



# REVIEW ON ROLE OF NUTRACEUTICALS IN THE PREVENTION AND TREATMENT OF AORTIC ANEURYSM

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## ABSTRACT:

An aortic aneurysm is excessive localized swelling of the wall of an artery which means balloon-like-bulge in the aorta that can dissect or rupture. Aorta is the largest artery that carries oxygen rich blood away from heart to blood vessels, reaching the rest of the body. This is more common in men than women, with prevalence rates estimated at 1.3-8.9% in men and 1.0-2- 2% in women. This will be extremely rare in babies, very rarely between age 3-18, in young adults between 19-40 ages rarely affected, adults above 41-60 ages commonly affected, above 60 are quite common. In India 10 million people are affected by aortic aneurysm. According to 2019 statistics aortic aneurysm was the cause of 9,904 deaths. About 59% of deaths due to aortic aneurysm happen among men. Aortic aneurysm treated in two ways by medications and surgery. Medicines can reduce risk by lowering blood pressure. Surgery for repair or to replace the affected section of aorta. The challenges after taking medicines like cocaine and methamphetamine have deleterious effects on cerebrovascular, leading to increased risk for aneurysm formation and rupture. The complications of surgery are bleeding during or after surgery, hemorrhage, acute renal failure, ischemic colitis, aorta-canal and aorta-enteric fistula. For avoiding such risk factors, having nutraceuticals can reduce the risk of challenges. Nutraceuticals contain nutrition required for health and pharmaceuticals remedy for sickness/injury. It includes nutraceuticals like vitamin rich components (vit K, B6, B12, C, D), flavonoids, n-fatty acids, soya products, nuts.

**KEY WORDS:** Aortic aneurysm, Nutraceuticals, Dietary supplements, therapeutic outcomes, Vitamins, n-fatty acids.

## INTRODUCTION:

Cardiovascular disease (CVD) is a group of diseases of the heart and blood vessels including aortic aneurysm. An aortic aneurysm is a balloon-like bulge in the aorta, which is the largest artery that carries blood from heart through chest and torso, which can dissect or rupture. The aorta is the largest blood vessel in the body, so a ruptured aortic aneurysm can cause life threatening bleeding. [1] The force of blood pumping can split the layers of artery walls, allowing blood to leak in between them. This affected 10 million in India. Aortic aneurysm is dilatation of the aorta to greater than 1.5 times its normal size.[2] It can occur in any part of the aorta categorizing Thoracic aortic aneurysm, (TAA) Abdominal aortic aneurysm (AAA), Periphery aortic aneurysm (PAA). TAA also called heart aneurysm which occurs in the section shaped like an upside-down U at the top of the aorta.[3] In people affected with marfan syndrome, that is a connective tissue disorder (Marfan syndrome). AAA develops in the handle of the aorta that points down. [4]

