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ORIGINAL ARTICLE

The Effect of 8 weeks of Swimming training alongside the Consumption of Garlic extract on the levels of Angiotensin 2 and its Receptor in Renal Tissues of aged rats

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ABSTRACT

The aim of this study was to investigate the effect of 8 weeks of aerobic swimming training along with the consumption of garlic extract on the levels of angiotensin 2 and its receptor in renal tissues of aged rats. For this purpose, 35 male rats aged 40-50 weeks and with the initial body weight of 250-300 g were randomly divided into 5 groups of (each group with 7 rats): control, sham, garlic, training, and training+garlic. The training program included swimming training for 8 weeks, each week for three days and each day for 30 minutes. The groups of garlic and training+garlic, received 1 ml of the garlic extract a day per kilogram of body weight orally (gavage) for the period of 8 weeks. Forty eight hours after the last training session and after 10-12 hours of fasting, the rats were anesthetized with the Ketamine/Xylazine combination and the renal tissue of all the samples was removed and stored at -70 ° C for measuring levels of angiotensin 2 and its receptor. The angiotensin 2 and its receptor were measured using the corresponding kit and by the ELISA method. To determine the inter-group differences, the data were analyzed using the one-way ANOVA test. The significance level was considered as P ≤ 0.05.The results showed that the eight weeks of regular swimming training along with the consumption of garlic extract significantly decreased the levels of angiotensin 2 and its receptor in the renal tissue of all the healthy aged rats (P<0.05). Overall, this study showed that the eight weeks of swimming training along with the consumption of garlic extract significantly decreased the levels of angiotensin 2 and its receptor in the aged rats, which can be used to improve the health status and to prevent the incidence of diseases in the elderly .

Keywords*: swimming training, garlic extract, angiotensin 2, angiotensin receptors, aged rats*

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INTRODUCTION

With improved methods of population control and treatment and also increasing the life expectancy, the world's population is aging. Elderly population growth rate is greater in developing countries than in developed countries and currently more than half of the world's elderly population live in developing countries. By changing the demographic structure and aging of populations, it is clear that disability and mortality caused by chronic diseases are higher than acute diseases among the elderly [9]. The issue of motor deficiency and the spreading process of immobility-related diseases such as renal diseases have

made the role of the healthy lifestyle model difficult in the prevention of such diseases. According to the conducted research, the sedentary lifestyle is known as a major factor responsible for over 1.3 million sudden deaths caused by renal and cardiovascular diseases, cancer and diabetes [1]. One of the most common chronic diseases among the elderly is the chronic kidney disease (CKD). These are among diseases that not only endanger the physical health, but also put other aspects of health at risk. Waste disposal, strict regulation of fluids and chemical compositions, secretion of some hormones and activation of vitamin D are among activities of the kidneys in the body. However, when more than 95% of the kidney tissue is damaged as a result of various diseases, the accumulation of toxins in the body reaches to such an extent that the continued existence would not be possible without the use of dialysis or kidney transplant [19, 2]. The disease, which has currently become prevalent in most countries and among the elderly, causes the cardiovascular diseases to be increased [13]. One of the indicators affected by the physical activity and food intake is angiotensin 2, which causes vasoconstriction and increased blood pressure and the release of aldosterone from the adrenal cortex and forms part of the renin-angiotensin system. Angiotensin 2 is a vascular activator peptide, recommended to be involved in the pathogenesis of cardiovascular and nephropathy diseases. In this field, the increased activity of the angiotensin-converting enzyme 2 (ACE) has been reported in diabetic patients with vascular, nephropathy and retinopathy complications and also in animal models of diabetes [3]. Characteristics of the angiotensin-converting enzyme have made it so important in the treatment of conditions such as hypertension, heart diseases and even diabetes. It is reported that the inhibition of this enzyme reduces the formation of angiotensin 2 and the metabolism of bradykinin, resulting in the dilation of arteries and veins and the decreased blood pressure [18, 14]. Studies have reported that the physical activity with appropriate intensity and duration could result in the treatment of many diseases. Therefore, exercising with its numerous physiological benefits for the body can be used as a proper method for the treatment of this disease [8]. There exist broad restrictions in the endurance and muscle strength in the elderly including the exercise threshold, reduced physical capacity and increased functional disability [5, 6, 7] due to their specific physical conditions that cause the chronic kidney failure [4], In addition to exercising, the use of herbs today has earned a special place in the treatment of diseases. The increasing importance of medicinal plants in the world and the presence of a large number of medicinal plants in our land require further studies on medicinal plants and their therapeutic effects [10]. In this regard, garlic plays a role as a medicinal herb rich in antioxidants in the prevention of obesity and its related diseases such as kidney and cardio-vascular diseases [11]. It has been recently reported that garlic may play an important role in reducing heart diseases, inflammation, hypertension and the risk of cancer [12]. Thus, on the basis of the positive role of exercising and the garlic consumption in the treatment of diseases, this study intended to investigate the effect of 8-week swimming training alongside the consumption of garlic extract on the levels of angiotensin 2 and its receptor in renal tissues of all the aged rats .

