International Journal of Emerging Trends in Pharmacy and Medicine
Vol. 01 (02), Apr - Jun 2025, pp. 01-11.
Online ISSN: 3107-4103
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A Review of Natural Food Products and Their Impact on Cardiac Health

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Abstract

Disorders of the heart (CVD). Based on data from clinical, epidemiological, and experimental research, dietary nutrients are regarded as cardiovascular-friendly natural products due to the significant cardioprotective benefits they offer cutting-edge primary and secondary inhibition of cardiovascular diseases. The effects of ω-3 (PUFA) are briefly discussed in this article. Several CVD disorders & natural foods that influence heart health, including pomegranate, walnut, onion, and garlic.

Keywords: Antiplatelet Activity, Cardiovascular Disease (CVD), Omega-3 Polyunsaturated Fatty Acids (PUFA), Pomegranate, Walnut.

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1. INTRODUCTION

As the foremost cause of death and disability worldwide, cardiovascular illness is becoming a more significant medical and public health issue. Heart illness, stroke, and atherothrombosis remain the main causes of mortality. CVDs were the top cause of death in 2019, according to data from the WHO. An aging population exacerbates the issue, and the 22.2 million deaths from CVD that are expected to occur by 2030. Heart failure, myocardial infarction (myocardial attack), stroke, peripheral vascular disease (PVD) & coronary heart disease (CHD), cardiomyopathies, dyslipidemias & hypertension are examples of CVDs (Shaito et al., 2020).

Vascular dysfunction causes organ damage, which in turn causes CVDs. Vascular malfunction, for instance, can result in a brain stroke or heart attack. Vascular disease (BP) is mostly caused by atherosclerosis, thrombosis, and hypertension. Common CVD Among the risk elements are high levels of low-density lipoprotein cholesterol (LDL), decreased levels of high-density lipoprotein cholesterol (HDL), hypertension, diabetes, hyperlipidemia, smoking, poor diet, and hypertension (Vilahur & Badimon, 2013).

The habit of traditional therapeutic plants has increased dramatically in recent years, and the habit of medicinal herbs remains an substitute beneficial option for several disorders, including CVDs. Medical plant research is no longer limited to pharmacology and chemical composition but also includes the training of metabolomics and fundamental mechanisms of action. Studies engage in transcriptomics, route analysis, pharmaceutical efficacy testing, and simple chemical component separation. The basic mechanisms underlying medicinal plants' remarkable healing qualities are becoming clarified (Vilahur & Badimon, 2013).

The foundation of CVD prevention and therapy has traditionally been a balanced eating pattern. In recent years, ischemic heart disease and atherosclerosis (IHD) have been linked to poor lipid profile levels or values, such as total cholesterol, LDL, VLDL, and triglycerides. For the treatment of hyperlipidemia, dietary therapy is recommended. Variables accompany other natural systems. Drug treatment is designed to treat diseases that are more challenging to cure.

Therefore, lowering blood cholesterol levels is the primary objective in the development and treatment of atherosclerosis. According to Vilahur and Badimon (2013), people (male or female) between the ages of 33 and 44 who have overall cholesterol levels of 256 mg/dL or greater are five times more likely to develop coronary artery disease. "Natural food products and their impact on cardiac health" is the title of the cardiovascular activities that this review is meant to introduce. It merely offers a few well-known examples of natural chemicals that have an influence on metabolic and cardiovascular issues, and it is by no means exhaustive. Natural foods, including walnuts, pomegranates, onions, garlic, and ω-3 polyunsaturated fatty acids (PUFA), remain the focus.

2. DISCUSSION

2.1. *Pomegranate*

The pomegranate (Punica granatum L.), a single primary edible fruit recognized by science, is today used in large quantities worldwide. In recent years, there's been a steady upsurge in scientific interest in this plant, on the way to the high levels of bioactive compounds found in its fruits, seeds, and other anatomical compartments, including flowers and leaves. Strong antioxidative, antibacterial, and anticarcinogenic properties have been discovered in pomegranates and their extracts.

The ancient fruit recognized as the pomegranate is original to Central Asia, which includes the Mediterranean area, the Middle East, Iran, and Turkmenistan, as well as northern India. It is a member of the Punicaceae family, namely the Punica L. genus. Pomegranate-derived chemicals have been shown in vitro and in vivo to enhance endothelial cell function, limit macrophage lipid absorption, decrease oxidative stress and platelet aggregation, and play a part in blood pressure regulation. Daily use of pomegranate juice has been studied in clinical studies to reduce blood pressure and prevent the progression of atherosclerosis in humans (Aviram & Rosenblat, 2012).

