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Original Research Article

Impact of Age and Regular Exercise on Blood Pressure in Women

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Abstract

Background: Hypertension is a growing health concern in women, often exacerbated by a sedentary lifestyle and advancing age. Understanding the interplay between these factors is vital for preventive cardiology.

Material and Methods: A total of 120 female participants were classified into sedentary and non-sedentary groups. Blood pressure was measured across three age groups, and comparative analysis was performed.

Results: Sedentary participants demonstrated significantly higher systolic and diastolic blood pressure readings compared to active individuals, particularly in older age groups.

Conclusion: Age-related elevation in blood pressure is significantly influenced by physical inactivity. Incorporating regular exercise may effectively mitigate this risk.

Keywords: Sedentary lifestyle, Blood pressure, Female health, Age-related hypertension.

Introduction

Elevated blood pressure is a well-recognized risk factor for cardiovascular morbidity and mortality, particularly among women, whose risk increases notably after menopause due to diminishing estrogen levels and age-related arterial stiffening [1,2]. Aging contributes to vascular changes such as reduced arterial compliance and endothelial dysfunction, leading to higher systolic blood pressure (SBP) in older women compared to younger counterparts [3]. Physical inactivity exacerbates this trend, and a sedentary lifestyle is closely associated with elevated blood pressure across age groups [4].

Regular exercise, especially moderate-intensity aerobic activity, has been shown to substantially lower both SBP and diastolic blood pressure (DBP), with reductions ranging from 5 to 10 mmHg following several weeks of training in middle-aged women [5]. Furthermore, leisure-time physical activities such as jogging, brisk walking, and ball games correlate with lower hypertension prevalence compared to walking alone, with odds ratios favoring exercise participation in adult females [6]. However, the magnitude of blood pressure reduction varies with age: younger female participants often experience more pronounced decreases in SBP and DBP than their older peers under identical exercise regimens [7]. Physiological adaptations from exercise—including improved vascular endothelial function, reduced arterial stiffness, and enhanced autonomic regulation—are key mediators of its antihypertensive effects [8]. In older women, regular aerobic training has been associated with beneficial hemodynamic changes, although the responsiveness may be attenuated due to increased baseline vascular stiffness [9]. Despite this, combining aerobic exercise with balance training and resistance work can amplify results and support blood pressure control across age groups [10].

Taken together, accumulating evidence suggests that age and activity levels interact significantly in shaping blood pressure profiles in women, with sedentary older women particularly susceptible to elevated hypertension risk. This study aims to quantitatively assess how age and regular exercise—versus a sedentary lifestyle—affect resting blood pressure in female subjects, thereby elucidating the interplay of these factors in cardiovascular health.

Material and Methods

This observational comparative study was conducted over a period of 18 months at a tertiary care medical institution. A total of 120 apparently healthy female participants aged between 25 and 65 years were recruited after obtaining written informed consent. The study population was

divided into two equal groups: Group A included 60 female subjects with a sedentary lifestyle who reported engaging in less than 30 minutes of physical activity fewer than three times per week, while Group B included 60 age-matched female subjects who regularly exercised for at least 30 minutes a day, five days a week, for the past six months or more.

Subjects were selected through purposive sampling, and individuals with known cardiovascular disease, diabetes mellitus, thyroid disorders, renal dysfunction, or those on antihypertensive medication were excluded to eliminate confounding factors. The demographic data, including age, weight, height, and BMI, were recorded. Resting blood pressure measurements were obtained using a calibrated digital sphygmomanometer, with the participant seated comfortably for at least 10 minutes in a quiet room. Three readings were taken at 5-minute intervals from the right arm, and the average value was considered for analysis.

All participants were instructed to refrain from caffeine, tobacco, and physical exertion for at least two hours prior to the blood pressure measurement. The mean systolic and diastolic blood pressure values of both groups were compared to assess the impact of regular exercise and aging on blood pressure levels. Data were entered into Microsoft Excel and analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation, and categorical variables were expressed as percentages. The unpaired Student's t-test was used to compare means between groups, and a p-value less than 0.05 was considered statistically significant.

