"Effect of Age and Sex on the R-R interval in ECG of Healthy Individuals."

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ABSTRACT:

Introduction: With advancing age, degenerative changes occur in heart muscle and its conduction system. Some of the pathways of Pacemaker system may develop fibrous tissue and fat deposits.

Method: Electrocardiogram from 150 apparently healthy adults in the age group of 20 – 80 years , were analyzed using Schiller Cardiovit AT 1,3 channeled ECG machine to study the impact of age and sex on heart rate . R-R interval in lead II was relied upon to calculate the heart rate.

Observations and Results: It was observed that there was highly significant decrease in heart rate with increase in age. The decrease in heart rate was also found when comparing among males and females separately. On comparison between males and females there was higher value of heart rate in females in all age groups with a significant rise in age group 20 – 39 years.

Conclusion: As age increases, vagal tone increases and heart rate decreases. The SA node loses some of its cells. These changes may result in a slightly slower heart rate. The heart rate is slightly higher in females as compared to males due to lower systemic blood pressure and more resting sympathetic tone.

Key words: age, sex, R-R interval.

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INTRODUCTION: Health and lifestyle factors together with the genetic makeup of an individual determine the response to these changes. In India, the absolute size of the aged population is considerable. The influence of age and sex on ECG measurements has been documented from as far back as 1961. (1)

With advancing age, degenerative changes occur in heart muscle and its conduction system. Some of the pathways of Pacemaker system may develop fibrous tissue and fat deposits.. The purpose of the present study was to determine the presence and extent of sex and age differences in heart rate in an adult population.

MATERIALS AND METHODS : The present study has been conducted on 150 healthy individuals (both male and female) in age group of 20-80 years. Individuals found free of any cardiovascular abnormality were taken up for the study. The ECG was recorded in supine position and fasting state.

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These were divided into 3 groups depending upon the age. Careful general physical examination was carried out, particularly cardiovascular examination to exclude any cardiovascular disease.

A conventional 12 lead electrocardiogram was recorded on Schiller Cardiovit AT 1, 3 channeled ECG machine.

Heart rate: Before measuring the heart rate, the whole of the graph was scanned for any evidence of dysrrhythmia. Heart rate was calculated in lead II by measuring the distance between successive R waves in term of seconds.

OBSERVATIONS AND RESULTS: Table 1 and 2 show the distribution of the study participants according to age and sex respectively. Table 3 shows mean and SD of Heart Rate in the three groups A, B and C. The result shows that with increasing age mean heart rate decreases. On using ANOVA test, F value comes out to be 13.41, which shows HS inter-group difference ($p<0.01$).On comparing group A with B, t value is 0.63 which is NS ($p>0.05$), A with C t value is 4.71 which is HS ($p<0.01$) and on comparing B with C the difference is again HS ($p<0.01$), with t value of 4.23.

Table 4 shows mean and SD of Heart Rate in males of the three groups A, B and C. The result shows that with increasing age mean heart rate decreases. On using ANOVA test, F value comes out to be 6.78 which shows HS inter-group difference among males ($p<0.01$).On comparing group A with B, t value is 0.04, which is NS ($p>0.05$). On comparing group A with C, t value is 3.31 which is HS ($p<0.01$) and on comparing

group B with C, the difference is S ($p<0.05$), with t value of 2.83.

Table 5 shows mean and SD of Heart Rate in females of the three groups A, B and C. The result shows that with increasing age mean heart rate decreases. On using ANOVA test, F value comes out to be 5.44 which shows HS inter-group difference among females ($p<0.01$).On comparing group A with B, t value is 1.42 which is NS ($p>0.05$). On comparing group A with C, t value is 3.09 which is HS ($p<0.01$) and on comparing group B with C, t value is 2.15 which is S ($p<0.05$).

