AN OVERVIEW ON STUDY OF TRANS FATTY ACIDS

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ABSTRACT:

In both developing and developed countries, trans fatty acids are largely consumed from partially hydrogenated vegetable oils. This article focuses on the effects of trans fatty acids (viz; cardiovascular problems, coronary heart diseases), steps to avoid trans fat consumption and amount of trans fat present in different food items. As trans fatty acids are present in number of commercially available products it is not difficult to consume up to 20g in a day, for exceeding the recommended maximum of 2g a day.

Keywords: Trans fatty acids, Consumption, Lipoproteins, coronary diseases.

Introduction:

Naturally occurring unsaturated fats contains double bonds that are nearly all in the cis configuration. Changes in fatty acid composition of the diet can have major effects on several critical physiological processes because the number and position of double bonds influence the function and metabolism of fatty acids, their incorporation into phospholipids and transformation into Prostaglandins and other eicosanoids.

Tran's fatty acids are geometric isomers of mono and poly saturated fatty acids having at least one carbon-carbon double bond and on opposite sides of double bonds with hydrogens. These trans fatty acids arise either by partial hydrogenation of unsaturated oils or bio-hydrogenation in the rumens of cattle. They have high melting point of 45^{o} C. In Humans Trans fat increases low density lipoproteins (LDL) which is harmful to us and also increases insulin level which may result in getting Type-II Diabetics. It also reduces the beneficial high density lipoprotein (HDL) levels in the body.

FOODS WHICH CONTAIN TRANS FATTY ACIDS:

Vanaspati, Margarine, Bakery products (e g. Cakes, Cookies, Pies) deep fried and frozen foods (French Fries, Breaded chicken and fish) Packaged snacks, Non-diary coffee creamers, frozen pizza, Fast food, Crackers. Due to the presence of these Trans fatty acids, partially hydrogenated oils have some advantages such as longer shelf life, solidity at room temperature and greater stability during high temperature commercial deep frying. As Trans fatty acids are present in number of

commercially available products it is not difficult to consume up to 20g in a day, for exceeding the recommended maximum of 2g a day.

In both developed and developing countries, the major source of dietary trans fatty acids is most commonly consumed contributing 2 to 3 percent of total energy in take in USA and 4% or more in developing countries.

Naturally trans fats occur in stomach of ruminant animals and present in small amounts in diary fat (Milk, Butter) and meat fat. These natural trans fatty acids include conjugated linolic acid and vaccenic acid. This vaccenic acid is a most pre-dominant trans isomer in ruminant trans fatty acids.

EFFECTS OF TRANS FATTY ACIDS:

1. The adverse effects of trans fatty acids on the ratio of total /HDL cholesterol was about twice the saturated fats. These results obtained at trans fatty acids intakes with above the range intake in most populations, were later confirmed in trials of diets containing 7.7%, 6%, and 3% of energy as trans fatty acids.

2. A common assertion is that trans fat reduces blood cholesterol concentrations compared with saturated fat and they have unique effects on serum lipid levels.

3. TFA effect membrane structure, thus altering enzymatic pathways that may subsequently induce cardiac arrhythmias and sudden death.

4. The analysis of trans and cis fatty acids levels in blood serum of women showed that breast cancer risk is increased with the increase in trans fatty acid levels.

5. Trans fatty acids could increase risk of cancer by altering immune response, cell wall integrity and prostaglandin synthesis.

6. The incidence of allergic conditions like asthma, cold and asthmatic eczema in children aged 13 – 14 years is increased due to these fatty acids consumption.

7. TFA have a wide range of physiological effects including both lipid and non lipid effects.

8. Trans fatty acids increase the ratio of total cholesterol to high density lipoprotein cholesterol which indicates the presence of bad cholesterol.

9. TFA have pro inflammatory effects, inflammation in atherosclerosis and other effects like diabetics and heart failure can be seen.

10. TFA intake has been associated with increased activity of the tumour, necrosis factor system among healthy women and higher levels of interleukin-6 and C-reactive protein among overweighing women.

11. TFA consumption produces endothelial dysfunctions.

12. TFA consumption may increase weight gain and fat accumulation, particularly of visceral fat.

13. TFA intake is associated with increase in abdominal circumference in men and increase in body weight in women.

14. Duration of TFA exposure and underlying predisposition to insulin resistance appear to play important role in the effects of TFA on glucose insulin homeostasis.