2.1.1. *Pharmacological Activities of Pomegranate*

Several scientific studies on the effects of pomegranates in the framework of CVDs have been carried out within the past 20 years. These trials provided ample evidence of the vasculoprotective benefits of pomegranate products. However, a few of these studies suggested that pomegranate consumption in large quantities or over a long time may result in certain, likely negative consequences, primarily diarrhea (Andy, Andy, & Tharayil, 2024).

Over two weeks, pomegranate juice reduced systolic pressure by 5% and ACE activity by 36% in hypertension individuals. Furthermore, the same study discovered that in patients with carotid artery stenosis, pomegranate juice intake for three years reduced blood pressure and the depth of the common intima-media thickness. In a sample of 51 healthy women, consuming pomegranate juice for four weeks reduced blood pressure without altering serum ACE activity (Banihani et al., 2013). Additional study with 13 hypersensitive males found that uncontrollable use of pomegranate juice lowered blood pressure. Serum levels of VC adhesion molecule-1, IC adhesion molecule-1, E-selectin, C-reactive protein (CRP), and IL-6 were among the clinical indications that remained unchanged in these patients.

In a subsequent investigation, pomegranate juice consumption was indicated to decrease both systolic and diastolic pressure in 21 high blood pressure participants. Furthermore, in obese women with dyslipidaemia, pomegranate peel hydroalcoholic extract decreased cardiovascular risk variables, according to a double-blind and randomized, placebo-controlled pilot study. (Aviram & Rosenblat, 2012). Although a meta-analysis examining the impact of pomegranate diet on CRP concentrations

found no significant association between these parameters, the advantages of pomegranate diet on blood pressure regulation in both human and pet studies appear to be therapeutically relevant. Pomegranate juice and seed oil have been shown in a recent study to effectively reduce blood pressure. (Lynn et al., 2012).

Another systematic review has just been completed and found that consuming pomegranate juice reduced systolic pressure despite the volume & duration of the fluid eaten in the trials that were analyzed. Doses exceeding eight ounces ensured a marginally significant effect on lowering diastolic blood pressure. Pomegranate juice consumption consistently lowers blood pressure, which may have therapeutic significance (Lynn et al., 2012).

Numerous pomegranate components offer a range of vasculoprotective qualities, as shown by the research mentioned above. It is thought that the presence of hydrolysable tannins, their byproduct ellagic acid, and urolithins is what causes some of these beneficial qualities. Inflammatory cells' signalling was inhibited. By activating the transcription features PPAR- and activator protein 1, punicalagin and gallic acid enhanced the production of paraoxonase 2 in isolated macrophages and reduced oxidative stress in macrophages (Wang et al., 2018).

Individual pomegranate fruit components, including punicalin, punicalagin, ellagic acid, and gallic acid, prevented the development of advanced glycation end products (AGEs) from sugar and bovine serum albumin in vitro antiglycation experiments. Numerous illnesses, such as arteriosclerosis and diabetic complications, are known to be exacerbated by AGEs. Pomegranate fruit extracts significantly decreased the accumulation of AGEs in rats given a diet rich in fat and sugar.

It has also been demonstrated that ellagic acid and punicalagin prevent fat breakdown in human and mouse adipocytes ex vivo (Kumagai et al., 2015). Additionally, ellagic acid's impact on endothelial cells' generation of reactive oxygen species (ROS) was examined. Ellagic acid pretreatment of HUVECs decreased ROS, which prevented oxLDL-induced eNOS downregulation. The rat thoracic aorta was vasorelaxated ex vivo by ellagic acid through a mechanism dependent on the endothelium and a decrease of calcium influx (Les et al., 2018).

2.2. *Walnut*

A tree nut that is a member of the walnut family is the walnut (Juglans regia). They have partaken human diet for thousands of centuries, having originated in Central Asia and the Mediterranean area. These nuts have more antioxidants than most other foods and are rich in omega-3 fats. Consuming walnuts may help protect against cancer and heart disease while also enhancing cognitive function. Although they may be added to salads, pastas, morning cereals, soups, and baked goods, walnuts are most frequently consumed as a snack on their own. Walnut oil is also made from them. Some species of walnuts are edible (Banel & Hu, 2009).

The walnut group had significantly lower levels of triglycerides, apo B, and total cholesterol, whereas the control group had higher levels. The n-3 fatty acid-enhanced

egg handling was unsuccessful. However, the walnut action's total-C: HDL-C rate was significantly reduced than that two egg treatments. Numerous studies have shown that eating fatty fish at night improves sleep quality, and none of the inflammatory indicators examined in this study displayed differences that are of statistical significance ($p > 0.05$) amongst groups. Working out at least twice a week will help preserve your heart (Usta et al., 2013).

