Mustard oil and coronary artery disease

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- The incidence of cardiovascular disease is increasing day by day and is presently gaining an epidemic proportion in India and India may harbour 50% of total CAD patients worldwide in coming 15 years.
- Presently about 20-25% of all hospital admissions and 25% of all mortality is due to coronary artery disease.
- Population surveys from India have reported 9-fold increase in its prevalence.
- This increase in incidence may be contributed to unhealthy dietary practice, lack of physical exercise, tobacco consumption, stress etc.

World Health Organization. Preventing chronic diseases a vital investment.. Geneva, 2005.

- The best approach to treat coronary artery disease is the prevention.
- There are various modifiable like smoking, diet, diabetes, hypertension, obesity and non-modifiable risk factors for prevention of CAD.
- One of the most focussed factor is diet which can be easily modifiable.
- American Heart Association recommend a diet in which protein intake represents 15% to 20% of calories, fats represent less than 35%, with only 7% from saturated fats, and the remaining calories being derived from carbohydrates. Cholesterol intake should be less than 300 mg/day.

- Lowering total fat intake variably alters blood lipid levels, depending on the specific subtypes of fat in the diet.
- When total fat is reduced, carbohydrate intake typically increases, which can induce adverse effects if the carbohydrates are more refined and of lower quality
- Some prospective studies suggest that low fat intake might increase the risk for stroke.
- So rather than decreasing total fat in diet, it is important to decrease intake of harmful fat.

- Indian diet has variable composition all over the India and oil is the integral part.
- Various types of oil are being used in India like coconut, peanut, soyabean, Mustard, sunflower etc.
- Use of Mustard oil is common in northern states including Rajasthan, West-Bengal, Orissa.

Functions of Fats

- They have high energy value
- Imparts palatability to diet
- Fats are precursors of biologically active compounds of the body
- Presence of fat is important for absorption of fat soluble vitamins like A, D, E
- Some fats called as EFAs have a vitamin-like function in the body
- They are constituents of body fluids and cell membranes
- Subcutaneous layer of fat insulates the body
- Fat pads at buttocks and palms protect the bones.

- Important composition of oil is fatty acid and they are source of good(PUFA, MUFA) as well as harmful fatty(saturated FA).

Saturated FA-

- In India, saturated fats are consumed as ghee (clarified butter) and coconut: as fresh, dry and as coconut oil along the coastal and southern parts of India. Milk products such as condensed milk (khoya), cream, full fat paneer are other sources of saturated fats. Cheese and also whole milk and its various products like milk shakes, ice creams, etc. form major source of saturated fats in urban India.
- SFA intake increases risk for CHD.
- But adverse effect is pronounced when saturated FA consumed in place of PUFA.

PUFA

- **n-3 PUFA** -Alpha leinoleic(LA) acid, source--Soyabeen, linseed, mustard
- **n-6 PUFA** - Leinoleic acid(ALA), Source- Vegetable oils.

LA typically accounts for greater than 90% of dietary PUFAs.

The evidence that Leinoleic acid lowers risk for CHD is robust

- **Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)** from fish and shellfish.

LA and ALA are essential fatty acids that cannot be synthesized by humans. Humans synthesize relatively little EPA and even less DHA and so dietary source is important.

Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can be synthesized in body from ALA of which mustard oil is good source.

In a meta-analysis of randomized trials, fish oil which oil supplementation which is a rich source of DHA and EPA reduced total mortality by 17%

TFA

- TFA are unsaturated fats with at least one double bond in a trans configuration. Major dietary sources are foods made with partially hydrogenated oils, such as baked goods, deep-fried foods, packaged snacks, and shortening used for home cooking.
- These are dangerous for heart.

Monounsaturated Fatty Acids

- Source- Animal fats and vegetable oils (e.g., olive, mustard and canola)
- MUFAs lower LDL-C concentrations and improve the TC/HDL-C ratio but might not reduce CHD risk

Risk of CAD with different types of fat

Nutrients[‡]	
Sodium	++++ ↑
Dietary fiber	++++ ↓
Refined carbohydrates and starches	—
Total fat	+++ ↑
Trans fat	+++ ↑
Polyunsaturated fat in place of:	
Saturated fat	+++ ↓
Carbohydrate	++ ↓
Monounsaturated fat in place of:	
Saturated fat	++ ↓
Carbohydrate	++ ↓
Saturated fat in place of:	
Carbohydrate[§]	+++ ↑
Seafood omega-3 fatty acids	+++ ↓
Plant omega-3 fatty acids	++ ↓
Dietary cholesterol	+++ ↑

Textbook of cardiology, Braunwald 10th Ed.

