

Egg Yolk Causes High Blood Pressure in Wistar Rats

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ABSTRACT

Hypertension constitutes a major risk factor for several cardiovascular diseases such as atherosclerosis, heart failure, renal insufficiency, coronary artery disease and stroke. The risk factor increases with age in both sexes. According to WHO, about one-third of the world's population suffers from hypertension and the incidence has been increasing at a rapid rate due to life style modification. This study is aimed at investigating the effect of egg yolk on blood pressure of Wistar rats. To achieve this, twenty Wistar rats weighing between 200 and 220 g were obtained and divided into 2 groups of ten each. Animals in group 1 received a special prepared egg feed diet (24 egg yolk mixed with 1 kg of normal rat diet) while those in group 2 received normal feed diet and they served as the control group. The animals were fed orally for 21 consecutive days and had access to drinking water ad libitum. Blood pressure of each of these groups was determined on day 0, 7, 14 and 21 respectively. No significant difference was observed in the blood pressure of animals in both the control and experimental groups prior to treatment. However, the blood pressure of animals treated with egg yolk significantly increased after 7, 14 and 21 days of treatment respectively with 21 days having the highest blood pressure. From this result, egg yolk significantly increased blood pressure and thus has the propensity to induce hypertension. Excessive consumption of egg should be discouraged in people with high risk of cardiovascular diseases.

Keywords: Blood pressure, cardiovascular diseases, cholesterol, egg yolk

1. INTRODUCTION

Hypertension is defined as the persistent elevation of systolic/diastolic blood pressure over 140/90 mmHg. It is a major risk factor for developing cardiovascular diseases [1]. Although no definite cause is apparent in the majority of hypertension cases (i.e. idiopathic hypertension), a number of underlying pathologies such as hyperactivity of the renin angiotensin system (RAS), inflammation, oxidative stress and impaired vascular relaxation, can contribute to its onset and long-term persistence [2,3]. Although various pharmaceutical drugs are available for the treatment of hypertension, management of hypertension often requires lifelong adherence to the medication and is associated with significant adverse side-effects [4]. Thus, there has been a growing interest in using alternative options, such as adoption of a healthy lifestyle with restricted energy and dietary sodium intake, engagement in physical activities and stopping smoking, for prevention and management of hypertension [5, 6].

Blood pressure is regulated through several mechanisms including modification of angiotensin-converting enzyme (ACE) activity and vascular function as well as changes in oxidative status [7]. Antioxidants may decrease blood pressure through decreasing oxidative stress in the body thus preserving the activity of nitric oxide synthase (NOS) as well as increasing nitric oxide (NO) bioavailability. Moreover, the potential interrelations

between blood pressure and plasma lipids may contribute to increased coronary heart disease in hypertensive patients [8].



Figure 1: Egg and Egg Yolk

Egg yolks are the yellow part at the center of an egg. They contain high levels of cholesterol but also provide a range of vital nutrients and health benefits [9]. Eggs are a low cost, nutrient dense food that is easy to access and prepare, making them an excellent dietary staple for many people worldwide. They are extremely versatile. People can prepare eggs in several different ways or use them in many aspects of food preparation, cooking, and baking [10]. People consume egg because of its high nutritional benefit without any consideration for its adverse effect. This study is therefore aimed at investigating the effect of egg yolk on the blood pressure of Wistar rats.

2. MATERIALS AND METHODS

2.1. Experimental Design and Animal Treatment

Twenty Wistar rats weighing between 200 and 220 g were used for the experiment. They were acclimatized for seven (7) days during which they were fed *ad libitum* with standard feed and drinking water and were housed in clean cages placed in well-ventilated housing conditions (under humid tropical conditions) throughout the experiment. All the animals received humane care according to the

criteria outlined in the ‘Guide for the Care and Use of Laboratory Animals’ prepared by the National Academy of Science and published by the National Institute of Health. They were randomly divided into two groups of ten rats each. Animals in group 1 received a special prepared egg feed diet (24 egg yolk mixed with 1 kg of normal rat diet) while those in group 2 received normal feed diet and they served as the control group. The animals were fed orally for 21 consecutive days and had access to drinking water *ad libitum*. Blood pressure of each of these groups was determined at day 0, 7, 14 and 21 respectively.

2.2 Determination of Blood Pressure

Blood pressure was determined from the tails of rats using non-invasive blood pressure (NIBP) measuring apparatus (IN125, AD Instruments, Sydney, Australia) according to the method described by Ayele *et al.*, [11]. Each rat was placed in NIBP restrainer and appropriate cuff with sensor was then mounted on its tail and warmed to about 33 – 35 °C. The tail cuff (MLT 125/R) was inflated to a pressure well above the expected systolic blood pressure, i.e., 200 mmHg, and slowly released during which the pulses were recorded by using Power Lab data acquisition system and computer running Lab Chart 5.0 software (Ad Instruments, Sydney, Australia). Systolic blood pressure (SBP), Mean blood pressure (MBP) and heart rate were measured directly using pulse tracing while diastolic blood pressure (DBP) was calculated from SBP and MBP as:

$$DBP = \frac{3MBP - SBP}{2}$$

2.3 Statistical Analysis

Data were subjected to analysis using Microsoft Excel software, 2013 version.