15. The pluripotent effects of TFA appear to be linked to biological effects of hepatocytes (Eg. Lipid metabolism, monocytes) (Eg. Systemic inflammation), endothelial cells and adipocytes, (Eg. Adiposity, glucose-insulin homeostasis).

16. TFA have stronger relationship with CHD risk than seen for any other macro nutrient.

17. High consumption of these TFA leads to coronary heart diseases.

METHODS TO REDUCE TRANS FATTY ACIDS IN FOOD PRODUCTS*:*

Reformulation of food products is an effective way of reducing Trans Fatty Acids. For Example Trans Fat contents are reduced to 0.5 grams per serving in 95%percent of the super market Products Analyzed and 80% of the restaurant products analysed.

Fat interesterification: Interesterified fat is a type of oil where the fatty acids have been moved from one triglyceride molecule to another. Interesterification of vegetable oils can replace an unsaturated fatty acid (oleic acid or linoleic acid) at the middle position of glycerol by a saturated fatty acid with the help of catalysts or lipase enzyme. Majority of the long term studies did not suggest that interesterification of dietary facts have any adverse change in lipoprotein profile. However more research is required in this field with focus on the effect of interesterified fat on inflammatory markers.

Genetically modified fatty acids using genetic engineering, fatty acids with desired characteristics can be obtained and then through reformulation the Trans Fatty Acids contents of food products can be reduced.

STEPS TO AVOID TRANS FATTY ACIDS

1. Substitution of natural plant oils containing lower percentage of poly unsaturated fatty acids for example Vanaspati.

2. Edible Oils industry should adopt alternative technologies to reduce trans fatty acids to at least WHO recommended levels.

3. Repeated use of cooking oils should be avoided.

4. Use of saturated fats from dairy sources instead of trans fatty acids containing oils is a healthy option.

5. Where ever possible, try to use oils such as olive oil and sunflower oil instead of Margarine and Butter. For instance when baking a cake, look for a recipe that works well using oil instead of solid fats, for example banana or carrot cake.

6. Choose a soft spread instead of a hard Margarine (Cooking Margarine) or salted butter. Most spreads today are made with less than 1% trans fat

7. Avoid buying commercial cakes, slices, biscuits, muffins, quinches and pies. Instead bake these at home using soft Margarine or occasionally unsalted butter.

8. Avoid bought pastry, including short crust and puff.

9. Avoid Deep fried fast foods unless you know a low trans oil has been used. In any case these foods are not healthy so avoid consuming them.

AMOUNT OF TRANS FATS PRESENT IN DIFFRENT FOOD ITEMS

FOOD ITEMS	**TRANS FATS PER 100 GRAMS(GRAMS)**
Biscuits	4.7

Pot Pie, Beef	4.2
Frosted Cakes	3.5
Fried Fish	2.4
Potato Puri	4.8
Gulabjamun	6.11
Indian Bread	1.9
Vegetable Biryani	3.1
Samosa	3.3
Halwa	6.3
Jalebi	17.7
Sweet biscuits	5.8
Potato Kachori	5.6

