

Oxidative Stress and Other Biochemical Parameters in Hypertension of Elderly Females

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Hypertension is more common in men than in women before menopause. After menopause, hypertension is more prevalence in women. Hypertension in pre menopausal women is associated with a higher resting heart rate and cardiac index and a lower peripheral resistance than in men with similar levels of arterial pressure. After menopause, no difference in hemodynamic can be found between men and women. This study done on female hypertensive patients admitted in G. M. and S. G. M. Hospital, S. S. Medical College, Rewa (M. P), India. The age range was taken from 35 to 80 years. Obtained data analyzed statistically by using student "t" test. Present study concludes that hypertension is associated with increased serum potassium, glucose, plasma malondialdehyde and decreased serum sodium, protein and superoxide dismutase.

Key words: Hypertension, oxidative stress.

Hypertension is a most common disease in the world. Hypertension is a type of cardiovascular disease.⁽¹⁾ National Center for Health Statistics (1995), define hypertension as an average systolic blood pressure ≥ 140 mm Hg, and or diastolic blood pressure ≥ 90 mm Hg. The recommendation of the World Health Organization in 1978 for definition of hypertension are systolic pressure above 160 mm Hg or diastolic pressure above 95 mm Hg (or Both) for arterial hypertension and systolic pressure 140 to 160 mm Hg or diastolic pressure 90 to 95 mm Hg or both for border line hypertension.⁽²⁾ The Seventh Report of the Joint National Committee on Prevention Detection Evaluation and Treatment of High Blood Pressure provides a new guideline for hypertension prevention and management; (1) In persons older than 50 years, systolic blood pressure of more than 140 mm Hg is a much more important cardiovascular disease (CVD) risk factor

than diastolic blood pressure; (2) The risk of CVD, beginning at 115 / 75 mm Hg and doubles with each increment of 20 / 10 mm Hg; individuals who are normotensive at 55 years of age have a 90% lifetime risk for developing hypertension³.

Hypertension is more common in men than in women before menopause⁴. After menopause; however, hypertension is more prevalence in women⁵. Men have a higher risk of developing target organ damage compared with age-matched premenopausal women⁶. Prevalence of hypertension is similar in women as in men, but women, at least before the menopause, are somehow protected against death from coronary heart disease when compared to men with a comparable risk profile⁷. Hypertension in pre menopausal women is associated with a higher resting heart rate and cardiac index and a lower peripheral resistance than in men with similar levels of arterial pressure. After the menopause, no difference in hemodynamic can be found between men and women and women seem to be characterized by a greater degree of blood volume expansion, as is shown by dilated chamber volumes and relatively low plasma rennin-activity⁸.

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MATERIALS AND METHODS

The clinical material for present study consists of 79 female patients of hypertension admitted in G. M. and S. G. M. Hospital, S. S. Medical College, Rewa (M. P.), India. The age range was taken from 35 to 80 years. Blood samples were collected from the patients at the time of admission. Clinical investigations were performed in the Department of Biochemistry and Pathology, S. S. Medical College, Rewa (M. P.), India. Serum glucose, protein (Total) and superoxide dismutase were estimated by GOD-POD⁹, biuret¹⁰ and Mishra H P *et al.*,¹¹ methods respectively. Plasma malondialdehyde was estimated by Jean C D *et al* method (1983)¹². Serum electrolytes were estimated by electrolyte analyzer. Obtained data analyzed statistically by using student “t” test.

RESULTS

1. Table number 1 showing comparison of

Table 1. Significant test between age groups 35 – 50 and 51 – 65 years in female hypertensive patients

S. No.	Parameters	Female hypertensive patients		t- test	P- value
		35 – 50 years (19) Mean ±SD	51 – 65 years (30) Mean ±SD		
1	Systolic blood pressure _(mm Hg)	145.89 ± 1.94	149.2 ± 4.50	3.024	<0.0001
	Diastolic blood pressure _(mm Hg)	99.37 ± 3.65	96.8 ± 1.34	3.517	< 0.001
2	Serum Sodium ions _(mEq / L)	131.38 ± 2.85	127.97 ± 2.70	4.216	< 0.001
3	Serum Potassium ions _(mEq / L)	5.88 ± 0.15	6.07 ± 0.27	2.799	<0.0001
4	Serum Glucose _(mg / dl)	115.61 ± 2.03	117.37 ± 3.35	2.059	< 0.05
5	Serum Protein (Total) _(gm / dl)	6.58 ± 0.19	6.36 ± 0.17	4.217	< 0.001
6	S- Superoxide dismutase _(EU / mg protein / ml)	9.76 ± 0.30	9.75 ± 0.22	0.134	0.894
7	Plasma Malondialdehyde _(nano mole / ml)	4.99 ± 0.17	8.66 ± 0.32	45.936	< 0.001

Table 2. Significant test between age groups 51 - 65 and 66 - 80 years in female hypertensive patients

