

Protective role of antioxidant vitamin C in prehypertensive patients in Tikrit city.

Imad Noaman Shareef*, Abdul Rahman J. Mansoor**, Uqba N. Yousif***.

* Dept. of Pharmacology, **, Physiology, ***, Medicine, College of Medicine, Tikrit University.

Abstract:

The cross sectional study was designed to investigate the effect of antioxidant therapy vitamin C 500mg daily dose on prehypertension patient (systolic blood pressure 120-139 and diastolic blood pressure 80-89mmHg) for nine months. The study was performed on 100 patient in both male and female.

The result of this study show that vitamin C was significantly decreased systolic and diastolic blood pressure after six and nine months of treatment.

There is some side effect appear in some patient during the course of study as nausea, vomiting, heartburn, fatigue, flushing, headache, insomnia, diarrhea, drowsiness.

Key words : Prehypertension patients, stethoscope, sphygmomanometer, vitamin C tablet.

Introduction:

Prehypertension is the earliest form of high blood pressure as blood pressure values of 120-139 /80-89mmHg.⁽¹⁾ and will require careful monitoring and rechecks to avoid progression to stage 1 hypertension or stage 2 hypertension^(2,3). Hypertension and prehypertension damage the artery wall and cause the artery to become stiff. This can cause hardening of the arteries or atherosclerosis and raise the risk of heart attack and stroke and when prehypertension gives to high blood pressure, stroke and heart disease become considerably higher⁽⁴⁻⁷⁾, also cause congestive heart failure and renal failure⁽⁸⁾. It found that a prehypertensive person is more than three times more likely to have a heart attack and 1.7 times more likely to have heart disease than a person with normal blood pressure⁽⁹⁾. The primary risk factor for prehypertension is being overweight, a family history of hypertension, a sedentary lifestyle, eating high sodium foods, smoking and excessive alcohol intake. Blood pressure levels appear to be familial but there is no clear genetic pattern⁽¹⁰⁾. The symptoms is often asymptomatic at the time of diagnosis. Only extremely elevated blood pressure (malignant hypertension) can, in rare cases, cause headaches, visual changes, fatigue, or dizziness, but these are nonspecific symptoms which can occur with many other conditions⁽¹¹⁾. Thus, blood pressures above normal can go undiagnosed for a long period of time. The prognosis of the prehypertension are at a higher risk for developing hypertension, or high blood pressure, compared to people with normal blood pressure^(12,13).

Vitamin C is a water-soluble vitamin and is antioxidant, it block some of the damage caused by free radicals, substance that damage DNA. The build-up of free radicals over time may contribute to the aging process and the development of health conditions such as heart disease. It helps prevent damage to low density lipoproteins cholesterol, which then builds up as plaque in the arteries and can cause heart attack or stroke⁽¹⁴⁻¹⁶⁾

The aim of the present study is determining the effect of antioxidant vitamin C in prehypertensive patients.

Patients and methods:

This work was conducted in the synergistic officinal collector in Al-Qadsia area/Tikrit city/Salahudeen Governorate by community based. The work was carried out from the October /2010 until December /2011. The patients were firstly checked to isolated only prehypertension (120-139/80-89mmHg). 100 patients underwent prehypertension in both male and female with age range from the 25-50 years were include in this study. The patients were treated with vitamin C 500mg single daily dose for nine month and check blood pressure every three months. All this checked do by using stethoscope and sphygmomanometer and selected the proper cuff size and two measurement left and right arms and taken the average from both⁽²⁾.

T- test is used to compare between two measurement. All data presented as mean, standard deviation, probable value < 0.05 was accepted.

Result:

This study was designed to study effect of antioxidant vitamin C drug 500mg on systolic and diastolic blood pressure in prehypertension patient for nine months therapy.

Table 1 shows the mean $\pm$ SD of systolic blood pressure in prehypertension patient treated with vitamin C 500mg daily and check every three months for nine months as follows as:

The mean $\pm$ SD for systolic blood pressure before treatment with vitamin C is 133 ± 5.15 while after three month treated with vitamin C is 132.24 ± 5.11 , while after six months is 130 ± 4.96 , and then after nine months is 127.52 ± 4.83 . The systolic blood pressure not significantly decrease blood pressure after three months treatment , while significantly decreases after six months treatment ($p < 0.005$) and the decline is increased after nine months of treatment ($p < 0.005$).