TRANS FAT CONTRIBUTION IN PERCENTAGE

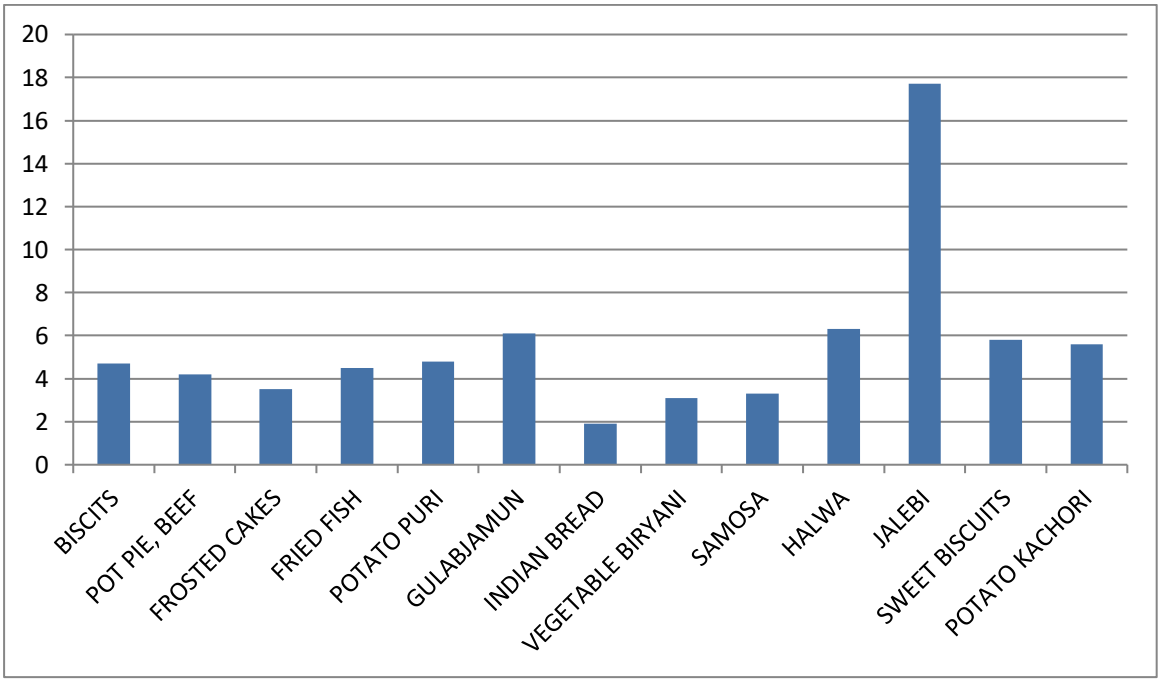
FOOD GROUP	**CONTRIBUTION(%)**
Cakes, Cookies	40%

Animal products	21%
Fried Potatoes	8%
Popcorn	5%
Breakfast Cereals and candy etc	5%

COUNTRIES' CONTRIBUTION TOWARDS TRANS FAT AND REDUCING METHODS THEY ADOPTED

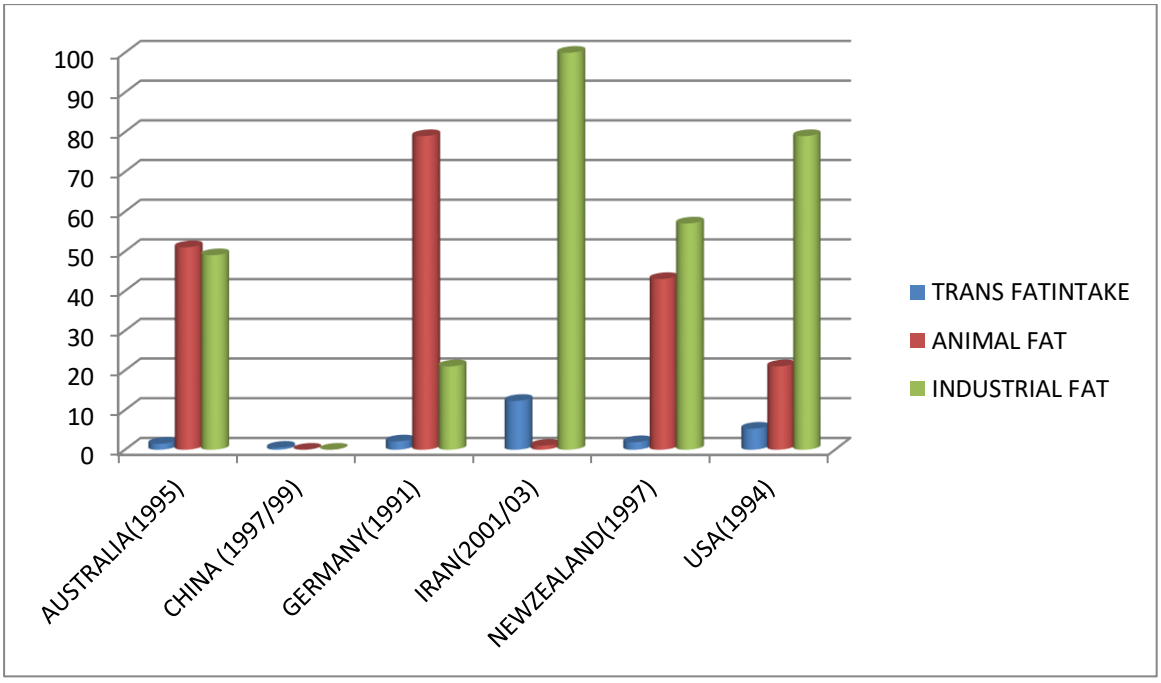
COUNTRY	SURVEY TYPE	SURVEY YEAR	TRANS FAT INTAKE(g/day)	ANIMAL FAT (%)	INDUSTRIAL TRANS FAT (%)	STUDY QUALITY	LOWERING METHODS
Australia	National	1995	1.5	51	49	Medium	Voluntary reduction(2007)
China	Local	1997/99	0.5	-	-	Medium	-
Germany	Local	1991	2.1	79	21	Medium	Voluntary reduction(2012)
Iran	National	2001/03	12.3	1	100	Medium	Mandatory limit (2004)
Newzealand	National	1997	1.9	43	57	Medium	Voluntary reduction(2007)
USA	National	1994	5.3	21	79	Medium	Mandatory labelling, local bans(2006)