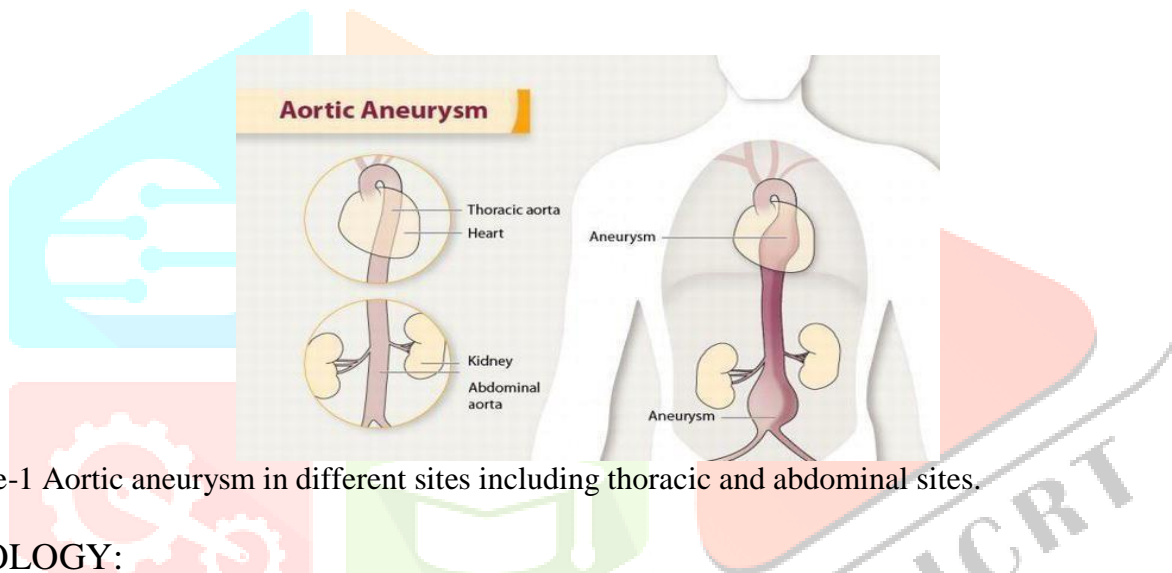


Figure-1 Aortic aneurysm in different sites including thoracic and abdominal sites.

## ETIOLOGY:

Aortic aneurysm is a complex disease with both genetic and environmental factors. Whether due to trauma or a pre-existing disease, aortic aneurysms occur due to the weakening of the vessel walls.[5] In this sense, the etiology of the aortic aneurysm disease is involved due to developmental/degenerative atherosclerosis, chronic aortic dissection, annuloaortic ectasia (Marfan syndrome), high blood pressure more likely due to overweight and sudden injury. [6]

Due to infectious tuberculosis, syphilis, mycotic. Vasculitis like Takayasu's arteritis, Ankylosing spondylitis, Rheumatoid arthritis, Reiter's syndrome, sarcoid, relapsing polychondritis, Cogan's syndrome. The complex pathological feature of aortic aneurysm is seen in both abdominal and thoracic aortic regions.[7]

**EPIDEMIOLOGY:** The pervasiveness of men than women, with estimated rates 1.3-8.9% and 1.0-2.2% respectively. Expansion and rupture are the main risk factor of AA (aortic aneurysm).[8][9] Only 1% of men aged between 55 to 64 are affected but more common with every decade of age.[10] The likelihood increases by upto 4% in every 10 years of life. AAA is most affected with aneurysms. Among the three categorized AA, an AAA rupture is the 13<sup>th</sup> commonest cause of death in western world.[9] In

men, 4 to 6 times more common with a ratio of 4:1 male to female.[7] In the screening studies found that the aortic aneurysm is generally small, those measuring  $\geq 5.5$  cm or greater are found in only 0.4-0.6%.[8] In the US, AAA related complications are liable for 4.903 deaths, with a coarse of 1.5 deaths per 1,00,000. [11][12]

**Age:** Aortic aneurysm commonly affected above 40 years of aged people. According to age statistics it is rarely affected among ages 0-40. In the United Kingdom and Sweden, screening all men over 65 is recommended.[9]

## PATHOPHYSIOLOGY:

A chronic condition of Aortic aneurysm (AA) includes degenerative diseases, inherited disorders, infections, inflammatory conditions and trauma.[13] This state leads to a permanent localized dilation of the aorta, which generates vessels to sudden rupture associated with a diameter less than or equal to 3.0 cm. [14][15] The most distinct histopathological changes of aneurysmatic aorta are seen in the region of tunica media and intima layers. These changes lead to an accumulation of lipids in the foam, extracellular free cholesterol crystals, calcification, thrombosis, ulcerations and layer rupturing.[16] Development of aneurysms relates to loss of two critical structural elements in the aortic walls: elastin and collagen. An elastin enables the aorta to retaliate to pulsatile flow while maintaining normal arterial dimensions.[17][18] The breakdown of elastin only leads to an aneurysmal expansion and rupture.[13] If left untreated aortic aneurysm (AA) then the aortic wall continues to weaken and becomes unable to withstand the forces of the luminal blood pressure resulting in progressive dilation and rupture, a destruction related with a mortality of 50-80%.[19] The rupturing of aortic walls may lead to an internal bleeding. The basic pathophysiologic mechanism of developing Abdominal aorta aneurysm (AAA) is degradation of tunica media by proteolytic process. Some researchers reported an increased expression and activity of matrix metalloproteinases in individuals with AAA.[20]

## SIGNS:

The individual with aortic aneurysm has signs of pain in chest or back, a deep pain on the side of the abdomen, a throbbing feeling near the belly button are the signs usually seen. Flank ecchymosis (appearance of a bruise) is a sign of retroperitoneal bleeding, also called Grey Turner's sign.[21]

