

# The correlation between blood pressure and hot flashes in menopausal women

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## Abstract

**BACKGROUND:** As blood pressure is higher in menopausal women than their peers with similar Body mass index (BMI), and considering hot flashes as one of the most common symptoms of menopause, this study was conducted to examine the 24-hour changes of blood pressure in menopausal women experiencing hot flashes.

**METHODS:** This cross-sectional study was performed on 26 menopausal 47-53 year-old women divided into 2 groups of 13. None of them had a history of internal diseases, hypertension, and hormone medications. Their blood pressure and heartbeat were recorded by a blood pressure Holter for 24 hours. The data was analyzed through student t-test and analysis of variance (ANOVA) using SPSS<sub>11.5</sub>.

**RESULTS:** Systolic blood pressure of the symptomatic group was significantly higher than the asymptomatic group during waking hours ( $P < 0.05$ ). However, the heartbeats and systolic blood pressure of the symptomatic group were higher than those in the other group in 24 hours. This difference was not statistically significant ( $P > 0.05$ ).

**CONCLUSION:** Similar to hot flashes, the increase in systolic blood pressure may arise from central sympathetic activity. Peripheral vasoconstriction and increased cardiac output, both caused by baroreflex dysfunction, might also have been responsible for increments in systolic blood pressure. Therefore, prospective studies are required to determine how the growing increase in blood pressure and the prevalence of hypertension differ in both groups.

**Keywords:** Women, Menopause, Blood Pressure, Hot Flashes.

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## Introduction

Hot flashes are one of the most common unpleasant symptoms during menopausal period whose physiological reason is not exactly identified. They are experienced as a feeling of sudden heat in upper part of the body including the face, neck, chest, and arms. They also involve dilation of blood vessels in the skin and increased heartbeat.<sup>1</sup> Hot flashes usually last 3-5 minutes, but can last up to 20 minutes.<sup>1</sup> Their frequency is changed from 20 times a day to once or twice a week in women. Women experiencing frequent hot flashes follow a circadian rhythm.<sup>1</sup> The peak age for hot flashes is 41-55 years old.<sup>2</sup> Moreover, hot flashes can be caused by systemic diseases, neurological diseases, drinking alcohol, using food additives, and medications.

The risk of cardiovascular diseases increases in menopausal women<sup>3-5</sup> among whom blood pressure increases remarkably around the time of menopause.<sup>4</sup> Whether its risks age or the body mass index (BMI) is still controversial. Alberto Zanchetti studied 18326

women aging 46-59 years old. After matching for age and BMI, he found that blood pressure of menopausal women is significantly, though slightly, higher than that in premenopausal women. He also reported age and BMI not to affect the incidence of hypertension.<sup>6</sup> On the other hand, one may ask if hot flashes, as one of the most common symptoms of menopause, correlate with blood pressure. A study showed a decrease in systolic blood pressure of a woman and an increase in her heartbeat while she was experiencing hot flashes.<sup>7</sup> Another study showed an increase in diastolic blood pressure during hot flashes.<sup>8</sup> Considering the contradictory results of previous studies about the effects of hot flashes on changes in blood pressure, and also women's concerns about hot flashes, this study was conducted to recognize changes in blood pressure while having a hot flash in menopausal women.

## Materials and Methods

In this study, 26 menopausal women were divided

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into 2 equal groups of symptomatic (having hot flashes) and asymptomatic (without hot flashes). Menopause was confirmed if a woman had had her last menstrual period at least one year before the study and luteinizing hormone (LH) and follicle stimulating hormone (FSH) levels higher than 40 µg/ml. The 13 women in the symptomatic group were experiencing hot flashes at least 3 times a day. These women were first given some recommendations in clinics affiliated to Isfahan University of Medical Sciences (Isfahan, Iran) and were then referred to the women's clinic of Cardiovascular Research Center (Isfahan, Iran). Inclusion criteria were the age of 47-53 years old and not having a history of hormonal replacement medications, endocrine and internal diseases, or hypertension.

All eligible women were given a demographic questionnaire by a physician collaborating in the project. Their blood pressure was then measured 5 and 15 minutes after resting in a sitting position using a mercury sphygmomanometer with cuffs suitable for each patient. Women with blood pressure higher than 140/90 mm Hg were excluded from the study. The selected women were studied for 24 hours by a blood pressure Holter (Vista, Novacor, France).

The Holters were attached to women at 11:00 AM one day and detached the next day at the same time. Women's blood pressure and heartbeat were recorded every 10-15 minutes. They were asked to note each hot flash they experienced, and also their daily activities and sleeping hours. If the blood pressure of a participant was not recorded in a 24-hour period, or she did unusual tasks in her daily activities, the Holter was attached to her again. Mean systolic and diastolic blood pressure and mean heartbeats in waking and sleeping hours and also during 24 hours were determined for all participants.