Table 2 shows the mean $\pm$ SD of diastolic blood pressure in prehypertension patient treated with vitamin C 500mg daily and check every three months for nine months as follows as:

The mean $\pm$ SD for diastolic blood pressure before treated with vitamin C is 86 ± 2.06 while after three month treated with vitamin C is 85.60 ± 2.18 , while after six months is 85.32 ± 1.52 , and then after nine months is 84 ± 2.76 . The diastolic blood pressure not significantly decrease after three months treatment , while significantly decreases after six months treatment ($p < 0.005$) and the decline is increased after nine months of treatment ($p < 0.005$).

TABLE 1: The mean $\pm$ SD of systolic blood pressure in 100 prehypertension patients treated with vitamin C for nine months in a dose 500mg daily.

Systolic blood pressure in prehypertension patients	Before treatment	First measurement 1-3 months	Second measurement 4-6 months	Third measurement 7-9 months
	133 ± 5.15	132.24 ± 5.11 Non significant	130 ± 4.96 Significant	127.52 ± 4.83 Significant

TABLE 2: The mean $\pm$ SD of diastolic blood pressure in 100 prehypertension patient treated with vitamin C for nine months in a dose 500mg daily.

Diastolic blood pressure in prehypertension patients	Before treatment	First measurement 1-3 months	Second measurement 4-6 months	Third measurement 7-9 months
	86 $\pm$ 2.06	85.60 $\pm$ 2.18 Non significant	85.32 $\pm$ 1.52 Significant	84 $\pm$ 2.76 Significant

Discussion:

The results of these study showed that vitamin C significantly decreases blood pressure, these results were in agreement with Cor Vasa who found that vitamin C significantly decreases level of total and LDL –cholesterol⁽¹⁷⁾ and with Wooldrige who found that vitamin C decreases all lipoproteins in blood⁽¹⁸⁾, however Hodis found that vitamin C slow the athersclerosis process⁽¹⁹⁾.

Ascorbic acid is also known to stimulate 7- α -hydroxylase, a key enzyme in the conversion of cholesterol to bile acid and increase the expression of LDL receptors on the cell surface, moreover the ascorbate is known to inhibit endogenous cholesterol synthesis as well as oxidative modification of LDL ^(19,20).

Furthermore, vitamin C also elevates HDL-cholesterol, which facilitates the reabsorption of fat located in plaques and protects blood vessels wall from damage exertion by oxidized LDL and also helps in healing of intimae injury ⁽²¹⁾.

There is evidence for increased formation of free radicals in patients of hypertension, raising the possibility that nitric oxide is inactivated by free radicals, which impair coronary endothelial function. Vitamin C could improve endothelium-dependent vasomotor capacity of coronary arteries inpatient with hypertension ⁽²²⁾. On the other hand, antioxidant vitamins also increased protein phosphatase A₁ activity and inhibit protein kinase C, smooth muscle proliferation, cell adhesion, platelet aggregation and enhance nitric oxide bioavailability, improve endothelium dependent vasodilator function ⁽¹⁸⁾.

These effects could be attributed to many biological effects. The deficiency of vitamin C leads to endothelial fragility, a tendency of the sequence epithelial cells (flat) which line the blood vessels to lose their adherent quality, endothelial interruptions are bridged with adhesive substitutes forming the foundation of thrombus⁽²³⁾.

Therefore, antioxidant vitamins may improve vascular function by water-soluble antioxidant present in extracellular fluid of the artery wall, including vitamin C, to inhibit LDL oxidation through an LDL-specific antioxidant action ⁽²³⁾.

Conclusions:

The present study conclude that conclude that vitamin C in a dose of 500mg/day for nine months had significantly decrease systolic and diastolic blood pressure in prehypertension patients.

Recommendation:

Other antioxidant drug might be studied to show their effect in prehypertension patients.

