

EGG, CHOLESTEROL AND CORONARY ARTERY DISEASE

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This editorial may be cited as: Hafizullah M, Aman R. Egg, cholesterol and coronary Artery disease. Pak Heart J 2019;52(01):01-3.

Egg is a rich source of cholesterol and a large egg contains 186 mg. Eggs and red meat - processed and unprocessed are rich in other nutrients such as choline, iron, carnitine, and added sodium. Additionally, egg contains 5 mg of monounsaturated and polyunsaturated fatty acids.¹ The relationship between dietary intake of cholesterol rich food items and blood levels of cholesterol has been under discussion for a long time. It has been shown recently in a meticulously conducted clinical study that healthy young men on consuming up to four eggs per day for eight weeks in which daily cholesterol intake ranged from 128 to 858 mg resulted in increase in total plasma cholesterol and LDL-C by 1.5 mg/dL for every 100 mg of dietary cholesterol added to the diet.² In women, the effect was greater, with increases in LDL-C of 2.1 mg/dL per 100 mg of dietary cholesterol per day when up to three eggs per day were consumed as dietary cholesterol intakes ranging from 108 to 667 mg per day.³

In various studies and meta-analysis egg consumption has been shown to be differentially associated with cardio vascular diseases like CAD and heart failure, cerebrovascular diseases, as strokes and total mortality. A meta analysis provided evidence that frequent consumption of eggs like more than one per day as against lesser consumption of less than one per day was associated with higher risk of heart failure, significantly lower risk of stroke and in some studies no significant association with stroke and stroke mortality. Higher consumption of eggs correlated with higher all cause mortality.⁴⁻⁸ However a meta-analysis of prospective cohort studies was unable to draw any firm conclusion to establish cause effect relationship between cholesterol and CVD essentially due to between-study heterogeneity and lack of methodological rigor.⁹ These seemingly conflicting results may be due to the association of unhealthy behavior such as physical inactivity, smoking and unhealthy dietary patterns.¹⁰ Moreover foods rich in cholesterol are also high in saturated fat and animal proteins.¹

Hitherto all cardiac patients and especially those with higher cholesterol levels were advised to reduce intake of food items containing high cholesterol and eggs. Dietary guidelines for Americans of 2015-20 baffled many cardiologists and shook the very foundations of dietary advice that was being offered to the patients world over. A new pearl of wisdom was offered to medical community that, "Cholesterol is not a nutrient of concern for over consumption". Along the lines it was also mentioned that, "individuals should eat as little dietary cholesterol as possible while consuming a healthy eating pattern."^{9,11,12} Medical community was made to believe that oral intake of cholesterol rich food had no bearing on total

blood cholesterol level and hence no role in causation of coronary artery disease and the morbidity and mortality associated with it.¹³ This, essentially, was a license to consume any number of eggs and this actually increased consumption of eggs by people across the globe.

Recently a meta-analysis has added more fuel to this debate and presented evidence to support the original thinking. This study was based on six cohorts that assessed usual dietary intake and had detailed information on key study variables. The cohorts included in the study were the Atherosclerosis Risk in Communities (ARIC) Study, Coronary Artery Risk Development in Young Adults (CARDIA) Study, Framingham Heart Study (FHS), Framingham Offspring Study (FOS), Jackson Heart Study (JHS), and the Multi-Ethnic Study of Atherosclerosis (MESA).^{6,15-19} The study is based on 29,615 individuals, mean age of 51.6 years and were followed up for median 17.5 years. In total there were 5400 incidents and 6132 all cause deaths. According to the analysis, each additional 300 mg of dietary cholesterol consumed per day was associated with higher risk of incident CVD hazard ratio (HR) 1.17 (95% CI, 1.09-1.26) adjusted absolute risk difference (ARD) was 3.24% (95% CI, 1.39%-5.08%) and all-cause mortality (adjusted HR 1.18, 95% CI, 1.10-1.26) and adjusted ARD, 4.43% (95% CI, 2.51%-6.36%). Each additional half an egg consumed per day was associated with higher risk of incident CVD (adjusted HR, 1.06, 95% CI, 1.03-1.10); adjusted ARD, 1.11% (95% CI, 0.32%-1.89%) and all-cause mortality (adjusted HR, 1.08, 95% CI, 1.04-1.11); adjusted ARD, 1.93% (95% CI, 1.10%-2.76%). The associations between egg consumption and incident CVD (adjusted HR, 0.99 (95% CI, 0.93-1.05); adjusted ARD, -0.47% (95% CI, -1.83% to 0.88%) and all-cause mortality (adjusted HR, 1.03 (95% CI, 0.97-1.09); adjusted ARD, 0.71% (95% CI, -0.85% to 2.28%) were no longer significant after adjusting for dietary cholesterol consumption. This study concluded that in US adults, higher consumption of dietary cholesterol or eggs was significantly associated with higher risk of incident CVD and all-cause mortality in a dose-response manner. It was recommended that the results should be considered in the development of further dietary guidelines and updates. This was a very well executed study in which all aspects were taken onto consideration which had led to confounding results in the previous studies. Moreover this was a long study with mean follow up of 17.5 years with a larger population and hence more likely to give significant results.

Accompanying editorial reemphasizes the main finding of the article that higher consumption of eggs and intake of dietary cholesterol consisting of eggs and meats was associated with higher incident CVD and all-cause mortality.²⁰ This association is significant and has a dose-response relationship. An added aspect in the study was that after adjusting for consumption of eggs and processed and unprocessed red meat the associations between dietary cholesterol and incident CVD and all-cause mortality did not remain significant. The author believed that the dietary cholesterol content of eggs abundantly explained the association between egg consumption and incident CVD and largely explained the association between egg consumption and all-cause mortality. It was recommended that with this evidence considering the effects of egg consumption and dietary cholesterol in the setting of heart patients the recommendation of limiting cholesterol rich food items should be considered.²⁰

Report on Physician Health Study published in 2008 supported that eating an egg a day is generally safe for heart but it did warn that going beyond this may affect adversely later in life.²¹ Moreover it is important to take another look at the diet and accompaniments of eggs rich menus like cheese, sausages, white bread or fried local bread (parathas). It may be prudent for diabetics and cardiac patients who have high cholesterol level and have difficulty in achieving optimal levels to limit consumption of egg yolks to not more than three per week and take extra care of 'trimmings' in their selected food items.^{9,11,22} Surely eggs may be a better choice than a breakfast rich in sugars and refined grains, but there are other better and viable options like oats with nuts and fresh fruits. To conclude, where as eggs may not be the optimal choice but certainly they are not the worst and they fall into the middle of the spectrum. Health conscious people may continue to take eggs but exercise caution in limiting the intake and emphasizing plant based options when available.

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