## SYMPTOMS:

Generally, an aortic aneurysm does not show any symptoms until it bursts. Sometimes AA may have asymptomatic symptoms (no symptoms) until it is either very large or it ruptures.[22] Before rupturing the symptoms like difficulty in breath or shortness of breath, feeling full even after a small meal, pain wherever the aneurysm is growing (could be neck, back, chest and abdominal), and will be painful for swallowing, coughing or being hoarse are experienced. Symptoms will depend on the blood vessel

affected. If the vessel ruptures, then it is a medical emergency that requires immediate treatment. After rupturing the symptoms may include dizziness or light-headedness, rapid heart rate, sudden severe chest pain, abdominal pain, back pain.[23] An aortic aneurysm leading to painful, sharp, pulsating sensations in the upper back spreads downwards, lower back and legs. Difficulty in breathing, Pain in the chest, jaw, or arms will be experienced, and Cool feet or black or blue painful toes appear.[24]

**COMPLICATIONS:** In higher risk conditions the artery vessels are ruptured. If an aortic aneurysm ruptures it leads to an internal bleeding.[25] The rupture can be very dangerous depending on the location of the aneurysm, even it will be life threatening if untreated. A growing AA can also lead to an aortic dissection in the artery wall. A dissection allows blood to leak in between the walls of the artery. During aortic aneurysm the primary effect is the artery will bulge like a balloon and will be painful. And reduces the blood flow from the heart

to other areas. The rupture will be caused due to the pressure of blood building up in the artery walls.[26]

### DIAGNOSIS:

Mostly people with Aortic aneurysm are asymptomatic, with an unnoticed growth of the disease. In this sense, by routine exams the most diagnoses of AA are made.[27] A diagnosis of AA requires an image of the artery to confirm, usually diagnosed by physical exam or CT scan or X-rays or ultrasonography. Ultrasonography is used to screen aneurysms and to determine their size. Along with that, free peritoneal fluid can be detected.[28] It is non-invasive and sensitive, but the presence of bowel gas or obesity may limit its usefulness. And CT scan has nearly 100% sensitivity for an aneurysm, it is also useful in preoperative planning and detailing the anatomy and possibility for endovascular repair.[29] If suspected rupture, it can also probably detect retroperitoneal fluid. Alternative methods which are less often used for visualization of an aneurysm include MRI and angiography.[30]

### TREATMENT:

The medicines and surgery are the two main treatments for aortic aneurysms. Medicines can lower the blood pressure then it will reduce the risk for aortic aneurysm. Surgery can repair or replace the affected section of the aorta.[31] The large aneurysm detected at risk of dissecting or rupturing may require surgery. Open aneurysm repair and Endovascular aneurysm repair (EVAR) are the mostly preferred surgeries for AA. Through the open aneurysm repair removes the aneurysm and sews a section of specialized tubing in place to repair the artery, this surgery may also be necessary if an aneurysm bursts. EVAR is a minimally invasive procedure to fix aortic aneurysm.

**Challenges after aortic aneurysm surgery:** All surgeries have risk, after a surgery it may take a month or longer to recover. The possible complication after the surgery includes leaking blood around the graft which is known as endoleak. Endoleak is a movement of the graft away from the placed section, and formation of blood clots and infection.[32]

**Challenges after medications:** The medicines used for the aneurysms like beta blockers, Angiotensin-2, statins etc have side effects. By taking medications, we must face many other challenges like side effects.

**BENEFITS OF NUTRACEUTICALS:** The term Nutraceuticals coined “nutrition” and “pharmaceutical” in 1989 by Stephen DeFelice. According to DeFelice, nutraceutical can be defined as, “a food or part of a food that provides medical or health benefits, including the prevention and treatment of a disease.[33] The definition encompasses medicinal products made from the natural substances.[34] Nutraceuticals are having the functional foods supplements which we intake when food is being cooked or prepared with or without knowledge that provides the body with the required amount of vitamins, fats, proteins, carbohydrates, etc., needed for the healthy survival. When functional foods aid the treatment and prevention of disease it works as Nutraceuticals, which has a combination of nutrition benefits and pharmaceutically helpful for the body for recovery from a disease. It is better to cure a disease by intake natural supplements than medications which lead to other side effects.[33] The nutritional supplement foods are healthy food products. Nutraceuticals are natural nutritional compounds, which are efficacious in preventative medicine or in the treatment of disease.[34] Several foods and dietary supplements help to protect the heart against aortic aneurysm. Nutrients as part of entire food intake and the lack of effectiveness of single nutrient supplementation will not show a beneficial effect to the body, as well the immune system to act as a protective system. In a single nutraceutical product, composition of many functional supplements which are effective nutrients and necessary for the treatment and cure of the disease.[35]