References:

- 1- Kearney PM, Whelton M, Reynolds K, Munter P, He J. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005, 365:217-223.
- 2- WHO. National guidelines for primary health care physicians: Hypertension. 22.
- 3- U.S. preventive service task force. Screening for high blood pressure: U.S. Preventive Service Task Force reaffirmation recommendation statement. *Annals of Internal Medicine*. 2007, 147(11):783-787.
- 4- Greenlund KJ, Croft JB, Mensah GA. Prevalence of heart disease and stroke risk factors in persons with prehypertension in the united states. 2004, 164:2113-2118.
- 5- Liszka HA, Mainous AG 3rd, King DE, Egan BM. Prehypertension and cardiovascular morbidity. 2005, 3:294-299.
- 6- Qureshi AI, Suri MF, Kirmani JF, Mohmmad Y. Is prehypertension risk factor for cardiovascular disease, stroke. 2005, 36:1859-1863.
- 7- Vasan RS, Beiser A, Seshadri S, Larson MG, Kannel WB, D'Agostino RB, Levy D. Residual lifetime risk for developing hypertension in middle-aged women and men: The Framingham Heart Study. 2002; 287:1003–1010.
- 8- Washio M, Tokunaga S, Yoshimasu K, Kodama H, Liu Y, Sasazuki S, Tanaka K, Kono S, Mohri M, Takeshita A, Arakawa K, Ideishi M, Nii T, Shirai K, Arai H, Doi Y, Kawano T, Nakagaki O, Takada K, Hiyamuta K, Koyanagi S. Role of prehypertension in the development of coronary atherosclerosis in Japan. *J Epidemiol*. 2004, 14:57–62.
- 9- Vasan RS, Larson MG, Leip EP et al. "Impact of high-normal blood pressure on the risk of cardiovascular disease". *N. Engl. J. Med*. 2001, 345 (18): 1291–1297.
- 10- Mainous AG 3rd, Everett Cj, Liszka H, King DE, Egan BM. Prehypertension and mortality in a nationally representative. *Am J Cardiol*. 2004, 94:1406-1500.
- 11- Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005; 365: 217–223.
- 12- 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. 2003, 289 (19):2560–72.
- 13- American Heart Association (2005, August 6). Prehypertension triple heart attack risk.
- 14- Daniel TA, Nawarskas JJ. Vitamin C in the prevention of nitrate tolerance. 2000, 34(10):1193-1197.
- 15- Dwyer JH, Merz NB, Shirocre AM, et al. Progression of early atherosclerosis and intake of vitamin C and vitamin E from supplements and food. *Cardiovascular diseases epidemiology and prevention: Circulation*. 2001, 103:1365.
- 16- Langlois M, Duprez D, Delanghe J, De Buyzers M, Clement DL. Serum vitamin C concentration is low in peripheral arterial disease and is associated with inflammation and severity of atherosclerosis: *Circulation*. 2001, 103(14): 1863-1868.
- 17- Gotto AM. Antioxidant and atherosclerosis *J AM Cardiol*. 2003, 41:1205-1210.
- 18- 21.Simon JA and Hudes ES. Serum ascorbic acid and cardiovascular prevalence in US adults: the third national health and nutritional examination survey. 1999, 9:358-363.
- 19.Niki E. Action of ascorbic acid as a scavenger of active and stable oxygen radicals. *Am J Clin Nutr*. 1995, 54:1199-1241.
- 20.Tribble DL. Antioxidant consumption and risk of coronary heart disease: emphasis on vitamin C and vitamin E. A statement for health care professionals from the American Heart Association , *circulation*. 1999, 8:537-542.

21. Stephens NG, Parson SA, Schofield PM, et al. Cambridge heart antioxidant studies: randomized controlled trial of vitamin E in-patient with coronary disease. *Lancet*. 1996, 347:781-786.
22. Wooldrige M and Wooldrige MA. Linus Pauling lecture on vitamin C and heart disease. *N Engl J Med*. 1993, 120-145.
23. Jacob R. The integrated antioxidant system. *Nutr Res*. 2001, 15:755-766.

Tikrit Medical Journal 2012; 18(2): 279-281