Additional resources for elongated-n-3 chain fatty acids in food for vegans, plus those who avoid seafood for various reasons, EPA and DHA are available. DHA is present in meals that have been fortified containing n-3 fatty acids, like eggs. For vegans, that is. Long-term health is harder to attain with diet alone. Those who need long-chain n-3 fatty acids might need to use supplements derived from microalgae oils. ALA, a plant-based n-3 fatty acid, may be transformed by the body into EPA.

It appears that switching to DHA is less successful. In this research, we contrasted n-3 fatty acids with walnuts high in ALA. Lacto-ova vegetarians (LOV) are influenced by the effects of regular eggs with acid-enhanced (mostly DHA) eggs on specific CVD risk. Compared to eating six regular eggs per week, LOV's Total-C and TAG levels were lower when they added 24 g/d (1 ounce, six days/week) of walnuts to their regular diet. Incorporating meals high in ALA is even more crucial (Usta et al., 2013).

Even when the egg included a high quantity of cholesterol and a significant dosage of DHA, adding walnuts to LOV's usual diet decreased the proportion of total-HDL cholesterol when in contrast to both egg treatments. Prior research has demonstrated that consuming 42–57 grams of walnuts daily lowers total-LDL-C and TAG in people with normal cholesterol levels as well as those with hypercholesterolemia. While total-C and TAG decreased, LDL-C stayed the same. Perhaps a lower starting point is the cause of this. LDL-C readings in our patients with normal cholesterol levels or as a result of the low walnut dosage used in our trial (24 g/d), in contrast to the higher dosages often used in earlier feeding studies. UTIs and blood cholesterol levels are consistently affected by cutting back on walnuts (Andy, Andy, Tharayil, & Mulukuri, 2024).

Despite the appearance of this being the case, previously found evidence indicates that the walnut treatment has a lower cholesterol intake than the egg treatment. Blood cholesterol is better predicted by dietary fatty acids than by dietary cholesterol. Consuming walnuts has been shown to lower blood cholesterol levels, like the control diet, since prior research has shown that DHA increases LDL-C, an increased diet was recommended even in cases when dietary cholesterol intake was limited. However, it was intriguing to see that compared to utilizing eggs as a standard treatment, using eggs boosted with n-3 fatty acids resulted in reduced cholesterol levels.

Even so, the findings were not statistically significant. This could be because, when hens fed flaxseed meal were compared, one ounce of walnuts contained a greater quantity of ALA (1 g/kg) than nearly half of the n-3 fatty acid-loaded egg (egg yolk). Typical egg yolks include as little as 0.1 g of ALA. Walnuts were shown to be superior to fatty fish in a previous study that compared the two foods (Usta et al., 2013; Andy, Andy, Tharayil, & Mulukuri, 2024).

It is found that walnuts raise HDL-C levels while lowering total and LDL-C levels. In contrast to the other treatment, the fatty fish increased HDL-C and decreased TAG. In the current study, however, the drop in TAG of 13% was not statistically significant for the eggs treated with n-3 fatty acids; 18 percent had n-3 fatty acid enrichment. When comparing the walnut therapy to the conventional egg treatment.

According to a clinically significant drop of 13–18%, ALA and EPA/DHA both help to reduce triglyceride levels. Already, we had tried fatty fish and walnuts. As opposed to walnuts, the quantity of EPA in erythrocytes doubled, and a diet high in fatty fish lowers TAG levels in fatty fish. Dietary category. This study looked at the amount of EPA in erythrocytes. Although there was no difference in the membranes across treatments, in the category of n-3 fatty acids, DHA remained noticeably higher.

The improved egg therapy was the most successful treatment when compared to the other two. The reason why walnut treatment lowers TAG levels higher is not explained by these studies. Conversely, the walnut treatment had three grams more total n-3 fatty acids from the food than the control group. Treatments including eggs may help explain the popularity of walnuts. Compared to eggs with additional fatty acids that included n-3 fatty acids, TAG was more impacted. The total HDL cholesterol proportion is a clinical standard for determining cardiovascular disease risk. When compared to other therapies, the walnut therapy was the most efficient in lowering this ratio. The two egg procedures were successful.

In addition to this ratio, the Apo- B- Apo- A-1 ratio fell during therapy, approaching a substantial difference between regimens. This suggests a generally better lipid profile when contrasting the walnut therapy with the standard egg treatment. To get the necessary profile, one ounce of walnuts was ingested. Six times a week instead of six eggs a week, the fatty acids configuration of Walnuts might play a role in mediating their effects; however, this might go beyond the walnut's lipid matrix.