### **NUTRACEUTICALS USED FOR TREATMENT OF AORTIC ANEURYSM:**

There are many nutraceuticals used for the treatment of the aortic aneurysm. Treating the cause of the disease, which generates a reduction in the balloon-like bulge in an aorta. The main cause of the aortic aneurysm is fat stored in the aortic walls. The decrease in the fat or cholesterol levels in the body helps in the reduction of the bulge in the walls. And it also helps in maintaining the blood pressure. By reducing the fat content, it lowers the blood pressure and decreases the chances of effect on the heart and its valves. Some of the nutraceuticals that help in the treatment of aortic aneurysm are:

#### **Omega-3s:**

Omega-3s are a type of polyunsaturated fat.[36] It has Vaso protective properties, which improves vascular stiffness in aortic aneurysm. In Abdominal aortic aneurysm the omega-3s have been mostly used. Abdominal aortic aneurysm (AAA), a clinically silent cardiovascular disease in which the main artery of the heart in the abdominal area bulges and weakens. Omega-3 has anti-inflammatory and Vaso protective properties- preliminary results in research by journals about the nutrient suggested that administration of 1.8 grams of omega fatty acids per day for 12 weeks reduced aortic stiffening, a condition which is tied to AAA progression. In incorporation with the ameliorating arterial stiffness



significantly, and the 12-week supplementation regimen significantly lowered pulse width velocity in the AAA patient. [35] They also bind to receptors in cells that regulate genetic function, due this effect omega 3 helps to prevent heart disease. They reduce triglycerides, a type of fat in blood. And they slow the build-up of plaque, a substance comprising fat, cholesterol, and calcium which hardens and blocks arteries.[37] Benefits of omega 3-s are decreasing triglycerides, lowering blood pressure, reducing blood clotting, decreasing risk of strokes and heart failure, and reducing irregular heartbeats.

#### DHA AND EPA:

Omega-3s in the fish contains, two main omega-3 fatty acids, eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) are found mainly in fish, fish oil and seafood.[38] This are associated with decreased risk of cardiovascular disease by lowering blood pressure and triglyceride level, and it helps in prevention of blood clots. DHA and EPA also play a role in reducing inflammation.[39] Fish is the best source for the DHA and EPA, but salmon and tuna contain more omega 3-s. Oily fish rich in omega-3s includes salmon, mackerel, albacore tuna, trout, sardines.[38] Omega 3-s is also present in fortified food like omega-3 enriched eggs, milk or margarine. Supplements with fish liver oil may have high amounts of vitamin A and

D. For pregnant women omega-3 supplements that have vitamin A are not recommended.

Food	DHA + EPA (mg)
Atlantic salmon (75g)	1600
Mackerel (75g)	1300
Sardines, canned (75g)	1000
Trout (75g)	750
Tuna, canned, white(75g)	650
Omega-3-enriched eggs (2 eggs)	160-270
milk with DHA (1 cup)	100

Table-1: Amount of DHA and EPA in oily fish [39]

#### ALA:

Omega 3-s is also present in some plants essential in ALA (alpha-linoleic acid). ALA is not as active in the body, it must be converted into other forms of omega -3 fatty acids, DHA and EPA.[40] But the ability of the body to convert ALA is limited only. About 5% of ALA is converted to EPA, and less than 0.5% is converted to DHA. Because the capacity of this pathway is very low in healthy, non-

vegetarian.[40] Thus if the body doesn't get enough EPA and DHA from food like fish or due to distaste eating fish, it is important to eat plenty of ALA- rich foods to meet omega-3 needs.[41] It also contains dietary fibres like ground flaxseeds and flaxseed oil, walnuts, chia seeds, canola oil and soya oil, soybeans and tofu and nuts [36]. Our body cannot make ALA, an essential food, which means we have to take food containing it. Daily 1100 to 1600 mg of ALA must be consumed, for a healthy heart. It comes sources, especially these:

