Influence of age and regular exercise on blood pressure in male subjects

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Abstract

Background: Both cross-sectional and longitudinal epidemiological studies have shown that sedentary life style elevates blood pressure and increased risk of hypertension and pre-hypertension among subjects with sedentary lifestyle. Sedentary life style increase the propensity to age related diseases and premature deaths. Inactivity may diminish life expectancy not only by predisposing to age related diseases but also it may influence the aging process itself by oxidative stress.

Methods: 100 male healthy sedentary and non-sedentary subjects in the age group of 25-55 years were selected randomly from the general population of Gadag city. Depending upon the age, subjects were divided into three groups for analysis. Blood pressure was recorded and compared between three groups.

Results: Statistically significant increase in blood pressure in sedentary subjects and also in group two and three compared to group one which shows age factor is also important in developing hypertension.

Key words: Age, Blood pressure, Exercise.

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Introduction

A sedentary life style increases the incidence of age-related diseases and premature deaths. Inactivity may diminish life expectancy not only by predisposing to age-related diseases, but also it may influence the aging process itself by oxidative stress.[1]

A study was conducted on 190 healthy male subjects both sedentary and trained athletes and the influence of age, height, weight and athletic training on the maximal heart rate was examined. It was found that athletes had a slightly but significantly slower maximal heart rate than the untrained men and no significant influence of height or weight on this relationship was detected.[2]

Regular exercise has been reported to lower the blood pressure in young adults with essential hypertension. Older hypertensive subjects experienced smaller reduction in BP than their younger counterparts.[3]

High blood pressure (SBP) occurs more frequently both among men and boys than among women and girls.[4]

Those individuals whose life style involves the most hours of sedentary activity like use of computers along with the additional stress due to jobs, have upto a 50% higher risk of developing hypertension".[5]

Systolic, diastolic blood pressure and triglyceride levels were highest in sedentary subjects.[6]

Sedentary normotensive have 20–50% higher risk of developing hypertension than individuals who physical exercise regularly.[7]

Materials and Methods

The present study was conducted in the department of Physiology, GIMS Medical College, Gadag. The study was undertaken to analyze the differences in blood pressure parameters between healthy sedentary and non-sedentary subjects in the age group of 25-55 years. 100 healthy sedentary subjects and healthy 100 non-sedentary male subjects were selected from the general population of Gadag city randomly. All the subjects gave consent after explaining the procedure of the non-invasive technique to them. A brief personal history, childhood obesity, detailed history of exercise and a clinical examination of all the systems were done to exclude medical problems and to prevent confounding of results. Before recording the blood pressure the subject was asked to relax physically and mentally for 30 minutes.

Blood Pressure Measurement (BP in mm Hg): Blood pressure was recorded with a mercury sphygmomanometer, in supine position in the right upper limb by auscultatory method. Similarly, three readings were taken at an interval of 15 minutes each and an average of the three values calculated. Pulse Pressure (PP) was calculated by Systolic Blood Pressure (SBP) minus Diastolic Blood Pressure (DBP). The Mean Arterial Pressure (MAP) was calculate by (MAP=DBP+1/3PP).

Table 1: Age-wise distribution of subjects

Age groups (years)	Sedentary	Non-sedentary
Group – I (26-35 years)	27	20
Group – II (36-45 years)	40	38
Group – III (46-55 years)	33	42
Total cases	**100**	**100**

Statistical analysis: The results were given as Mean ± Standard Deviation and range values. Comparisons were made between sedentary and non-sedentary subjects and for different age groups. Student's t-test (Unpaired) was used for comparisons between the groups. A p-value of 0.05 or less was considered as statistical significant.

Results

Blood pressure (mmHg): The Mean systolic blood pressure (mm of Hg) in sedentary subjects was 133.8 ± 7.2 and in non-sedentary subjects was 122.3 ± 8.7. There was statistically significant increase in systolic blood pressure in sedentary subjects when compared to non-sedentary subjects.

The Mean diastolic blood pressure (mm of Hg) in sedentary subjects was 87.5 ± 5.1 and in non-sedentary subjects was 77.9 ± 6.6. There was statistically significant increase in diastolic blood pressure in sedentary subjects when compared to non-sedentary subjects.

Table 2: Comparison of blood pressure between sedentary and non-sedentary subjects

Groups		SBP (mm of Hg)		DBP (mm of Hg)		PP (mm of Hg)		MAP (mm of Hg)	
	n	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Sedentary	53	110-140	133.8 ±7.2	60-90	87.5 ±5.1	30-60	46.3 ±5.4	76.7 - 106.7	102.9 ± 5.3
Non-sedentary	42	100-140	122.3 ±8.7	60-88	77.9 ±6.6	30-60	44.3 ±7.4	76.0 – 05.3	92.7 ± 6.5
Mean difference		11.5		9.6		2.0		10.2	
Significance	**t**	7.09		7.93		1.50		8.44	
	p	**< 0 .001, HS**		**< 0 .001, HS**		**0.14, NS**		**< 0 .001, HS**	

Analysis for all parameters done by unpaired 't' test.
HS- Highly significant, S- Significant, NS- Not significant.

