



**ORIGINAL RESEARCH PAPER**

**Physiology**

**IMPACT OF SERUM CHOLESTEROL ON AUTONOMIC FUNCTIONS OF HEART IN GERIATRIC POPULATION.**

**KEY WORDS:** HRV, Geriatric, cholesterol, autonomic nervous system

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**ABSTRACT**

There is very well established association between heart rate variability and heart diseases related mortality and morbidity. Sympathetic activity increases and parasympathetic activity decreases whenever there is decrease in autonomic modulation of heart. These changes are seen in population with increased cholesterol and in other diseases. The aim of the present study is to probe the relation between HRV and cholesterol in geriatric population and effect of sympathetic and parasympathetic stimulation on ANS in them.

**Material And Methods:** Serum cholesterol of 27 subjects was less than 200 are grouped as group1 and remaining 18 whose cholesterol was above 200 are grouped as group2, when HRV of these two groups analyzed.

**Discussion:** In geriatric population HRV of subjects with high cholesterol was higher than those with less cholesterol during normal 5 minutes recording of HRV in our study. This finding is not significant in our study. During deep breathing and cold pressor test, subjects with lower cholesterol had higher HRV compared to those with higher cholesterol levels.

**Conclusion:** In geriatric population, cardiac health is better in population with lower cholesterol levels and they have a better autonomic response to both sympathetic and parasympathetic stimulation. Treating geriatric population with lipid lowering drugs may help them to improve their cardiac health.

**INTRODUCTION:**

There is very well established association between heart rate variability and heart diseases related mortality and morbidity. <sup>(1,2,3,4)</sup> Sympathetic activity increases and parasympathetic activity decreases whenever there is decrease in autonomic modulation of heart <sup>(5)</sup>. These changes are seen in population with increased cholesterol and in other diseases <sup>(1,2,3,4,5,6)</sup>.

Present data shows, HRV decreases with increased cholesterol in patients with or without coronary artery disease. When these patients treated with lipid lowering drugs there in an improvement in autonomic activity. <sup>(6,7,8)</sup>

The aim of the present study is to probe the relation between HRV and cholesterol in geriatric population and effect of sympathetic and parasympathetic stimulation on ANA in them.

**MATERIAL AND METHODS**

This study was conducted in LITTLE SISTER OLD AGE HOME in Nantoor circle, Mangalore. There are about 47 old aged inmates in the age group 55 to 85 years attended the study voluntarily. Among them 14 were men and 33 were women.

A detailed clinical history of these subjects was taken. Relevant past history, family history, any drug history, personal history like smoking, alcoholism occupational history etc, were also taken. General physical examination, vital signs, complete systemic examination was done.

**Inclusion Criteria**

1. Subjects between age group 55 to 85 years.
2. Can follow instructions.
3. Healthy, doing their routine work by themselves.

**Exclusion Criteria**

- 1 History of respiratory disease.
- 2 History of neurological disease.
3. Atrial fibrillation.
4. Congestive cardiac failure.

5. Acute MI or unstable angina.
6. Frequent Ectopics .
7. Inability to undergo deep breathing test.
8. Inability to undergo cold pressor test.

Subjects on anti-diabetic therapy regardless of duration and Diabetes under control were included in study.

**List Of Parameters Studied**

- 1) Age
- 2) Sex
- 3) Blood investigations
  - Serum Cholesterol in mg/dl (by cholesterol oxidase method <sup>(1)</sup>).
  - Serum HDL<LDL
- 4) Heart rate Variability

**MEASUREMENT OF HRV**

- 1)Material used in the study was ECG appliances with Jelly & electrode.
- 2)Digital data Acquisition system
- 3)HRV soft 1.1 VERSION, AIIMS, NEW DELHI.

A high quality ECG recording was taken under standardized condition to minimize artifacts. The ECG signal is first analogally recorded & then digitally converted. Analysis of this in the time domain & frequency domain was done using 1.1 VERSION, AIIMS, NEW DELHI software.

Recording was done in the morning between 8.30 to 9.30am in a cool room temperature of 20 to 28 degree Celsius after breakfast. They were requested to come in a relaxed condition & quiet mood.