Food	ALA
Flax oil (1 tbsp)	7740
Ground flaxseeds (1 tbsp)	2460
Walnuts (¼ cup)	2300
Chia (1 tbsp)	1900
Canola oil (1 tbsp)	1260
Soy oil (1 tbsp)	930

Table-2: Amount of ALA in plant sources and its dietary fibres [39]

**Hemp seeds:** The hemp seeds (*Cannabis sativa* L.) are rich in beneficial bioactive compounds and have antioxidant activity in-vitro and ex-vivo, as well as antimutagenic activity. [41] Hemp has a property of cholesterol-lowering and reducing high blood pressure, due to the presence of fatty acids i.e linoleic acid and alpha-linoleic acid. Improves lipid metabolism due to their ability to induce fatty acid oxidation in liver and skeletal muscle and simultaneous suppression of hepatic lipid synthesis.[42,43] It can reduce inflammation in the body and lipid deposition in walls of blood vessels and reduces the blood pressure.[44] As well as hemp seeds are also rich in peptides, which are considered as a potential antihypertensive agent.[45,46] The cardiovascular positive effect of hemp seeds are shown not only due to fatty acids, also because of potent hypolipidemic effects of dietary hemp.[47] Hemp seed oil will reduce blood plasma HDL-cholesterol, triglycerides. Reduction of lipid peroxidation by hemp seeds and oil in bloodplasma and heart, improves noradrenaline contraction.[48]

**Chia seeds:** This chia seed (*salvia hispanica*) is a great plant-based source of ALA omega-3 fatty acids.[40] Chia seeds contain quercetin, an antioxidant that can reduce risk of developing heart disease. These seeds are rich in fiber.[49] Chia seeds reduce the risk of chronic diseases when consumed as a part of a healthy diet. In 2007 an animal study, found that consuming chia seeds reduced blood triglycerides and elevated good HDL and omega-3 levels in the blood. For adults over age 19, 1100mg for women and 1600mg for men amount of ALA recommended to intake daily.[40] Nutrients in 1-ounce serving (28.35

grams) of chia seeds:

Food	ALA
Calories	138g
Protein	4.7g
Fat	8.7g
Carbohydrates	12g
Fiber	9.8g
Sugar	0g

Table-3: Nutrient per serving (28.35g) of Chia seeds [50]

The fatty acid content in chia seeds varies from 25% to 40%, with 60% of the total fatty acids, which is made up of ALA an omega-3 fatty acid and 20% composed of linoleic acid an omega-6 fatty acid.[50]

**Walnuts:** These walnuts (Juglans) are generally considered part of healthy diet because of their high levels of proteins, fiber and rich in omega-3 fats, and contains antioxidants of higher amount than most other foods.[51] Walnuts are composed of 65% of fat by weight, with healthy fats and ALA omega-3 fatty acid.[40] Eating walnuts daily lowered bad cholesterol and may reduce the cardiac risk. This helps in reducing the plaque or fatty deposits that build up in the arteries. Consumption of walnut daily reduced total LDL particles by 4.3% and small LDL particles by 6.1%. IDL (Intermediate Density Lipoprotein) cholesterol will also reduce, that IDL cholesterol is a precursor to LDL and refers to a density between that of low-density and very-low-density lipoproteins. IDL cholesterol emerges as a relevant lipid cardiovascular risk factor independent of LDL cholesterol. The LDL cholesterol changes varies among the gender, in men 7.9% of LDL cholesterol falls down and 2.6% in women.[52] According to USDA list, along with 654 calories per 100g of walnuts containing:



Protein	15.23g
Fat	65.21g
Carbohydrate	13.71g
Fiber	6.7g
Sugar	2.61g

Table-4: Walnuts containing amount of calories for 654 calories per 100g [51]

Calcium (Ca)	98mg
Iron (Fe)	2.91mg
Magnesium (Mg)	158 mg
Phosphorous (P)	346 mg
Potassium (K)	441 mg

Table-5: Mineral content in walnuts [51]

Flaxseed: Flaxseed, *Linn usitatissimum*, is also known as linseed.[53] These flaxseed is a nutritional component, provides a good amount of fiber, protein, magnesium, manganese and omega-3s.[40] It helps to unclog arteries due to its high fiber content and contains omega-3 fatty acid which helps in reduction of inflammation and to control the high blood pressure.[54] The seeds are industrially used for producing flax oil, as it is one of the richest plant sources of the n-3 PUFA ALA. The oil content consists of 32-45% of seed mass, in which 55-57% is ALA and 15-18% is linoleic acid of n-6 PUFA.[55]