RESULT AND DISCUSSIONS

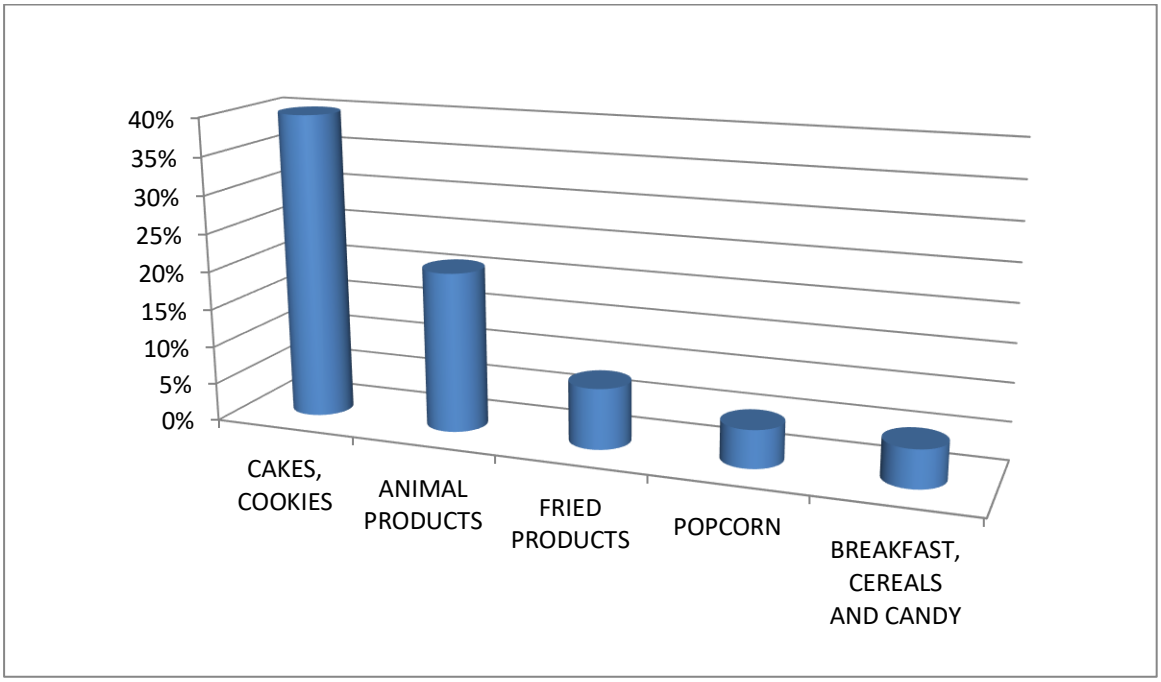


AMOUNT OF TRANS FAT PRESENT IN DIFFRENT FOOD ITEMS

From the above graph Jalebi has the highest amount of trans fat and Indian bread has the lowest amount of trans fat.



COUNTRIE'S CONTRIBUTION TOWARDS TRANS FAT



TRANS FAT CONTRIBUTION IN PERCENTAGE

From the above graph we can say that Bakery products have more amount of trans fat.

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