

Amaranth Flour and Flaxseeds Boon to Hypercholesterolemic Patients: A Review

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Abstract

The prevalence of hypercholesterolemia is rapidly rising in India. Several studies have reported that high cholesterol is prevalent among 15-20 percent of rural and 25-30 percent of urban population. Thus there is an utmost need to reduce the morbidity and mortality related to it. To maintain a healthy lifestyle, dietary management of hypercholesterolemia is important. Dietary management includes reduction in the intake of saturated fats, trans-fats and increased intake of fiber rich diet and essential fatty acids. As much as 10% of cholesterol can be reduced by a diet which is high in omega-3 fatty acid and fiber. Amaranth has higher antioxidant activity, protein and phytochemical content. On the other hand, flaxseeds are a good source of omega-3 essential fatty acids such as linoleic acid and alpha linolenic acid, lignin and fiber. It is beneficial to treat high cholesterol by good dietary intake.

Keywords

Hypercholesterolemia, omega -3 fatty acids, high fiber, Amaranth flour, Flaxseed

Introduction

The prevalence of hypercholesterolemia in India is increasing rapidly so, there is an utmost need to reduce the morbidity and mortality related to it. High cholesterol can limit flow of blood thereby increasing the risk of heart diseases and stroke. It would be better to prevent and treat the hypercholesterolemia by dietary management instead of medical management. Dietary management of hypercholesterolemia includes giving high fiber diet and essential fatty acid like plant sources, especially fruits and vegetables, grains, beans, nuts and seeds.

Hypercholesterolemia

Hypercholesterolemia is amongst the most common conditions encountered in the medical profession (Soran et al., 2018). High cholesterol is signified with greater than 190 mg/dl LDL-cholesterol or greater than 160 mg/dL with any major risk factors. The important risk factors include like Age, positive case history of premature atherosclerotic disorder, Hypertension, Diabetes, Smoking, low HDL-cholesterol levels (less than 40 mg/dl in male and less than 55 mg/dl in a female) (Ibrahim et al., 2022). High cholesterol level can predispose the risks of heart diseases and stroke. Raised total cholesterol may be a major cause of high risk factor for Ischemic heart condition and stroke in both the developed and developing countries.

Prevalence

The prevalence of hypercholesterolemia may differ with various factors including gender, age, resident region, and socioeconomic status. It is necessary for each country to conduct implement treatment programs and epidemiological survey and to reduce the prevalence of hyperlipidemia and the risk of CVD (Lin et al., 2018). Globally, mean total cholesterol changed between 1980 and 2008, falling by <0.1 mmol/L per decade in both men and women (Farzadfar et al., 2011). Recent multi-centric studies have reported that hypercholesterolemia or high cholesterol is prevalent among 15–20 percent of rural and 25–30 percent of urban population (Gupta et al., 2017). This prevalence is lower in India than high-income countries. Studies have reported that over a 20-year period, LDL cholesterol, Triglyceride and total cholesterol levels have increased among urban population. The high prevalence of hyperlipidemia in India, demands for immediate lifestyle intervention strategies to lower cardiovascular risk factor (Joshi et al., 2014). Diet has an effect on blood cholesterol. Dietary cholesterol in diet is the leading cause of raised blood cholesterol. Trans fats have been shown to reduce HDL levels and increase LDL levels. Trans fats are recognized as a potential risk factor for cholesterol-related cardiovascular disease, and avoiding them in an adult diet is recommended (de Souza et al., 2015). Increasing consumption of diet rich in phytosterols, soluble fibers, phospholipids, and stearic acid lower plasma cholesterol by inhibiting cholesterol absorption in the small intestine. All of these compounds appear to exert their effects by interfering with micellar solubilization of cholesterol within the intestinal lumen (Jesch, 2017). There are some food sources which are beneficial in treating hypercholesterolemia,

such as legumes, avocados, nuts, whole grains like amaranth, oats, barley etc. and some seeds like pistachios, pumpkin seeds, chia seeds, flax seeds etc.

Flaxseed

Flaxseed or Linseed (*Linum usitatissimum*) is popularly known as Alsī, Jawas, Aksebija in Indian languages. It is a rabi crop, have blue flowers, and belongs to family of linaceae. Flax is an annual herb that produces golden to reddish brown color and small flat seeds. Texture of Flaxseed is crispy with nutty taste (Rubilar et al., 2010).