	Fat, g	ALA, g	Protein, g	CHO, g	Dietary Fiber, g	Lignan, mg	Calories, kcal
Whole flaxseed	41.0	22.8	20.0	28.9	27.8	82-2,600	450
Ground flaxseed	40.8	23.1	20.0	29.2	27.7	82-2,600	450
Flaxseed oil	100.0	57.0	0.0	0.0	0.0	0	884
Partially defatted flaxseed meal	11.1	6.0	38.9	33.3	33.3	2,500	389

Table-6: Nutritional composition of 4 common forms of flaxseed (per 100g) [56]

### Polyphenols:

Polyphenols may offer protection by improving the function of the inner lining of the heart and blood vessels (endothelium), increasing protective HDL cholesterol (the good cholesterol), decreasing LDL cholesterol (the bad cholesterol), and promoting anti-platelets and anti-inflammatory activity. The protection from the development of heart disease is due to an antioxidant property. Some polyphenol-rich foods are Apples, Red wine, Olive oil, Turmeric, Blueberries, Strawberries.[57] They protect the heart by neutralizing oxidized LDL, which forms plaque inside the arteries.[58]. Also lowers the blood pressure, thus contributing to the reduction of cardiovascular complications.[59] And leads to promoting good circulation and keeping blood vessels healthy and flexible, by reducing the cholesterol in the artery walls.[60]

**Resveratrol:** Red wine is thought to be healthy for the heart. This contains antioxidants in its substances such as alcohol and some certain substances.[61] It decreases the conditions that lead to heart attack. And this will increase the level of high-density lipoprotein (HDL), which is good cholesterol and protects from cholesterol build up in the vessels of the heart. Resveratrol prevents the damage of blood vessels, reduces LDL, bad cholesterol and prevents blood clots. This is extracted from the skin of grapes which is used to make wine. It may improve the function of the layer of cells that line the blood vessels.[62] Resveratrol improves heart function by moderating inflammatory processes in patients with systolic heart failure.[63]

**Olive oil:** Olive oil (*olea europaea*) is a food that is composed of a major saponifiable fraction about 98-99%. The saponifiable fraction is represented by oleic acid of 55-83%. And composed of other saturated and unsaturated acids like linoleic, palmitic and stearic acids about 3-21%. [64,65] Beneficial effect of olive oil on the cardiovascular system by decreasing the lipid by peroxidation process and enhances the antioxidant enzyme activity.[66] Olive oil also exerted the protective effects on the progression of non-alcoholic fatty liver disease to fibrosis[67][68][69] and exerts anti-obesity effects.[70][71]

**Anthocyanin's:** Anthocyanin is one of the bioactive components as nutraceuticals and traditional medicine. [72] It lowers the risk of cardiovascular risk, extracted from edible plants are potential for pharmaceutical ingredients.[73] Anthocyanin is a water-soluble flavonoid. It has the rare ability to cross the blood brain barrier. It is absorbed very quickly within three to six hours of taking supplement. Examples of anthocyanins are blueberries and strawberries etc.[74]

- **Blueberries:** Blueberries (*Vaccinium angustifolium*) affect the vascular reactivity in the aorta. [75] These blueberries are bioactive and beneficial to health.[76] It is popularly known as “super fruit” due to its high antioxidant activity and known as dense nutrient content [77][78] Berries helps in lowering the blood pressure and it also decreases in the fat build up in the body. Therefore, it decreases many risks leading to heart disease.[78]
- **Strawberries:** Strawberries are rich in vitamin C and other antioxidant, which helps to reduce severe risk conditions of heart. It also an excellent source for magnesium, phosphorus, calcium, potassium, folate, vitamin k. [79] Nutrients vitamins contains per 100 grams are

Nutrients	Amount
Calories	91
Protein	0.67 g
Fat	0.3 g
Carbohydrates	7.68 g
Fiber	2 g
Sugar	4,89 g

Nutrients in 100 grams of strawberries [79]

## Vitamins:

The vitamins play a major role in the maintenance of a healthy heart. Vitamins like K, C, E may reduce risk of formation of aneurysms and rupture in the aortic walls.

