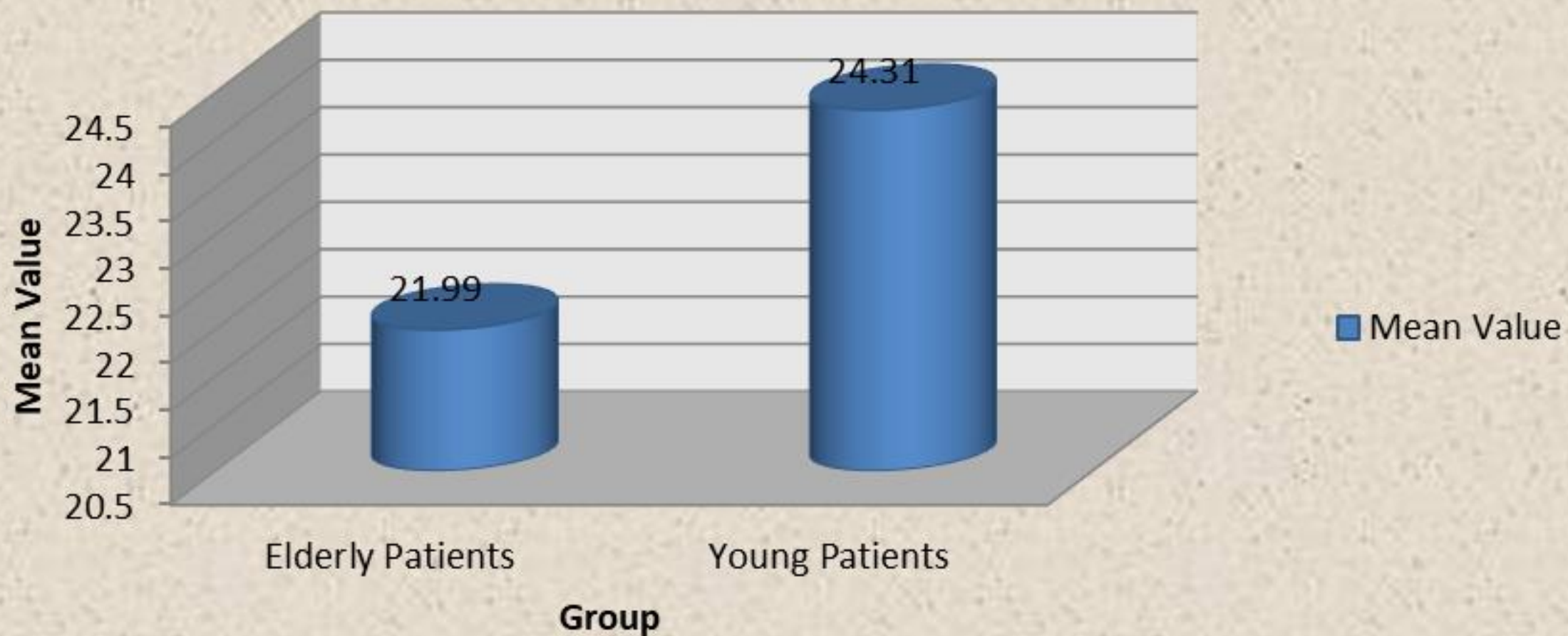




# COMPARISON OF CHANGE IN SYSTOLIC BLOOD PRESSURE (RESTING-STANDING) BETWEEN ELDERLY AND YOUNG PATIENTS

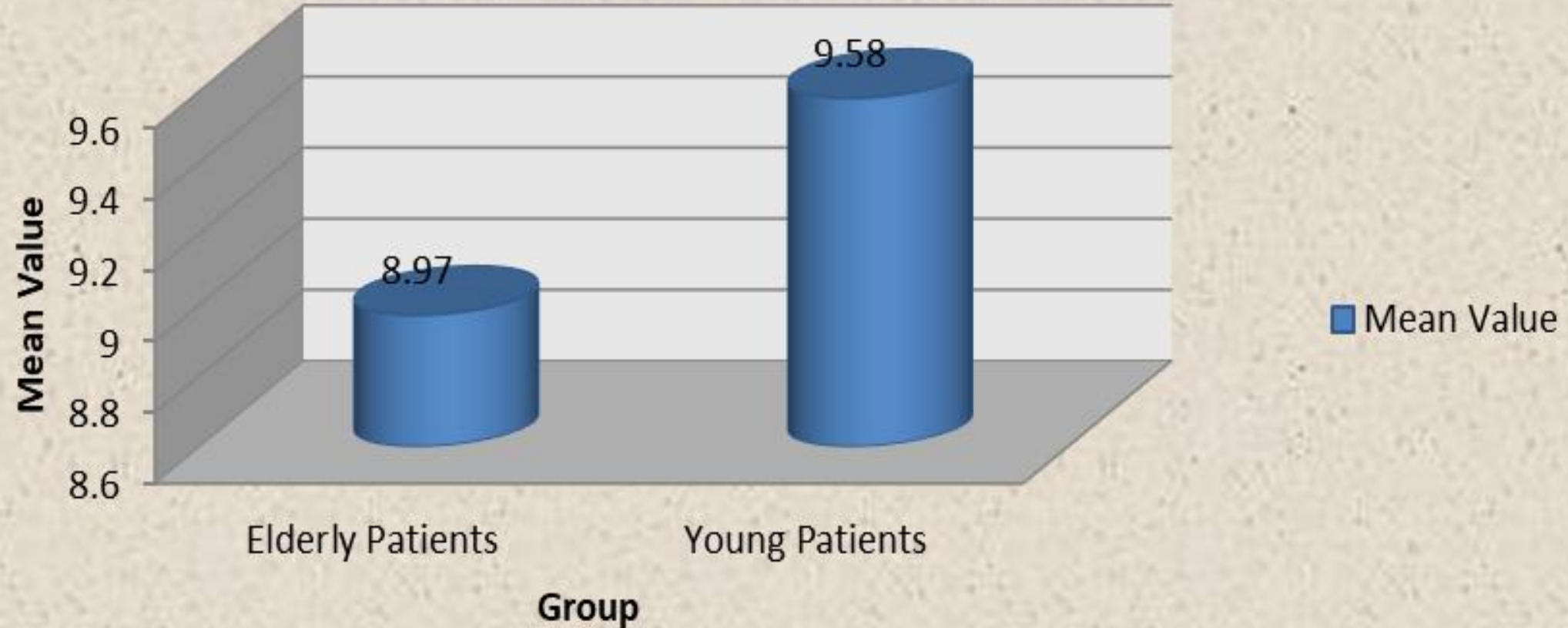


# COMPARISON OF MEAN CHANGE IN HEART RATE AT HANDGRIP IN COMPARISON TO RESTING BETWEEN ELDERLY AND YOUNG PATIENTS





# COMPARISON OF MEAN CHANGE IN DIASTOLIC BLOOD PRESSURE AT COLD PRESSOR IN COMPARISON TO RESTING DIASTOLIC BLOOD PRESSURE BETWEEN ELDERLY AND YOUNG PATIENTS



# Discussion

- Findings in our study were s/o-
- **Significant reduction in cardio vagal response** (best assessed by HR response to standing, deep breathing & Valsalva manoeuvre) with  $p < 0.001$
- **Significant reduction in adrenergic response** (best assessed by BP response to immediate standing & blood pressure response to Valsalva maneuver) with  $p < 0.001$  in elderly
- Impaired vagal control of heart rate with increasing age.
- **Mild derangement of spoon test** in some individuals of older age group which were statistically significant.
- Similar pattern was seen in other studies as well.

# Conclusion

- In our study we observed that age related ANS dysfunction was significant statistically.
- This has profound implications like -
- Significant number of aged are likely to have a varying degree of ANS dysfunction, should be kept by clinicians when ***planning treatment***.
- The house design should be ***elder-friendly***. Well lit rooms, slip-resistant floors, and safe stairs.

- Handrails on both sides of the staircase and in the toilet can prevent a fall.  
As they are prone to ***“FALLS”***
- Education to the elderly and their caregivers is a must to be in airy cool shaded places in summers as the sudomotor function is not optimal in the aged.
- As they are prone to ***“HEAT STROKE”***
- One should consider when prescribing drugs that can cause hypohydrosis  
e.g.- anticholinergic agents.



- Over time the **demographic profile has changed** and thanks to better health care and **longevity** we have now *more elderly* among us.
- Awareness of age-related problems is the need of the day for the society as a whole and
- ANS related issues need the attention of healthcare professionals

# References

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