The blood cell membranes in all three treatments contain the same EPA concentrations. Compared to the control group, the walnut treatment had greater EPA levels. The fact that the organization did not expand as anticipated may be connected to this. The high consumption of omega-6 fatty acids. Alternatively, compared to n-3 FA-enriched erythrocytes, walnut-treated erythrocytes had significantly reduced DHA levels in their membranes.

2.3. *Egg Treatment*

This suggests that ALA consumption is advantageous. Diets heavy in fat are not the only way to get DHA. DHA is taken straight from this source and contrasted with LOVs that do not ingest it. Future research will concentrate on consuming more walnuts or other foods high in ALA, or to determine if DHA absorption in erythrocytes increases under these conditions, a diet therapy lasting longer than eight weeks could be necessary. On the other hand, erythrocyte DHA levels and risk factors were examined in connection with cardiovascular health.

Right now, it appears that the protective layer is not an impediment. This study indicates that inflammation has a role in the development and creation of atherosclerosis & raises the risk of cardiovascular disease. Determined by blood indicators of inflammation, certainly some proof of n-3 fatty acids might aid in reducing discomfort.

These results, however, contradict one another. Our investigation revealed no appreciable alterations in inflammatory markers. Signals when n-3 fatty acids or walnuts are present. Utilizing improved eggs for treatments. According to the bulk of research, n-3 fatty acids have no impact on healthy individuals. The impact of fatty acids on cytokines and other inflammatory markers. However, a higher dose of EPA & DHA (2 g/d) or a longer intervention period (12 weeks) only partially decreased the amounts of Detachable molecules that attach, including sIC-AM-1 and sVC-AM-1, in healthy subjects observing n-3 fatty acid consumption.

About 500 mg of egg enhanced with n-3 fatty acids were produced. 30 mg of EPA per egg yolk, but only for 8 weeks, and DHA per egg yolk. Only when walnuts and other foods high in ALA are taken do they have a similar beneficial impact on the adhesion molecule sE-selectin. Eating accounted for at least 6.5–12% of the body's overall energy. In order to regulate the environment, a diet that lowers cellular adhesion levels will be essential. Future studies should concentrate on the atherosclerosis process while considering dietary supplements of n-3 fatty acids. The proper dosage & period must be carefully considered, particularly in healthy individuals. We previously found increased plasma levels of eicosanoids such as thromboxane and prostaglandin (PGE2).

After eating two fatty fish meals each week, the amount of (TXA2) metabolites decreased (EPA + DHA of 780 mg/d). It is commonly recognized that EPA produces eicosanoids that have anti-inflammatory properties, whereas derivatives of arachidonic acid have pro-inflammatory properties. In rats in the same study, we observed a similar effect with walnut consumption (42.5 g/d), which is attributed to the ALA and other walnuts' tocopherol content. It is also known that the cyclooxygenase enzyme activity is suppressed by the tocopherol content of walnuts. Whether or if these biomarkers might affect the current study due to taking a low dosage is uncertain because they were not assessed in the study.

Whether to utilize walnuts or eggs that are enriched with n-3 fatty acids is still up for debate. There was a free-living component to this control trial. The outcomes fall short of those of trials with metabolic control. Conversely, subjects under unconstrained living conditions consume their typical diet with minimal dietary change. Because this research was done on healthy LOVs, people who eat fewer animal products, the results are more generalizable and reflect what the general public would more realistically want to eat. However, it is important to exercise caution when interpreting the results. Regarding dietary cholesterol, people who have long-term medical conditions, people who eat different kinds of animal-based foods, and those who could be allergic to them (Usta et al., 2013).

2.4. *Onion and Garlic (ajoene)*

It has been demonstrated that allium plants, such as onions (Allium cepa) and garlic (Allium sativum), have several positive cardiovascular benefits, including lowering cholesterol and triglyceride levels, increasing fibrinolysis, and promoting antiplatelet activity. Cooked preparations showed minimal to no effect on platelet aggregation, even though raw garlic and onion have been shown to do so. Numerous studies have demonstrated that garlic significantly affects platelets' capacity to assemble.

Five of the six experiments that examined garlic's impact on platelet aggregation showed positive outcomes (a decrease in platelet aggregation), whereas one showed no effect at all. There were no changes in fibrinogen levels, and it was unclear if fibrinolytic activity was present (Kris-Etherton, 2014). The chemicals found in onions and garlic have also been shown to significantly decrease TX production; this is most likely because they directly and non-competitively block the COX enzyme. Blood TXA2 levels significantly decreased by 80 percent after 26 weeks, based on a study assessing how eating a fresh garlic clove affected the generation of platelet TX (Kris-Etherton, 2014).