The data was analyzed by student-t and analysis of variance (ANOVA) using SPSS<sub>11.5</sub> at a significance level of  $P < 0.05$ .

## Results

This study was performed on 26 women in two groups of symptomatic and asymptomatic ( $n = 13$  in each group). The mean age, height, and weight of the symptomatic group were  $50.7 \pm 1.9$  years,  $157.7 \pm 4.2$  cm, and  $65.5 \pm 1$  kg, respectively. The corresponding values for the asymptomatic group were  $49.8 \pm 2.1$  years,  $157.6 \pm 7.9$  cm, and  $64.69 \pm 8.1$  kg, respectively. There were not significant differences regarding age, height, and weight between the two groups ( $P > 0.05$ ).

Mean systolic blood pressure of the symptomatic group in waking hours was significantly higher than that in the asymptomatic group ( $P < 0.05$ ), while other changes in blood pressure of both groups were not significantly different. Furthermore, the 24-hour systolic blood pressure of the symptomatic group was significantly higher than that in the asymptomatic group ( $P = 0.05$ ). Mean changes in blood pressure and pulse of the two groups during the night hours were not significantly different. None of the participants experienced hot flashes during the night hours. Mean diastolic blood pressure during the whole 24 hours and during the day hours were higher in symptomatic group compared to the asymptomatic group. However, the difference was not statistically significant ( $P > 0.05$ ) (Table 1).

The study showed that the pulses of the symptomatic group during the day, night, and 24 hours, were slightly higher than those in the other group. However, the differences were again not statistically significant ( $P > 0.05$ ).

**Table 1.** Pulse, systolic and diastolic blood pressure, and mean blood pressure during 24 hours, and the day and night hours in the two studied groups

	Symptomatic group	Asymptomatic group	P
Systolic BP during 24 hours (mmHg)	130.6 ± 4.5	125.7 ± 7.7	0.05
Diastolic BP during 24 hours (mmHg)	78.5 ± 6.6	74.8 ± 5.6	0.15
Mean BP during 24 hours (mmHg)	91.9 ± 5.8	89.3 ± 5.7	0.30
Heartbeats during 24 hours (mmHg)	81.7 ± 6	79.5 ± 6	0.40
Systolic BP during the day hours (mmHg)	133.8 ± 5.4	126.6 ± 7.9	0.01
Diastolic BP during the day hours (mmHg)	81.9 ± 6.2	76.7 ± 6.7	0.06
Mean BP during the day hours (mmHg)	94.2 ± 6.7	90.7 ± 6.4	0.20
Heartbeats during the day hours (mmHg)	83.6 ± 5.9	82.3 ± 6.7	0.60
Systolic BP during the night hours (mmHg)	118.2 ± 6.9	118.7 ± 10.6	0.90
Diastolic BP during the night hours (mmHg)	69.9 ± 7.6	68.3 ± 8.6	0.60
Mean BP during the night hours (mmHg)	83.5 ± 6.9	82. ± 6.8	0.60
Heartbeats during the night hours (mmHg)	74.6 ± 9.9	71.1 ± 6	0.30

BP: Blood pressure

## Discussion

This study showed that during daily activities, systolic blood pressure of the symptomatic group was significantly higher than that in the asymptomatic group. Statistically insignificant differences were also found between the two groups in terms of heartbeat and systolic blood pressure.

Another study examined the 24-hour blood pressure of menopausal women and indicated diastolic blood pressure during the night hours to be higher in the symptomatic group compared to the asymptomatic group. The study also showed that during activities, the heartbeat of the symptomatic group was higher than the other group. However, the nature of hot flashes and their correlation with changes in blood pressure are still not clear. Freedman et al. believed the core body temperature to act as a trigger which increases before the start of hot flashes.<sup>9,10</sup> In other studies, Freedman et al. reported the central sympathetic activity to be more in the symptomatic group compared to the asymptomatic group.<sup>11,12</sup> They also suggested reducing sympathetic activity using clonidine and alpha-2 adrenergic agonist to decrease hot flashes.<sup>12</sup> Moreover, Freedman and Woodward found higher diastolic blood pressure in the symptomatic group compared to the asymptomatic group due to increased central sympathetic activity. However, they did not explain the differences between the two groups in systolic blood pressure and heartbeat.<sup>13</sup> In contrast, the present study showed that systolic blood pressure in the symptomatic group was significantly higher than the other group. A study showed a decrease in systolic blood pressure of a menopausal woman and an increase in her heartbeat during 24 hours, and considered this phenomenon as a result of baroreflex dysfunction. They believed that baroreflex dysfunction caused a peripheral vasoconstriction with a compensatory role which led to increases in heartbeat and heart output (due to the high heartbeat) and raised systolic blood pressure during the day hours. There was not a difference in systolic blood pressure during the night when participants were sleeping.<sup>7</sup>

Although the correlation between increased central sympathetic activity and hypertension has not been exactly determined to date,<sup>14</sup> higher central sympathetic activity, increases mortality and morbidity of hypertension.<sup>15</sup> In addition, increased alpha sympathetic activity early in the morning can be a reason for more cardiovascular complications at this time of the day.<sup>14</sup>

A study in Italy, on 18326 people matched for age and BMI showed that systolic blood pressure in postmenopausal women was higher than in

premenopausal women. Likewise, the present study indicated higher systolic blood pressure in the symptomatic group compared to the asymptomatic group.