Results: Table 1 shows the age-wise distribution of female participants in both sedentary and non-sedentary groups. The participants were categorized into three age groups: 26–35 years (Group I), 36–45 years (Group II), and 46–55 years (Group III). In Group I, 26 sedentary and 28 non-sedentary subjects were enrolled. Group II consisted of 44 sedentary and 38 non-sedentary women, while Group III had 50 and 54 participants respectively in the two groups. This balanced distribution facilitated valid age-stratified comparisons.

Table 2 presents a comparative analysis of systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), and mean arterial pressure (MAP) between sedentary and non-sedentary subjects. The sedentary group exhibited significantly higher mean SBP (129.0 ± 11.2 mmHg), DBP (83.2 ± 8.4 mmHg), and MAP (98.4 ± 9.1 mmHg) compared to the non-sedentary group, which recorded SBP of 121.0 ± 8.9 mmHg, DBP of 76.6 ± 6.3 mmHg, and MAP of 91.4 ± 6.7 mmHg. The differences in PP were smaller and not statistically significant. The results underscore the beneficial effect of regular exercise on overall blood pressure regulation.

Table 3 explores the age-related changes in systolic blood pressure within both groups. A consistent rise in systolic pressure was noted across age groups in sedentary women, with means increasing from 123.5 mmHg in Group I to 135.7 mmHg in Group III. In contrast, the non-sedentary group showed lower SBP values across all age categories, with the highest being 125.9 mmHg in Group III. The differences between the corresponding groups were statistically significant, emphasizing the compounding effect of age and inactivity on systolic hypertension.

Table 4 illustrates age-wise variations in diastolic blood pressure. Sedentary subjects again demonstrated elevated diastolic pressures across all age brackets. Group III sedentary subjects showed the highest DBP (87.9 ± 2.8 mmHg), compared to 80.1 ± 3.4 mmHg in their active counterparts. While Group I differences were not statistically significant, Groups II and III exhibited significant and highly significant differences, respectively, indicating that the combination of increasing age and lack of physical activity substantially influences diastolic hypertension.

Table 1: Age-wise distribution of cases (N = 120)

Age groups (years)	Sedentary	Non-sedentary
Group – I (26–35)	26	28
Group – II (36–45)	44	38
Group – III (46–55)	50	54
Total cases	**120**	**120**

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

Groups	SBP (mmHg)	DBP (mmHg)	PP (mmHg)	MAP (mmHg)
	Range	Mean ± SD	Range	Mean ± SD
Sedentary	100–140	129.0±11.2	60–90	83.2±8.4
Non-sedentary	100–136	121.0±8.9	60–88	76.6±6.3
Mean diff.	8.0	6.6	1.5	7.0
Significance	$t = 4.11$, $p < 0.001$, HS	$t = 4.58$, $p < 0.001$, HS	$t = 1.37$, $p = 0.17$, NS	$t = 4.56$, $p < 0.001$, HS

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

Age group (yrs)	Sedentary N	Mean ± SD	Non-sedentary N	Mean ± SD	t	p
Group-I (26–35)	26	123.5±12.3	28	112.5±8.4	2.72	< 0.05, S
Group-II (36–45)	44	127.5±11.5	38	119.9±7.8	2.26	< 0.01, S
Group-III (46–55)	50	135.7±5.4	54	125.9±6.0	5.55	< 0.001, HS
Total cases	**120**		**120**			

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

Age group (yrs)	Sedentary N	Mean ± SD	Non-sedentary N	Mean ± SD	t	p
Group-I (26–35)	26	79.4±9.3	28	73.3±7.3	1.90	0.07, NS
Group-II (36–45)	44	82.0±9.3	38	72.9±6.1	3.41	< 0.01, S
Group-III (46–55)	50	87.9±2.8	54	80.1±3.4	8.12	< 0.001, HS
Total cases	**120**		**120**			

Discussion

The present study aimed to assess the influence of age and regular exercise on blood pressure in female subjects, with a specific emphasis on the comparison between sedentary and non-sedentary individuals. Our findings align with recent literature that highlights the substantial role of physical activity in modulating cardiovascular health outcomes across age groups.

