

# EFFECT OF CONSUMPTION OF TWO ADDITIONAL EGGS EVERY DAY ON BLOOD CHOLESTEROL OF HEALTHY NORMOLIPIDEMIC PEOPLE, A CLINICAL TRIAL

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## Abstract

**INTRODUCTION:** Dyslipidemia is one of the major risk factors of cardiovascular disease. Nutrition can significantly affect blood lipids. Eggs are a common food for many people and are rich in nutrients and vitamins. They are also rich in cholesterol. Considering the different recommendations and controversies surrounding the healthiness or otherwise of egg consumption, we added two eggs to the usual daily dietary regimen of healthy normolipidemic young volunteers and monitored the changes in their lipid profile.

**METHODS:** This clinical trial was done on 60 volunteers living in a university campus. They regularly ate food served in the university restaurant. Their diet was monitored from 2 weeks before the start of the new diet with additional eggs. Fasting blood samples were taken at the beginning of the study. Two well-cooked moderately-sized eggs (all from the same supplier) were added to the subjects' breakfast for one month. Blood lipids were measured again at the end of this period.

**RESULTS:** Mean levels of total cholesterol, low-density lipoprotein cholesterol (LDL-C) and triglyceride increased significantly, but remained within normal limits ( $P=0.001$ ,  $0.000$  and  $0.01$ , respectively). High-density lipoprotein cholesterol (HDL-C) decreased significantly ( $P=0.000$ ).

**CONCLUSIONS:** Adding 14 eggs a week to the usual diet of normolipidemic healthy individuals can unfavorably affect blood lipids and may have adverse long-term cardiovascular consequences. In other words, eating less than two eggs a day may be a healthier practice.

**Keywords:** Egg, cholesterol, cardiovascular disease.

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## Introduction

Cardiovascular disease is the leading cause of mortality and morbidity in the world. In Iran, it is the cause of more than 48% of total mortality by the age of 50 and beyond.<sup>1</sup>

Nutrition plays an important role in the pathogenesis of atherosclerosis by affecting its major risk factor, especially blood lipids.

Eggs are a very common food. They are rich in nutrients, vitamins and protein.<sup>5,10</sup> Egg yolk is rich in cholesterol. Hence, the question "*How many eggs can be eaten without concern about blood lipids?*" needs to be addressed.<sup>3</sup> Recommendations in this regard are varied and controversial.<sup>2,3,6</sup> In this study, we added two eggs to the usual daily dietary regimen of healthy

normolipidemic young volunteers. The subjects were evaluated for possible adverse effects.

## Materials and methods

The subjects included 60 volunteering male and female medical students. They were all healthy and normolipidemic and were aged between 18 and 26 years (mean age = 22.7 years). They had no history of diabetes, hypertension, important renal or hepatic disease or family history of ischemic heart disease.

The students' dietary regimens were monitored from 2 weeks before obtaining the first blood sample.

The Ethics Committee of Birjand University of Medical Sciences approved the study. Informed written consents from all volunteers were obtained.

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**TABLE 1.** Lipid changes (mg/dl) before and after egg consumption

	Before	After	Percentage of change	P value
Total cholesterol	138.5	160.5	+15.9	0.001
Triglyceride	109.3	137.8	+26.1	0.01
LDL-C	62	100.6	+62.2	0.00
HDL-C	55.7	33.3	- 40.2	0.00

Every evening, a brief food frequency questionnaire was used to show if any of the subjects had eaten foods other than their usual diet.

The dietary regimens of the subjects were compared before and after starting the new diet.

A fasting blood sample (12 hours) was taken before adding two well-cooked moderately-sized eggs to the subjects' breakfast during one month of the study.

The self reported questionnaires and our diet monitoring suggested no significant change in the subjects' dietary regimens before and after adding two eggs to breakfast. Four students were excluded from the study because they altered their diets by eating other major foods for more than 3 times, or did not take the daily servings of eggs for more than 3 times during the one month period.

The results were assessed statistically in SPSS 10 using paired t-test.

### Results

Mean total cholesterol which was 138.5 mg/dl before consumption of two additional eggs for one month increased to 160.5 mg/dl at the conclusion of the study period. Triglyceride increased from 109.3 to 137.8 and LDL-C increased from 62 to 100.6 mg/dl. HDL-C which was 55.7 mg/dl before the start of the new diet decreased to 33.3 mg/dl at the end of the study. All of the changes in lipid levels in this study were statistically significant (Table 1).

### Discussion

Researchers generally recommend eating less meat, dairy, egg yolk, and hydrogenated oil and more fruits, vegetables and grain.<sup>2</sup> In an epidemiological study,<sup>3</sup> a relationship was reported between less egg consumption and lower mortality in women. In another epidemiologic review,<sup>4</sup> it has been claimed that with dietary confounders considered, there is no association between consumption of more than one egg per day and the risk of coronary heart disease in non-diabetic men and women.<sup>4</sup> Some authors have suggested that raw (less heated) eggs may be healthier than the well-cooked eggs because they produce less oxidized LDL.<sup>5</sup> It is also worth mentioning that eggs contain natural antioxidative enzymes,<sup>9</sup> which may have anti-atherosclerotic properties.

A study conducted in Brazil<sup>14</sup> concluded that consumption of three eggs every day increases the residence time of chylomicron remnants, which may have undesirable effects related to the development of CAD. Confusion exists in public health policy in controlling CVD risk factors such as unhealthy nutrition and lack of exercise in industrial countries.<sup>16</sup> Recently, there has been a growing appreciation that health derives from an overall pattern of diet rather than from avoidance of particular foods.<sup>13</sup>

In our study, *bad* cholesterol (LDL-C) increased and *good* cholesterol (HDL-C) decreased.

However, at the end of the study period, neither of the blood lipids was beyond normal limits.<sup>6-9</sup> This underlines the hypothesis that high enough levels of cholesterol in healthy subjects activate compensatory protective mechanisms.<sup>10</sup> On the other hand, it has been postulated that saturated or trans fatty acids have more adverse effects on blood cholesterol than food cholesterol itself.<sup>6,10,15</sup> Egg yolk contains monounsaturated fatty acids.<sup>12</sup>

It should also be noted that significant decreases in blood cholesterol may not lower total mortality in healthy subjects.<sup>11</sup> A decline of HDL-C - considered as an unfavorable change in this study, may have been in part due to high calorie intake which increases triglyceride and decreases HDL-C.<sup>10,11</sup>

In this study, eggs were added to the existing diet, not as substitute to existing dietary components. We recommend that young healthy individuals consume less than two eggs a day; up to two eggs may be consumed as substitute to daily dietary components.

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