**Vitamin K:** The vitamin K deficiency plays a role in formation of aneurysm. Vitamin K supplementation holds the potential to lower the risk of aortic aneurysm and improves the cardiovascular

outcome. The healthy vascular muscle secretes vitamin K dependent proteins, having enough of these proteins inhibits the accumulation of calcium. Vitamin K1 (the phylloquinone form) has an important heart health property. This vitamin K1 stores in the liver, which plays a role in the maintaining of proper coagulation of blood muscle cells for protein synthesis. [80]

**Vitamin C:** Vitamin C shows a crucial protective effect against AAA development.[81] This vitamin attenuated the development of abdominal aortic aneurysm (AAA), decreasing maximal aortic diameter by 25.8% ( $P<0.05$ ) and preserving elastin lamellae( $P<0.05$ ). It decreased the expression of MMP-2 and MMP-9 and decreased the oxidative stress in abdominal aorta. It shows an anti-inflammatory action, by decreasing inflammation in aneurysm tissue. An increased level of antioxidative stress in cooperation with the preserving elastin lamellae, inhibiting matrix-degrading proteinases and suppressing inflammatory response.[82]

**Vitamin E:** The vitamin E ameliorates Abdominal aortic aneurysm and reduces the combined end point of fatal and non-fatal aortic rupture. The oxidative stress (8-isoprostane) plays a pivotal role in Angiotensin-2 driven AAA formation.[83]

## NUTRACEUTICALS: IN PREVENTION OF AORTIC ANEURYSM:

Healthy diet maintenance can prevent an aortic aneurysm. Nutraceuticals including fruits, vegetables, whole grains, poultry, fish and low-fat dairy products help the body to maintain a healthy body. [84] Avoid saturated and trans fats and limit salt. By taking the nutrient sufficient components daily of required quantity will reduce the changes of diseases, helps in maintaining blood pressure and cholesterol under control.[85] Nutraceuticals also helps in the prevention of aortic aneurysm by protecting the artery walls. The nutraceuticals like vitamins, omega-3s fatty acids which have rich DHA, EPA supplements (salmon, tuna), ALA supplements (chia seeds, flaxseeds) and polyphenols etc will also help in prevention of aortic aneurysm. And Some more nutraceuticals that prevents aortic aneurysm are:

### Green tea:

In the journal of vascular surgery, the Japanese researchers reported that drinking green tea, which contains polyphenols, offers benefits in preventing abdominal aortic aneurysm (AAA) expansion - a serious condition characterised by destruction of the body's main artery. When green tea is regularly consumed then it will be beneficial for patients with a small AAA or a prophylactic strategy for AAA. Also leads to life-threatening conditions when this main artery overstretched and bloated. Thus, resulting in vasodilation, if left untreated causes rupture that leads to death 50% of the time.[86]

### Ginkgo biloba:

The extract of ginkgo biloba prevents aortic rupture. Aortic rupture is a complex biological process involving biochemical, cellular, proteolytic, and biomechanical factors.[87] This has an ability to increase blood flow to various parts of the body. Ginkgo biloba was attributed to a 12% increase in levels of circulating nitric oxide, a compound which is responsible for dilating blood vessels. And shows an anti-inflammatory action.[88]

## Vitamin D:

Vitamin D is an important steroid that acts on many cellular mechanisms.[89] This shows a beneficial effect on heart and blood vessels which promotes vascular calcification and arterial stiffness. [90] The deficiency enhances degeneration and remodelling of collagen and elastin fibres in the artery walls, leading to its weakening and progressive dilation.[91] [92]

According to the National Institutes of Health (NIH), the recommended amount of vitamin D daily is:

- Infants (0-12 months): 400 IU (International Units)
- Children (1-18 years): 600 IU
- Adults upto age 70: 600 IU
- Adults above age 70: 800 IU
- Pregnant or lactating women: 600 IU [93]

## CONCLUSION:

Many nutraceuticals that are beneficial for the heart, which helps in the treatment and prevention of aortic aneurysm are present; few of them are shown. It is natural that people's focus is shifting to a positive approach for prevention of disease to stay healthy. Nutraceuticals usage has increased all over the world in various disease conditions. In many cases nutraceuticals offer an advantage over the synthetic drugs under development by the pharmaceuticals industry. It has a novel pharmacological activity that has become interesting in their possible clinical use and thus helping in prevention and therapeutic effect in aortic aneurysm as well several diseases.

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