Nutritive values

Flaxseed is used as herbal medicine which has high amount of lignans, phytoestrogen, Dietary fiber and alpha-linolenic acid (Kajla et al., 2015). Many studies have shown that these composites have hypolipidemic and antioxidant properties. Flaxseed is also known for its high quality protein, phenolic compounds and soluble fibers (Soni et al., 2016). Flaxseed possesses both nutritional and functional properties. The content of compounds such as vitamin E, polyunsaturated fatty acids, lignans, essential amino acids and dietary fibers makes flaxseed a source to satisfy basic needs in the human diet and helps in maintaining good health. Healthy properties are related to anti-inflammatory, anti-oxidant, anti-carcinogenic activities and helps in lowering cholesterol and thus decrease the prevalence of cardiovascular disease and prevent diabetes (Bernacchia and Vinci, 2014). According to study the proximate compositions of flaxseed were: fiber (20.23%), ash (1.96%), protein (21.00%), moisture (8.50%), fat (43.17%) and carbohydrate (5.14%) (Ishag et al., 2020).

Beneficial effect of flaxseed in hypercholesterolemia

Flaxseed is a rich source of polyunsaturated fatty acids especially omega 3 fatty acid and fibers, so it acts as a functional ingredient. Flaxseed oil used as a functional food ingredient that has been incorporated into muffins, dairy products, juices, baked foods, macaroni, meat, and pasta products (Goyal et al., 2016; Ahmad et al., 2020). Flaxseed supplementation gains patients' acceptance and is well-tolerated. This may be of clinical relevance and indicates that flaxseed must become a part of our routine diet (Kanikowska et al., 2020). Kristensen et al. (2012) examined the effect of flaxseed dietary fibers and observed that the drink prepared from flaxseed could lower fasting total cholesterol and

LDL cholesterol by 12 and 15 percent respectively, whereas flax bread only produced a reduction of 7 and 9 percent respectively. Flaxseed dietary fibers play a vital role in lowering blood cholesterol and help to maintain energy balance. Flax seeds at the dose of both 200mg/kg and 400mg/kg have potential to reduce hyperglycemia and dyslipidemia associated with diabetes, both doses of herbal extracts also showed significant decline in triglycerides, total cholesterol, and low-density lipoprotein, very low-density lipoproteins, and serum amylase levels with prominent improvement in HDL cholesterol levels in diabetic rats compared to positive controls (Qureshi et al., 2019).

Amaranth

Amaranthus, collectively known as amaranth or pigweed, is a cosmopolitan genus of herbs (Narwade and Pinto, 2018). According to the uses for human consumption, amaranth can be divided into grain and vegetable.

Nutritive values

Amaranth is high nutritious grain. As the grain amaranth species possesses higher antioxidant activity and phytochemical content, so, it is a good substitute for traditional cereals and is a potential source of health-promoting bioactive compounds. As these grains are affordable and widely available, efforts to promote their consumption for health benefits, its use in food bio fortification applications and pharmaceutical industries should be encouraged (Akin-Idowu et al., 2017). The proximate composition of amaranth flour was protein (14.60%), moisture content (4.17%), crude fat (8.28%), ash (1.87%), total carbohydrate (71.09%) and energy content (417.28 kcal) (Tanimola et al., 2016). The beneficial health effects of amaranth are likely due to the joint presence of all macro and micronutrients, as found in the whole grain (Maurya et al., 2018).

Beneficial effect of Amaranth in hypercholesterolemia

Amaranths have been recognized in Homoeopathic and Ayurvedic medicines for its various health benefits. The primary site of action of amaranth flour is probably the intestine where it could inhibit the absorption of exogenous cholesterol. Amaranth flour can be recommended for further investigations as a suitable component of dietary regimens in patients with dyslipidemia (Chmelik et al., 2013). A bioactive compound Squalene, which is contained in amaranth, could be responsible for hypolipidemic effect

Amaranth flour and squalene, shows various positive impact on HDL levels (Cazarin et al., 2012). Amaranth flour besides squalene contains other substances which can actively participate in its hypolipidemic effect (Chmelik et al., 2013b). Amaranth protein showed various important hypocholesterolaemic effect and also used as supplementation of dietary protein. It has been showed that intake of Amaranth protein led to remarkable decrease in non-HDL-cholesterol probably by reducing their production. Incomplete protein digestion may produce bioactive peptides which affect absorption of cholesterol in the gut or even its direct synthesis and/or LDL-receptor activity (Mendonca et al., 2009).

Conclusion

Hypercholesterolemia is amongst the most common conditions encountered in the medical profession. High cholesterol increases the risk of heart diseases. Globally, one-third of ischemic heart disease is associated with high cholesterol. Diet has an effect on blood cholesterol. Therefore, it is important to choose nutritionally beneficial diet. Dietary management of hypercholesterolemia includes reducing intake of saturated fat, trans-fat and increasing intake of high fiber diet and essential fatty acid. As flaxseed contain high amount of lignans, phytoestrogen, soluble fiber and alpha-linolenic acid. On the other hand, amaranth flour has higher antioxidant activity, protein content and bioactive compound are beneficial in treating hypercholesterolemia by its effects of cholesterol absorption. As both amaranth and flaxseed are affordable and widely available, so, they can be incorporated in various recipes to prevent and treat cardiovascular diseases.

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