METHODOLOGY

For the purpose of implementing the study, 35 Wistar rats aged 40-50 weeks with the initial body weight of 250-300 grams were selected from the Center for Research and Reproduction of Laboratory Animals at Islamic Azad University, Sari Branch and after entering into the research environment and becoming familiar with the new environment and the process of training in the swimming pool for a period of one week, they were randomly divided into 5 groups of control, sham, garlic, training, and training+garlic. The aerobic swimming training program lasted for 8 weeks, each week for three days and each day for 30 minutes. The control group did not perform any exercises during the period. Moreover, food and water were freely available during the period. The training+garlic group received 1 ml of the garlic extract a day per kilogram of body weight orally (gavage) for the period of 8 weeks [20]. Forty eight hours after the last training session and after 10-12 hours of fasting, the rats were anesthetized by an intraperitoneal injection of the Ketamine/Xylazine combination and the renal tissue was removed and stored at -70 °C for measuring levels of angiotensin 2 and its receptor. Analysis of the data was performed using the one-way ANOVA and Tukey's test at a significance level of $P \leq 0.05$.

RESULTS

The results showed that levels of angiotensin 2 and its receptor in the groups of training, garlic and training+garlic were significantly decreased compared to the control and sham groups ($P<0.05$).

Figure 1. Changes of angiotensin 2 and its receptor in the five groups

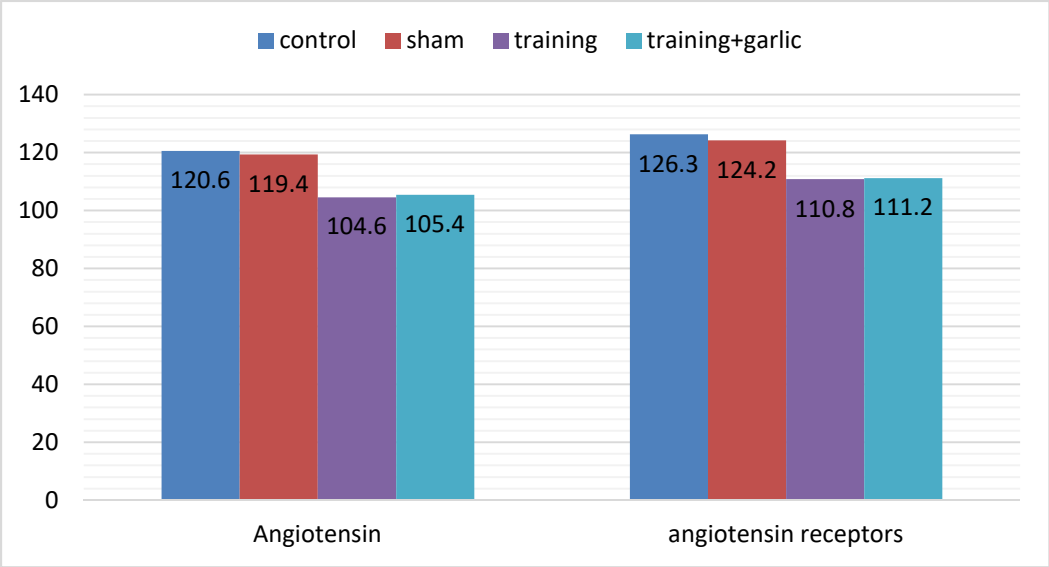
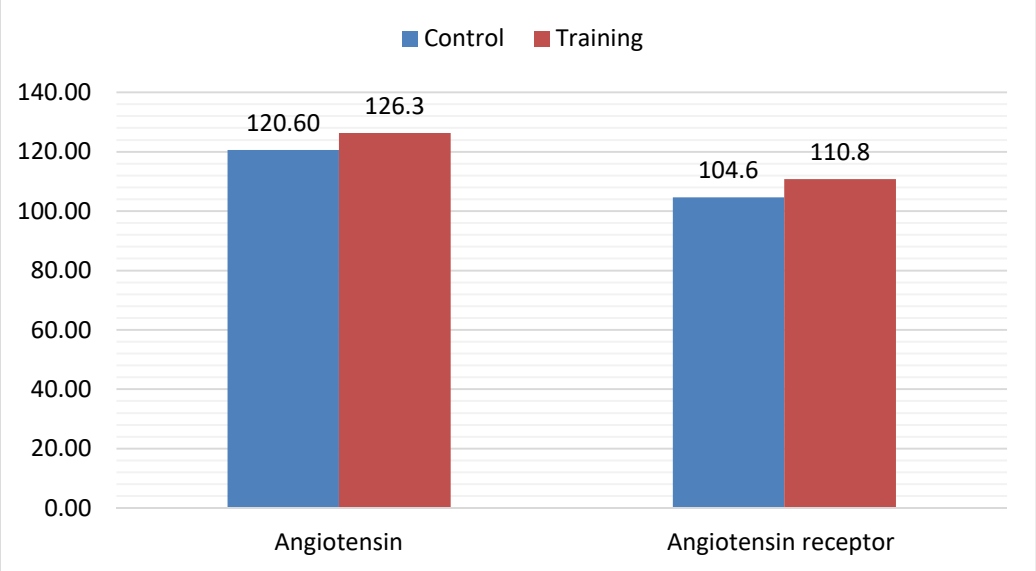