The room was darkened & without acoustic disturbance. They were instructed to be relaxed and to breathe spontaneously at their own rate the procedure was explained to the subject.

After a resting period, the subjects ECG was recorded in

the supine position during normal breathing for 5 min . After this a break of 2min was given .Then the next ECG recording was taken during deep breathing for 1 min, the procedure as follows.

The subject was asked to inspire for the first 5 seconds from the count of 1 to 5 and expire the next 5 seconds from the count of 5 to 1. This recording was taken for 6 such cycles I.e. one min.

**Cold pressor test-**The subjects were asked to keep one hand till wrist joint in an ice cold box for 1 min, during that time the ECG were recorded.

**Statistics**

The statistical analysis was done by using ANOVA (Analysis of variance), student's unpaired T test, Mannwhitney U test,Tukey's Test.

P value was taken as significant at 5 percent confidence level(p<0.05).

**RESULTS**

**EFFECT OF TOTAL CHOLESTEROL AND HRV**

Serum cholesterol of 27 subjects was less than 200 are grouped as group1 and remaining 18 whose cholesterol was above 200 are grouped as group2, when HRV of these two groups analyzed. During normal condition SDANN, LF and HF was high in subjects with high cholesterol, whereas when sympathetic and parasympathetic system was activated by cold pressor test and deep breathing technique, SDANN, LF and HF was more in subjects with cholesterol less than 200mg/dl.These changes were not statistically significant.

Total cholesterol vs SDANN

GROUP	TCHOL1	N	Mean	Std. Deviation	Z
Normal	SDANN <=200	27	11.0667	6.01689	1.20500
	>200	18	15.1578	11.03473	
Deep breathing	SDANN <=200	28	19.3414	15.37748	.04500
	>200	18	18.1978	13.14058	
cold presur	SDANN <=200	26	16.3019	14.13382	.43000
	>200	18	12.8350	7.89499	

Total cholesterol vs LF

GROUP	TCHOL1	N	Mean	Std. Deviation	Z
Normal	LF <=200	27	25.5604	12.53581	.20900
	>200	18	26.0506	13.14283	
Deep breathing	LF <=200	28	71.2111	20.86720	.83300
	>200	18	63.6956	27.45528	
cold presur	LF <=200	26	46.6977	20.31203	.23900
	>200	18	44.8489	26.78475	

Total cholesterol vs HF

GROUP	TCHOL1	N	Mean	Std. Deviation	Z
Normal	HF <=200	27	30.6830	22.70575	.51000
	>200	18	35.1850	25.83044	
Deep breathing	HF <=200	28	16.9614	17.52532	1.10300
	>200	18	27.4039	26.51277	
cold presur	HF <=200	26	39.2515	20.76136	.39400
	>200	18	44.4211	32.54146	

**DISCUSSION:**

In geriatric population HRV of subjects with high cholesterol was higher than those with less cholesterol during normal 5 minutes recording of HRV in our study. This finding is not significant in our study. During deep breathing and cold pressor test, subjects with lower cholesterol had higher HRV compared to those with higher cholesterol levels.

Study by Kupari et al<sup>(10)</sup>, showed that HRV increases with decreased LDL cholesterol which was statistically significant. This study had 88 healthy adults. In our study, during normal condition this association was observed which was statistically insignificant, our group was geriatric population.

A study by Christensen et al., high cholesterol was inversely associated with HRV in men with and without heart disease<sup>(6)</sup>. In our study when subjects were given parasympathetic stimulation in the form of deep breathing and sympathetic stimulation in the form of cold pressor test showed increased

HRV, SDANN, LF and HF. This may be due to better sympatho-vagal balance in patients with normal cholesterol and better cardiac health in this group of geriatric population. Treating geriatric population with lipid lowering drugs may improve their cardiac health and autonomic activity of heart. In a study by Melenovsky et al.,<sup>(7,8)</sup> showed treatment with statins will improve the cardiac health by improving cardiac autonomic activity.

**CONCLUSION**

In geriatric population, cardiac health is better in population with lower cholesterol levels and they have a better autonomic response to both sympathetic and parasympathetic stimulation.

Treating geriatric population with lipid lowering drugs may help them to improve their cardiac health.

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