- So INCLUSION OF OIL RICH IN PUFA RATHER THAN DRASTICALLY DECREASING OIL INTAKE IS THE KEY FOR REDUCING CAD.

Table 1. Comparison of Fats Available in Different Oils

Fats/Oil	Saturated Fatty Acid (SFA)	Mono-unsaturated Fatty Acid (MUFA)	Linoleic Acid (Omega-6 PUFA)	Alpha-Linoleic Acid (Omega-3 PUFA)	N-6/N-3 ratio
Mustard	8	70	12	10	1.2:1
Canola	4	62	22	10	2.2:1
Ghee	65	32	2	<1	3:1
Soybean	15	27	53	5	10.6:1
Red palm	50	40	9	<0.5	18:1
Olive oil	13	76	10	<0.5	20:1
Palm oil	45	44	10	<0.5	20:1
Rice bran	22	41	35	1.5	23:1
Groundnut	24	50	25	<0.5	50:1
Sunflower	13	27	60	<0.5	120:1
Safflower	13	17	70	<0.5	140:1

Source: POS Pilot Plant Corporation, Saskatoon, Saskatchewan, Canada, June 1994;National Institute of Nutrition, India, 1995.

- Mustard oil has about 60% of monosaturated FA of which 42%eruic acid, 12% oleic acid

- Mustard oil contains 11% of omega-3-FA which is higher than many other oil.
- It has 21% PUFA of which 6% is omega-3 Alpha leinoleic acid and 15% omega-6 leinoleic acid. It has 12% saturated fat.
- Mustard oil, which is rich in alpha-linoleic acid (an essential fatty acid which has been shown to reduce cholesterol levels, and reduce the risk of heart diseases), was linked with 2 fold lower risk compared to sunflower and other oils.

Fatty acid ratio of different vegetable oils

Oils	Fatty acid ratio			Essential fatty acids ω -6:ω -3
	SFA	MUFA	PUFA	
Mustard	1	39.6	16.50	1.71
Rice bran	1	2.02	2.12	41.23
Soybean	1	2.03	5.86	6.49
Sesame	1	3.06	3.66	47.39
Safflower	1	2.20	13.56	80.85
Groundnut	1	3.84	3.45	41.58
Olive	1	8.33	0.09	0.09
Sunflower	1	6.97	9.59	54.59
Palm	1	0.98	0.27	-

- The mustard oil is rich in monounsaturated fats and polyunsaturated fats, both of which help **lower bad cholesterol** and raise good **HDL cholesterol**. Improving your cholesterol balance also helps lower triglycerides, or blood fat levels, which can in turn prevent obesity, kidney disease and **hyperthyroidism**, in addition to improving heart health.
- In a clinical trial of Acute coronary syndrome, reduction in total cardiac events in patients treated with fish oil or mustard oil occurred compared to placebo (24.5% and respectively vs 34.7%; **P** < 0.01).
- The researchers also said that people who use mustard oil for frying reduce their risk of heart attack by almost 71%.

- Collaborative study with USA, AIIMS and St. Johns Medical Medical College, Bangalore has proved that use of mustard oil as cooking medium reduces the risk of Coronary Heart Disease (CHD) by almost 70% in comparison to sunflower oil.
- Mustard oil is healthier than olive oil because it does not has trans FA, has low saturated fat and high in MUFA and PUFA such as omega-3FA and stable at high temperature which makes it ideal cooking oil and even deep frying oil.
- It also benefits in fighting cancer.
- Mustard oil is used as massage oil which improves blood circulation and muscular circulation.

Take home message….

- Rather than decreasing oil consumption in diet significantly, it is important to use oil rich in PUFA to decrease CAD.
- Mustard oil which is easily available India is good source of PUFA which is good for heart.
- Its use has favourable effect on heart health and decrease cardiovascular events.
- It also has other beneficial effect on health.

Thanks