Table 6 shows comparison of Heart Rate between males and females of the three groups .On comparing males and females of group A, statistical analysis shows result to be S ($p<0.05$) with t value of 2.32 and females showing a higher heart rate. On comparison of Heart rate between males and females of groups B and C, the result comes out to be NS ($p>0.05$) with t value of 0.89 and 1.10 respectively.

Table 7 shows comparison of SBP between males and females of the three groups. On comparing males and females of groups A and B, statistical analysis shows result to be NS ($p>0.05$) with t value of 0.07 and 0.19 respectively. On intersex comparison of group C, the result comes out to be HS ($p<0.001$) with t value of 4.29 with males having a higher value.

In the present study, it was observed that there was highly significant decrease in heart rate with increase in age. The decrease in heart rate was also found when comparing among males and females separately. On comparison between males and females there was higher value of heart rate in females in all age groups with a significant difference in age group 20 – 39 years.

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Table 1 –DISTRIBUTION ACCORDING TO AGE

Group A (20-39)			Group B (40-59)			Group C (60-80)		
Range	No.	% age	Range	No.	% age	Range	No.	% age
20-24	19	38	40-44	5	10	60-64	12	24
25-29	9	18	45-49	22	44	65-69	11	22
30-34	7	14	50-54	16	32	70-74	13	26
35-39	15	30	55-59	7	14	75-80	14	28
Total	50	100	Total	50	100	Total	50	100
Mean±SD	27.84±6.73		48.32±4.27			69.4±6.50		

Table 2 – DISTRIBUTION ACCORDING TO GENDER

Group	Male		Female		Total	
	No.	% age	No.	% age	No.	% age
A	28	56	22	44	50	100
B	19	38	31	62	50	100
D	33	66	17	34	50	100

Table 3 - SHOWING MEAN +/- SD OF HEART RATE (beats/ min) IN THE THREE AGE GROUPS

Group	No.	Range	Mean±SD
A	50	58-125	90.56±18.23
B	50	60-125	88.34±16.90
C	50	50-115	73.96±16.90

Statistical Analysis

	A vs B	A vs C	B vs C	F value
't' value	0.63	4.71	4.23	13.41
'p' value	>0.05	<0.01	<0.01	<0.01
Sig.	NS	HS	HS	HS

Table - 4 SHOWING COMPARISON OF HEART RATE (beats / min)AMONG MALES OF THE THREE AGE GROUPS

Group	No.	Range	Mean±SD
A	28	58-125	85.39±16.33
B	19	60-125	85.57±17.52
C	33	50-100	71.90±15.32

Statistical Analysis

	A vs B	A vs C	B vs C	F value
't' value	0.04	3.31	2.83	6.78
'p' value	>0.05	<0.01	<0.05	<0.01
Sig.	NS	HS	S	HS

Table - 5 SHOWING COMPARISON OF HEART RATE (beats / min) AMONG FEMALES OF THE THREE AGE GROUPS

Group	No.	Range	Mean±SD
A	22	63-125	97.13±18.75
B	31	65-125	90.03±16.71
C	17	50-115	77.94±19.63

Statistical Analysis

	A vs B	A vs C	B vs C	F value
't' value	1.42	3.09	2.15	5.44
'p' value	>0.05	<0.01	<0.05	<0.01
Sig.	NS	HS	S	HS

Table - 6 SHOWING COMPARISON OF HEART RATE (beats / min) BETWEEN MALES AND FEMALES OF THE THREE AGE GROUPS

Group	Sex	No.	Range	Mean±SD	't'	'p'	Sig.
A	M	28	58-125	85.39±16.33	2.32	<0.05	S
	F	22	63-125	97.13±18.75			
B	M	19	60-125	85.57±17.52	0.89	>0.05	NS
	F	31	65-125	90.03±16.71			
C	M	33	50-100	71.90±15.32	1.10	>0.05	NS
	F	17	50-115	77.94±19.63			