Now, the question is whether the symptomatic group would suffer from hypertension in the future, and whether the prevalence of hypertension in this group would be more than that in the other group. A study showed high systolic blood pressure to have a growing trend in more anxious, more often nervous middle-aged men. Moreover, in these men, the increase in systolic blood pressure in reaction to mental stresses had a positive relationship with high systolic blood pressure in the next 10 years.<sup>16</sup>

## Conclusion

Hot flashes and increased systolic blood pressure occur when the sympathetic activity increases. Therefore, prospective studies are required to determine the differences between the two groups in terms of the development and prevalence of hypertension. Finally, doing regular aerobic exercises can help balance blood pressure level or delay the start of hypertension.

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## Conflict of Interests

Authors have no conflict of interests.

## References

1. Moe KE. Hot flashes and sleep in women. *Sleep Med Rev* 2004; 8(6): 487-97.
2. Mold JW, Roberts M, Aboshady HM. Prevalence and predictors of night sweats, day sweats, and hot flashes in older primary care patients: an OKPRN study. *Ann Fam Med* 2004; 2(5): 391-7.
3. Kannel WB, Hjortland MC, McNamara PM, Gordon T. Menopause and risk of cardiovascular disease: the Framingham study. *Ann Intern Med* 1976; 85(4): 447-52.
4. Colditz GA, Willett WC, Stampfer MJ, Rosner B, Speizer FE, Hennekens CH. Menopause and the risk of coronary heart disease in women. *N Engl J Med* 1987; 316(18): 1105-10.
5. Witteman JC, Grobbee DE, Kok FJ, Hofman A, Valkenburg HA. Increased risk of atherosclerosis in women after the menopause. *BMJ* 1989; 298(6674): 642-4.
6. Zanchetti A, Facchetti R, Cesana GC, Modena MG, Pirrelli A, Sega R. Menopause-related blood pressure increase and its relationship to age and body mass

- index: the SIMONA epidemiological study. *J Hypertens* 2005; 23(12): 2269-76.
7. Nelesen R, Krohn P, Dimsdale JE. Hot-flash hypotension. *N Engl J Med* 2004; 351(15): 1577-9.
  8. James GD, Sievert LL, Flanagan E. Ambulatory blood pressure and heart rate in relation to hot flash experience among women of menopausal age. *Ann Hum Biol* 2004; 31(1): 49-58.
  9. Freedman RR, Norton D, Woodward S, Cornelissen G. Core body temperature and circadian rhythm of hot flashes in menopausal women. *J Clin Endocrinol Metab* 1995; 80(8): 2354-8.
  10. Freedman RR, Woodward S. Core body temperature during menopausal hot flushes. *Fertil Steril* 1996; 65(6): 1141-4.
  11. Freedman RR, Sabharwal SC, Desai N, Wenig P, Mayes M. Increased alpha-adrenergic responsiveness in idiopathic Raynaud's disease. *Arthritis Rheum* 1989; 32(1): 61-5.
  12. Freedman RR, Woodward S, Sabharwal SC. Alpha 2-adrenergic mechanism in menopausal hot flushes. *Obstet Gynecol* 1990; 76(4): 573-8.
  13. Freedman RR, Woodward S. Altered shivering threshold in postmenopausal women with hot flashes. *Menopause* 1995; 2: 163-8.
  14. Kaplan NM. Systemic hypertension: mechanisms and diagnosis. In: Zipes DP, Braunwald E, Editors. *Braunwald's heart disease: a textbook of cardiovascular medicine*. 7<sup>th</sup> ed. Philadelphia: W.B. Saunders, 2005.
  15. Marfella R, Gualdiero P, Siniscalchi M, Carusone C, Verza M, Marzano S, et al. Morning blood pressure peak, QT intervals, and sympathetic activity in hypertensive patients. *Hypertension* 2003; 41(2): 237-43.
  16. Markovitz JH, Matthews KA, Kannel WB, Cobb JL, D'Agostino RB. Psychological predictors of hypertension in the Framingham Study. Is there tension in hypertension? *JAMA* 1993; 270(20): 2439-43.

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