3. RESULTS

The results of the effect of egg yolk on blood pressure are presented in figures 2 – 5.

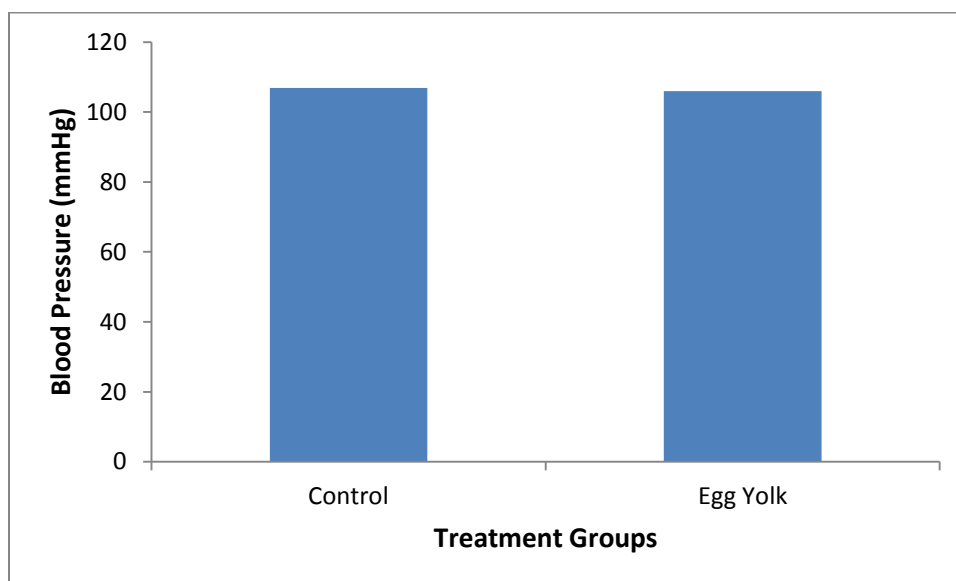


Figure 2: Blood Pressure of Animals Prior to Treatment

Bars are presented as mean with n = 10

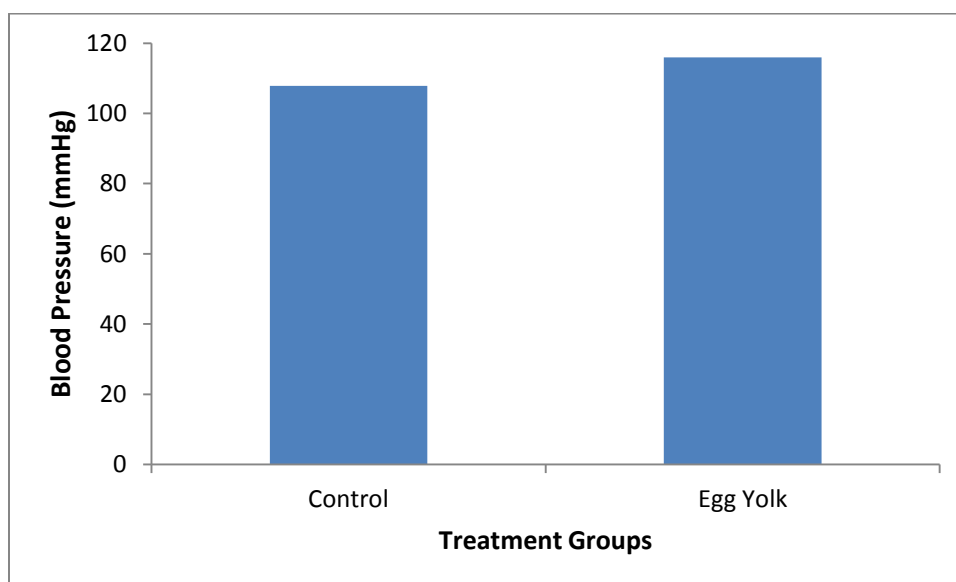


Figure 3: Effect of Egg Yolk on Blood Pressure after 7 days of Treatment

Bars are presented as mean with n = 10

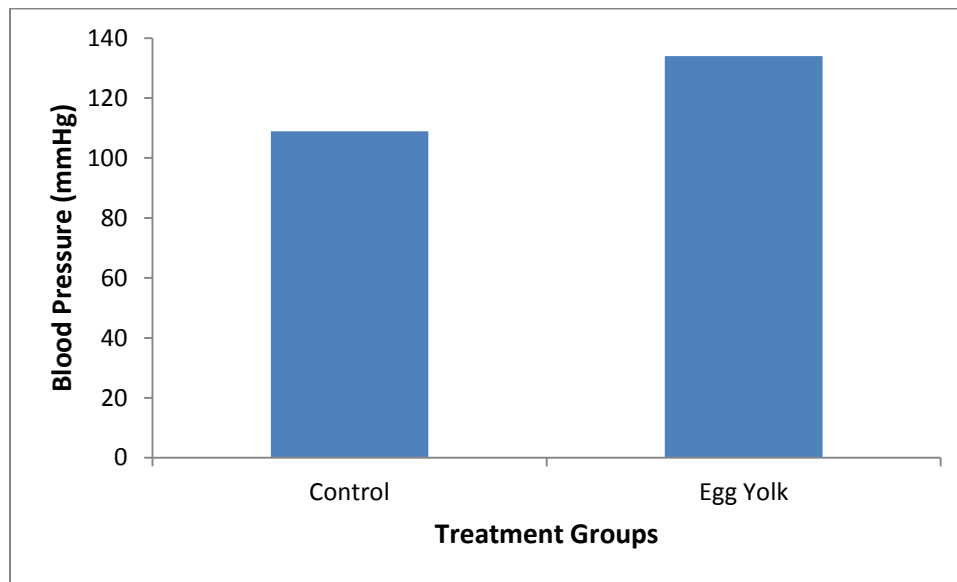


Figure 4: Effect of Egg Yolk on Blood Pressure after 14 days of Treatment

Bars are presented as mean with n = 10

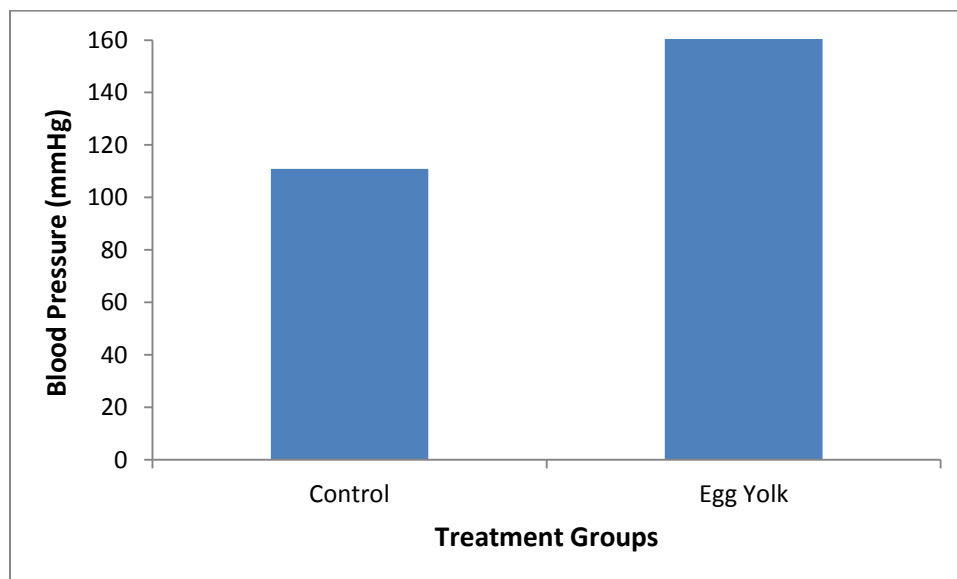


Figure 5: Effect of Egg Yolk on Blood Pressure after 21 days of Treatment

Bars are presented as mean with n = 10

4. DISCUSSION

Hypertension is one of the leading causes of disability, mortality and morbidity throughout

population [12]. It is the most common chronic illness among the world faces. Hypertension is the most common cardiovascular diseases and constitutes a major factor for several cardiovascular pathologies

including atherosclerosis, coronary artery disease, myocardium infarct, heart failure, renal insufficiency, stroke and dissecting aneurysm of aorta. An elevated arterial pressure is an important public health issue in developed countries [13]. Although it is common, asymptomatic and readily detectable but it can often lead to lethal complication, if left untreated. The method in practice to control high blood pressure is “long-term” drug therapy [14]. Diet and lifestyle seems to be the major cause of high blood pressure (hypertension). This study is therefore aimed at investigating the effect of egg yolk on the blood pressure of Wistar rats.

From the result of this study, no significant difference was observed in the blood pressure of animals in both the control and experimental groups prior to treatment (figure 2). However, the blood pressure of animals treated with egg yolk significantly increased after 7, 14 and 21 days of treatment respectively with 21 days treatment having the highest blood pressure (figures 3-5). Egg yolk has been reported to contain high cholesterol concentration [15]. Cholesterol rich diets have been linked to dyslipidemia which is considered a major risk factor for hypertension [11,16]. This might be responsible for the sustained increase in blood pressure of animals treated with egg yolk. This is in agreement with the report of Spence *et al.*, [15].

5. CONCLUSION

From the results of this study, egg yolk significantly increased blood pressure and thus has the propensity to induce hypertension. Excessive consumption of egg should be discouraged especially in people with high risk of cardiovascular diseases.

CONFLICT OF INTEREST

Authors declare that no conflicting interests exist in the publication of this paper.

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