Table 7 : COMPARISON OF SYSTOLIC BLOOD PRESSURE

BETWEEN MALES AND FEMALES OF THE THREE GROUPS

Group	Sex	No.	Range (mmHg)	Mean±SD (mmHg)	't'	'p'	Sig.
A	M	28	110-124	115.28±4.65	0.07	>0.05	NS
	F	22	110-126	115.18±4.80			
B	M	19	110-130	119.28±4.65	0.19	>0.05	NS
	F	31	110-130	119.61±5.57			
C	M	33	110-140	129.81±8.05	4.29	<0.001	HS
	F	17	110-130	120.00±6.78			

DISCUSSION: In this study, 150 healthy individuals (both male and female) in age group of 20 -80 years were physiologically analyzed on the basis of electrocardiographic heart rate. Changes in heart rate with age and gender were noted and statistically analyzed. The conclusion of the present study was compared with those of previous studies and results were drawn. Studies in the past with similar outcome were reported by Gsell et al (1987) (2), Choo et al (1987) (3), Reardon and Malik (1996) (4).

The difference in heart rate between males and females was identical to the results of various studies by Macfarlane et al (1994) (5), Michelucci et al (2002)(6) and Wu et al (2003) (7).Cugini et al (2002) (8) suggested that the biological clocks regulating the heart rate circadian rhythm in human beings undergo a resetting of their mechanisms of tonic, amplitude and phasic modulation as a function of age. He explained this to be the mechanism for bradycardia that is associated with aging process. Varlamova and Evdokimov (2003) (9) observed elongation of the R-R interval in ECG of men and women with aging. Devkota et al (2006) (10) while studying ECG recordings from 171 healthy subjects above 60

years, observed sinus bradycardia in 31 (18.1%) subjects.

The heart rate is slightly higher in females as compared to males due to lower systemic blood pressure and more resting sympathetic tone. In the present study although there was no significant difference in BP in age group of 20-39 years(as seen from Table 7), yet the heart rate was significantly higher in females in the same age group. Thus resting sympathetic tone is an important determinant of heart rate in this age group.

REFERENCES:

1. Macfarlane PW. Age, sex, and the ST amplitude in health and disease. J Electrocardiol 2001;34(Suppl):235-41.

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2. Gsell O, Bruckner R, Burckhardt D, Hugenschmidt F, Monnier M. Longitudinal aging research over 20 years. Electrocardiogram, blood pressure, body weight, pulse wave velocity, accommodation latitude and retinal arteries of the eye. Z Gerontol 1987;20(3):141-5.

3. Choo MH, Lau C, Phoon WO, Chia BL. Electrocardiographic findings in 204 residents of homes for the aged. Ann Acad Med Singapore 1987;16(1):84-7.

4. Reardon M, Malik M. QT interval change with age in an overtly healthy older population. Clin Cardiol 1996;19(12):949-52.

5. Macfarlane PW, McLaughlin SC, Devine B, Yang TF. Effects of age, sex and race on ECG interval measurements. J Electrocardiol 1994;27(Suppl):14-9.

6. Michelucci A, Mortara D, Lazzeri C, Barletta G, Capalbo A, Badia T et al. Simultaneous assessment of electrocardiographic parameters for risk stratification: validation in healthy subjects. Ital Heart J 2002;3(5):308-17.

7. Wu J, Kors JA, Rijnbeek PR, Van Herpen G, Lu Z, Xu C. Normal limits of the electrocardiogram in Chinese subjects. Int J Cardiol 2003;87(1):37-51.

8. Cugini P, De Rosa R, De Laurentis T, Tamura K. Age –related trend in circadian rhythm of electrocardiographic sinusal R-R intervals in clinically healthy subjects. Clin Ter 2002;153(2):93-7.

9. Varlamova NG, Evdokimov VG. Age markers on EKG. Adv Gerontol 2003;11:76-9.

10. Devkota KC, Thapamagar SB, Bista B, Malla S. ECG findings in elderly. Nepal Med Coll J 2006;8(2):128-32.