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**File: ■ Pomegranate (*Punica granatum*, Lythraceae)
■ Metabolic Syndrome
■ Cardiovascular Risk Factors**

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RE: Natural Pomegranate Juice Demonstrates a Beneficial Effect on Systolic and Diastolic Blood Pressure and hs-CRP, while also Increasing Triglycerides and VLDL Cholesterol

Moazzen H, Alizadeh M. Effects of pomegranate juice on cardiovascular risk factors in patients with metabolic syndrome: a double-blinded, randomized crossover controlled trial. *Plant Foods Hum Nutr.* June 2017;72(2):126-133.

Metabolic syndrome is the name for a group of risk factors (high blood pressure, increased blood levels of sugar and lipids, and excess body fat around the waist) that increase the development of cardiovascular disease. Foods high in polyphenols have high antioxidant and anti-inflammatory properties. Pomegranate (*Punica granatum*, Lythraceae) fruit juice may have cardiovascular benefits in relation to this issue. However, nutritionists are concerned with pomegranate's simultaneous effect on the rise of glycemic factors and sugar-dependent lipids; namely, triglycerides and very-low-density lipoprotein cholesterol (VLDL-C). The purpose of this randomized, double-blind, placebo-controlled, crossover study was to evaluate the effect of pomegranate juice on cardiometabolic indices and glycemic indices in patients with metabolic syndrome.

Patients with metabolic syndrome (n = 32; aged 18-70 years) were recruited via advertisement in Shabestar, Iran. This study took place between December 2012 and January 2013. Included patients had ≥ 3 of 5 components of metabolic syndrome—namely, waist circumference > 88 cm for women and > 102 cm for men, serum triglycerides ≥ 150 mg/dL, high-density lipoprotein (HDL) cholesterol < 50 mg/dL for women and < 40 mg/dL for men, systolic blood pressure ≥ 135 mmHg or diastolic blood pressure ≥ 85 mmHg, and fasting plasma glucose concentration > 110 mg/dL. Excluded patients included those who were pregnant or breastfeeding; consumed alcohol; had systemic, inflammatory, hepatic, or kidney diseases; and were allergic to pomegranate juice or the pomegranate placebo. Patients were withdrawn from the data analysis if during the study they had any change of diet, any disease development, or had an increase in low-density lipoprotein (LDL) cholesterol where medications were needed. Patients were treated with either 500 mL pure pomegranate juice or placebo for 7 days, and, following a 7-day washout, they received the opposite treatment. Pomegranate juice was prepared by hand by the researchers. The arils were removed from Shiraz

pomegranates and were manually squeezed to yield juice; no additives were used. The juice included anthocyanins, 100.46 mg/L; total phenolics, 69 mg/L; total flavonoids, 283.02; and antioxidant capacity (DPPHsc [2,2-diphenyl-1-picrylhydrazyl radical scavenging activity]), 69%. Food engineers created a placebo formula to resemble the pomegranate juice taste and color. The similarity of the placebo and pomegranate juice was confirmed by 3 expert testers. The placebo was void of any polyphenols. The patients were asked not to change their lifestyle, diet, or physical activity during the study. Food intake and physical activities were recorded in a diary for 3 days to ensure no changes were made during the study. Blood was drawn at baseline and after 7 days of treatment to measure high-sensitivity C-reactive protein (hs-CRP), fasting blood sugar, total cholesterol, blood insulin, triglycerides, HDL, LDL, and VLDL. Blood pressure also was measured.

Thirty patients were included in the final analysis; 1 patient was withdrawn due to development of the flu and taking antibiotics, and 1 patient had emotional and psychological problems. There was no change in intake of energy, carbohydrates, protein, or fat. Triglyceride levels and VLDL were significantly higher after pomegranate juice than after the placebo ($P = 0.025$ and $P = 0.016$, respectively). Blood hs-CRP was significantly lower after pomegranate juice compared with baseline ($P = 0.028$) and placebo ($P = 0.018$). After pomegranate juice consumption, systolic and diastolic blood pressure significantly decreased compared to baseline and placebo ($P < 0.001$ for all). After placebo, systolic blood pressure significantly decreased compared to baseline ($P = 0.007$).

The authors conclude that 500 mL/day of natural pomegranate juice had a beneficial effect on systolic and diastolic blood pressure and hs-CRP, despite increasing triglyceride and VLDL levels. Other studies report no effect of pomegranate juice on hs-CRP, while one reported a beneficial effect in overweight and obese individuals. The authors hypothesize that the difference between their findings and other reports can be attributed to the high daily dose of pomegranate juice in this study and the variety (Shiraz) of pomegranate used. It is not surprising that the increase in triglycerides was accompanied by an increase in VLDL because VLDL transports triglycerides. A meta-analysis concluded that the significant increase of triglycerides could disappear with long-term use.¹ The authors state that, "This study showed that nutritionists, at least in the short-term, were right in being concerned because consuming pomegranate juice, in addition to having beneficial effects on blood pressure and inflammatory indices, has harmful effects on triglyceride and VLDL-C which is due to its high level of fructose." Long-term studies in a larger population are needed to confirm these short-term results. The authors declare that they have no conflict of interests. The study was funded by Urmia University of Medical Sciences; Urmia, Iran.

—Heather S. Oliff, PhD

Reference

¹Sahebkar A, Simental-Mendía LE, Giorgini P, Ferri C, Grassi D. Lipid profile changes after pomegranate consumption: a systematic review and meta-analysis of randomized controlled trials. *Phytomedicine*. 2016;23(11):1103-1112.

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