S. No.	Parameters	Female hypertensive patients		t- test	P- value
		51 – 65 years (30) Mean ±SD	66 – 80 years (30) Mean ±SD		
1	Systolic blood pressure _(mm Hg)	149.2 ± 4.50	148.93 ± 4.83	0.224	0.824
	Diastolic blood pressure _(mm Hg)	96.8 ± 1.34	97.2 ± 2.26	0.834	0.408
2	Serum Sodium ions _(mEq / L)	127.97 ± 2.70	125.38 ± 2.63	3.764	< 0.001
3	Serum Potassium ions _(mEq / L)	6.07 ± 0.27	6.74 ± 0.14	12.066	< 0.001
4	Serum Glucose _(mg / dl)	117.37 ± 3.35	126.23 ± 3.82	9.551	< 0.001
5	Serum Protein (Total) _(gm / dl)	6.36 ± 0.17	6.10 ± 0.19	5.586	< 0.001
6	S- Superoxide dismutase _(EU / mg protein / ml)	9.75 ± 0.22	9.43 ± 0.30	4.711	< 0.001
7	Plasma Malondialdehyde _(nano mole / ml)	8.66 ± 0.32	8.91 ± 0.32	3.026	<0.0001

female hypertensive patients between age groups 35 – 50 and 51 – 65 years. We observed, extremely significant (p<0.0001) systolic blood pressure and potassium were increased in age group 51 to 65^{yr} when compared to age 35 to 50^{yr} of female hypertensive patients. Plasma malondialdehyde was increased highly significant (p<0.001). Serum glucose was increased significantly (< 0.05). Diastolic blood pressure, serum sodium, and protein (T) were decreased highly significant (p<0.001).

2. Table number 2 showing comparison of female hypertensive patients between age 51 – 65 and 66 – 80 years. Serum potassium, glucose and protein (T) were increased highly significant (p<0.001). Plasma malondialdehyde was increased extremely significant (p<0.0001). Serum sodium and superoxide dismutase were decreased highly significant (p<0.001) in age group 66 to 80^{yr}

when compared to age 51 to 65^{yr} of female hypertensive patients.

DISCUSSION

There is growing evidence that increased oxidative stress and associated oxidative damage are mediators of vascular injury in cardiovascular diseases. Stress is intensified with the process of aging, and in the elderly, this is accompanied by a more common accuracy of primary hypertension¹³. Some workers have demonstrated similar results as showing in table 1¹⁴⁻¹⁷. Potassium regulation is maintained by a system which affects the rate of renal excretion of the ions and its distribution between the intra-extra-cellular spaces. Long-term regulation is accomplished by the interactions of several component of the control system. The direct effect of changes in plasma potassium concentration on potassium secretion by the cells of the distal nephron is the most powerful regulator of potassium excretion¹⁸. Some workers and associates correlated complication of hypertension with hyperglycemia¹⁹. Increased production of oxygen free radicals may play a role in many diseases such as hypertension²⁰. Among the defense system operating against the reactive oxygen species, superoxide dismutase is the most important antioxidant enzymes (AOEs). The reactive oxygen species has been proposed as a key mediator of the progression of renal injury associated with essential hypertension²¹.

The present study comprised female hypertensive patients between age range 51 – 65 and 66 – 80 years (Table No. 2). As expected, the female hypertensive patients (51 – 80 years) showed similar results that have been explained by some workers^{22,23}. Hyperkalemia is 3 to 5 fold higher in more than 60 years of age²⁴. Essential hypertension exhibit several red blood cell (RBC) ion transport abnormalities, insulin resistance (IR) which causes hyperglycemia. Extra cellular hyperosmolarity secondary to hyperglycemia causes a shift of water and potassium from the normal or elevated serum potassium concentration²⁵. Prevalence of isolated systolic hypertension rose from 5% at age 60 to greater than 10% at age 70 and 24% at age 80 year²⁶. Elderly patients are hemodynamically characterized by a low cardiac output because of a decreased stroke volume

and high peripheral resistance²⁷. The deficit in sodium ion transport across cell membranes (demonstrated in RBCs) in patients with essential hypertension or in normotensive subjects with a family history of hypertension, may alter the calcium / sodium ion exchange across vascular smooth muscle membrane²⁸. Hyponatremia is seen in all age groups, but important differences exist in elderly²⁹.

Hypertension in the elderly is associated with greater than normal levels of lipids oxidation and causes oxidative stress.⁽³⁰⁾ The concentrations of antioxidant such as superoxide dismutase was found to be decreased in patients with uncontrolled hypertension. These results suggest that an increased in free radicals generation in essential hypertension.⁽³¹⁾ Hypertension caused increased oxidation process, which emphasized on importance and usefulness of antioxidants, because SOD is the first enzymatic antioxidant defense, its low level in hypertensive patients may be due to excess of oxidative stress.⁽³²⁾ Therefore, present study concludes that hypertension is associated with increased serum potassium, glucose and plasma malondialdehyde. Decreased serum sodium, protein and superoxide dismutase associated with hypertension in elderly females.

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