Comparison of age related changes in blood pressure between sedentary and non-sedentary subjects (Table 3)

In sedentary subjects in Group-I the Mean SBP (mm of Hg) was129.7±9.4; in Group-II the Mean SBP (mm of Hg) was 135.5 ± 4.3; in Group-III the Mean SBP (mm of Hg) was 134.9±7.I

In non-sedentary subjects in Group-I the Mean SBP (mm of Hg) was 116.0 ± 5.5; in Group-II the Mean SBP (mm of Hg) was 122.0 ± 8.7; in Group-III the Mean SBP (mm of Hg) was 125.1 ± 8.7.

There was statistically significant increase in Mean SBP (mm of Hg) of sedentary subjects when compared to non-sedentary subjects in all the groups.

In sedentary subjects in Group-I the Mean DBP was 84.3 ± 8.3; in Group-II the Mean DBP was 88.6 ± 2.8; in Group-III the Mean DBP was 88.8 ± 2.5.

In non-sedentary subjects in Group-I the Mean DBP was 78.4 ± 4.8; in Group-II the Mean DBP was 77.3 ± 7.1; in Group-III the Mean DBP was 79.1±6.7.

There was statistically significant increase in DBP of sedentary subjects in Group-II and Group-III when compared to non-sedentary subjects of the same age groups. The Mean DBP in Group-I was slightly increased in sedentary male subjects compared to non-sedentary male subjects of the same age group.

Table 3: Age related changes in systolic blood pressure between sedentary and non-sedentary subjects

Age group (yrs)	Sedentary			Non – Sedentary			Significance	
	N	Sex	Mean ± SD(mmHg)	n	Sex	Mean ± SD(mmHg)	t	P
Group-I (26-35 yrs)	14	Male	129.7 ± 9.4	05	Male	116.0 ± 5.5	3.91	< **0.01, S**
Group-II (36-45 yrs)	21	Male	135.5 ± 4.3	24	Male	122.0 ± 8.7	6.73	< **0.001, HS**
Group-III (46-55 yrs)	18	Male	134.0 ± 7.1	13	Male	125.1 ± 8.7	3.33	< **0.01, S**
Total No. of Cases	**53**			**42**				

Analysis for all parameters done by unpaired 't' test.
HS-Highly significant, S- Significant, NS- Not significant.

Table 4: Age related changes in diastolic blood pressure between sedentary and non–sedentary subjects

Age group (yrs)	Sedentary			Non - Sedentary			Significance	
	N	Sex	Mean ± SD(mmHg)	N	Sex	Mean ± SD(mmHg)	t	P
Group-I (26-35 yrs)	14	Male	84.3 ± 8.3	05	Male	78.4 ± 4.8	1.91	**0.08, NS**
Group-II (36-45 yrs)	21	Male	88. 6 ± 2.8	24	Male	77.3 ± 7.1	7.23	< **0.001, HS**
Group-III (46-55 yrs)	18	Male	88.8 ± 2.5	13	Male	79.1 ± 6.7	4.97	< **0.01, S**
Total No. of Cases	**53**			**42**				

Analysis for all parameters done by unpaired 't' test
HS-Highly significant, S- Significant, NS- Not significant.

Discussion

In our study there was an increase in both systolic and diastolic blood pressure in sedentary subjects when compared to non-sedentary subjects.

In sedentary subjects the Mean SBP was increased by 11.4 mm of Hg and DBP was increased by 9.5 mm of Hg.

Physical inactivity decreases the production of Nitric Oxide (NO) by the abnormal endothelium, which leads to changes in vessel diameter leading to vascular structural changes which results in hypertension.[8]

Regular aerobic exercise can prevent the age-associated loss in endothelium-dependent vasodilation and restore levels in previously sedentary middle aged and older healthy men. This may represent an important mechanism by which regular aerobic exercise lowers the risk of cardiovascular disease in this population[9].

Regular physical activity appears to slow the normal loss of elasticity and compliance in the human cardiovascular system and can reverse some of the age-related declines in arterial stiffness[10].

The enhanced acetylcholine-induced decrease in systemic blood pressure following regular daily exercise is primarily due to the augmented synthesis of nitric oxide in the endothelium of peripheral vasculature. This change in the function of endothelium could be important in the adaptation of circulation to exercise training[11]

Regular aerobic exercise both attenuates the age-associated decline in cardiovagal BRS, and partially restores the loss of cardiovagal BRS in previously sedentary middle-aged and older healthy men. This could have important physiological implications for the maintenance of myocardial electrical stability and/or control of arterial blood pressure in older adults[12].

Similar findings were reported by multiple studies, Arakawa E[13], WHO Expert committee report[43], Sherma DL[15], Lester M et al.[16], Gupta SP et al.[17], Nippon Eiseiga Zasshi[18], Laurie Barclay.[19], Juan J Antonio CL.et al.[20]

Conclusion

The conclusions of our study are:-

Both SBP and DBP were increased in sedentary subjects. Both SBP and DBP were increased as the age advances both in sedentary and non-sedentary subjects but statistically significant increase was seen only in sedentary subjects.

Further research is recommended to understand how genes and gene-environment interaction leads to

changes in blood pressure. A better understanding of ethnic/racial differences in the development and progression of various complications in sedentary lifestyle is needed. Hormonal assay and lipid profile estimation along with fat parameters would have given a better understanding about sedentary life style and its consequences. We need to evaluate the strategies and efficacy of physical activity in various diseases.

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Conflict of interest: NA

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