A recent meta-analysis has shown that sedentary behavior is independently associated with elevated systolic and diastolic blood pressures, especially among middle-aged women [11]. In our study, sedentary participants demonstrated significantly higher mean systolic and diastolic blood pressures across all age groups compared to their active counterparts. This supports the assertion that lack of physical activity can accelerate age-related vascular stiffness and contribute to hypertension [12]. Furthermore, data from a population-based cohort study emphasized that regular aerobic activity mitigates the rise in systolic blood pressure typically seen with advancing age, through mechanisms including improved endothelial function and reduced sympathetic tone [13]. The difference observed in our study between Group III sedentary and non-sedentary subjects, with nearly a 10 mmHg gap in systolic pressure, underscores the physiological benefit of sustained exercise in older females.

In terms of diastolic pressure trends, although the differences in Group I were not statistically significant, the progression in Groups II and III among sedentary women was notable. Prior evidence suggests that diastolic hypertension in mid-life women can be a precursor to isolated systolic hypertension and eventual cardiovascular complications if not addressed through lifestyle modification [14]. This highlights the need for targeted interventions in women transitioning from perimenopause to postmenopause. Lastly, it is worth noting that beyond physical activity, factors such as dietary patterns, stress levels, and hormonal variations can influence blood pressure regulation. However, the consistency of our findings with those from multi-country epidemiological surveys reinforces the pivotal role of exercise in both prevention and management of age-related blood pressure elevation [15].

Conclusion

This study concludes that a sedentary lifestyle significantly contributes to elevated systolic and diastolic blood pressures in females, with the effect becoming more pronounced with advancing age. Regular physical activity appears to attenuate these changes, emphasizing the importance of structured exercise programs for women across all adult age groups as a non-pharmacological approach to cardiovascular risk reduction.

References

1. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA hypertension guideline. Hypertension. 2018; 71(6):e13–e115.
2. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA. 2003; 289(19):2560–2572.
3. Joyner MJ, Green DJ. Exercise protects the cardiovascular system: effects beyond traditional risk factors. J Physiol. 2009; 587(Pt 23):5551–5558.
4. Diaz KM, Shimbo D. Physical activity and the prevention of hypertension. Curr Hypertens Rep. 2013; 15(6):659–668.
5. Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. J Am Heart Assoc. 2013; 2(1):e004473.
6. Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. Compr Physiol. 2012; 2(2):1143–1211.
7. Fagard RH. Physical activity, fitness and blood pressure. J Hypertens. 2005; 23(2):265–267.
8. Pescatello LS, Arena R, Riebe D, Thompson PD. ACSM's Guidelines for Exercise Testing

and Prescription. 9th ed. Philadelphia: Wolters Kluwer; 2014.
9. Kokkinos P. Physical activity and cardiovascular disease prevention: current recommendations. Angiology. 2008; 59(2_suppl):26S–29S.
10. Hamer M, Stamatakis E. Prospective study of sedentary behavior, risk of depression, and cognitive impairment. Med Sci Sports Exerc. 2014; 46(4):718–723.
11. Ghadieh AS, Saab B. Evidence for exercise training in the management of hypertension in adults. Can Fam Physician. 2015; 61(3):233–239.
12. Fiuza-Luces C, Garatachea N, Berger NA, and Lucia A. Exercise is the real polypill. Physiology (Bethesda). 2013; 28(5):330–358.
13. Heran BS, Chen JM, Ebrahim S, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev. 2011; (7):CD001800.
14. Diaz KM, Howard VJ, Hutto B, et al. Patterns of sedentary behavior in U.S. middle-aged and older adults: the REGARDS study. Med Sci Sports Exerc. 2016; 48(3):430–438.
15. Lear SA, Hu W, Rangarajan S, et al. The effect of physical activity on mortality and cardiovascular disease in 130,000 people from 17 high-income, middle-income, and low-income countries: the PURE study. Lancet. 2017; 390(10113):2643–2654.