Onions have 13 times less antiplatelet activity than garlic, even if they decrease TXA2 production. It was already established that many compounds derived from the accumulation of platelets are inhibited by plant species. They comprise adenosine, paraffinic sulfide & allicin. A high-sulfur component is shared by most of these compounds. Onions have a true sulphur-dependent antiplatelet effect; the lower the sulphur level, the less antiplatelet activity there is. The main ingredient in garlic that is thought to prevent platelet aggregation is allicin & more specifically, ajoene, which is a result of allicin's self-condensation.

The findings indicate that while ajoene does not change vWF binding to GPIb, it decreases fibrinogen and vWF binding to the GPIIb/IIIa receptor. On the platelet membrane, ajoene seems to decrease the quantity of functional GPIIb/IIIa receptor sites by lowering the viscosity in the inner region of the lipid two-layer, rather than changing fibrinogen affinity for the GPIIb/IIIa receptor or the conformation of the GPIIb/IIIa receptor.

The fact that ajoene stops GPIIb/IIIa binding supports the idea that it decreases platelet aggregation produced by all known agonists. It has also been shown that ajoene inhibits the synthesis of TXA2 via altering the metabolism of arachidonic acid. Additionally, it has been demonstrated that diallyl trisulfide, the paraffinic sulfide component of allium, exhibits antiplatelet properties. According to studies, this polysulfide, which does not affect the synthesis of inositol-1,4,5-triphosphate, inhibits TXA2 synthesis, platelet aggregation, and Ca2+ mobilization brought on by thrombin in a concentration-dependent manner (Bahadoran et al., 2017).

2.5. *W-3 Poly-unsaturated Fatty Acids*

Numerous large-scale studies have thoroughly examined the cardio-protective qualities of fish-derived dietary 3 PUFA, eicosapentaenoic acid (EPA; C20:5 n-3) and

docosahexaenoic acid (DHA; C22:6 n-3). As a result, a very small incidence of cardiac disease was reported in Greenland Eskimos, which was still linked to the increased intake. A 7% decrease in coronary heart disease mortality has been associated with a 20-gram daily increase in fish consumption (Robinson & Stone, 2006).

Although the precise mechanisms through which fish-derived -3 PUFAs offer this protection are still up for debate, reduced platelet aggregation, a better lipid profile (primarily lower plasma tri-glyceride levels) & anti-inflammatory responses (decreased cytokine/chemokine production & release, NF-B activation) are the primary ones that have been proposed. And plaque stabilization (lower monocyte infiltration) (Rodriguez-Sanchez et al., 2015).

Fish-derived -3 PUFAs are thought to have antithrombotic properties because their absorption enters the phospholipid membrane and changes their metabolism of arachidonic acid, which lowers the production of TXA-2. Hence, -3 PUFA promotes the production of platelet physiologically inactive eicosanoids (TXA3) instead of platelet activator eicosanoids (TXA2) by competing with arachidonic acid (-6 PUFA) as a substrate for the COX enzyme. Consequently, a high level of -3 PUFA incorporation in phospholipids found in cell membranes changes the balance of eicosanoid synthesis in the direction of an anti-thrombotic profile. However, -3 PUFA have been shown to improve vascular function & increase Unknown delivery, which regulates platelet work (Hr, 2018).

Another -3 PUFA included in vegetable oils is linolenic acid (ALA), which has been demonstrated to have antiplatelet properties. The question of whether ALA's partial conversion (10%) to EPA and DHA after oral consumption explains the beneficial effects seen or if ALA directly affects biology is raised by this conversion (Saravi et al., 2021). However, in a recent elegant work through p38MAPK suppression, Holy and associates showed that ALA can lower tissue factor expression, platelet activation, and in vivo arterial thrombus development.

3. CONCLUSION

Natural foods possess an excessive amount of potential and promise for the course of therapy and anticipation of energy expenditure & CV-diseases demonstrated by significant instances and recent developments covered above. Nonetheless, epidemiological research has shown the benefits of eating a healthy, fruit-rich diet, vegetables, MUFAs, and PUFAs, as well as drinks high in polyphenols, in preventing cardiovascular disease (CVD) onset and progression. It is yet unknown what biochemical processes this diet influences CVD. However, a few studies have demonstrated that Mediterranean functional foods have significant anti-thrombotic and anti-atherosclerotic qualities. These will enable conclusive conclusions to be made on the possibility of developing a useful preventative strategy before an addition to the present pharmacological therapies for thrombotic diseases.

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