Figure 2. Changes of angiotensin 2 and its receptor in both the control and experimental groups



DISCUSSION AND CONCLUSION

Studies show that aging causes the incidence of chronic diseases. Chronic kidney disease is among the most important causes of morbidity and mortality which is associated with the increasing activity of angiotensin-2 and its receptors 1 and 2 and subsequently, the increasing systolic and diastolic blood pressure. Therefore, the protective effects of the garlic supplement may be related to the antioxidant potential and the presence of phenolic and flavonoids compounds in the plant [16]. In this respect, the garlic extract may decrease levels of angiotensin-2 in renal and heart tissues of aged rats by reducing oxidative stress and inhibiting the NF-κB activity [15, 17]. It was also reported that regular exercising along with the antioxidant intake resulted in lower blood pressure in rats by increasing the cholinergic device and angiotensin-2 inhibitors [21]. There exist numerous reports with regard to the positive effects of regular physical activities on the reduction of receiver sensitivity and ultimately, the reduction of susceptibility to angiotensin -2. In contrast, the reduced body mobility caused by aging is proved to be associated with the reduced activity of the ACE inhibitor enzyme and the subsequent increase in the angiotensin-2 activity. Moreover, aging is associated with the increased oxidative stress, resulting in the stimulation of the gene expression of angiotensin-2 receptors 1 and 2 [15]. The results of this study showed that the eight weeks of regular swimming training along with the consumption of garlic extract decreased the levels of angiotensin 2 and its receptor which was insignificant. The results demonstrated a

correlation between the reduced angiotensin 2 and its receptor and the reduced tissue inflammation caused by aging, in normal rats under the training. There are numerous reports with regard to the positive effects of regular physical activities on the reduction of receiver sensitivity and ultimately, the reduction of susceptibility to angiotensin -2. In contrast, the reduced body mobility caused by aging is proved to be associated with the reduced activity of the ACE inhibitor enzyme and the subsequent increase in the angiotensin-2 activity [1]. In a similar vein, the results of the study by Tartibian *et al*. (2012) demonstrated no significant change in the amount of angiotensin 2 in the training group after four weeks of exercise training. However, the level of angiotensin 2 was significantly reduced after 8 weeks of exercise training [1], which is consistent with the results of the present study. The researchers also showed that the long-term swimming training (6 to 16 weeks) in sick rats resulted in a significant reduction in the amount of angiotensin-2 receptors and an increase in sodium excretion through the kidneys and urine [3]. Hosseini *et al*. showed in their study that the consumption of garlic extract (100 mg per kg of body weight) for the period of one and two months had no significant effect on angiotensin-converting enzyme 1 in diabetic rats [3]. In this study, the protective effects of regular swimming training along with the consumption of garlic indicate the positive effects of aerobic exercise and garlic intake on the reduction of oxidative stress and the increase of antioxidant defense along with a decline in levels of angiotensin 2 and its receptor in renal tissue of aged rats. Thus, it seems that exercising activity alongside the consumption of garlic extract can be considered as an effective approach to reduce kidney damages and support renal tissues against damages caused by oxidative and inflammatory stress of aging.

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