

CONSUMPTION OF FAT IN INDIAN DIET

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ABSTRACT

Fats are an important constituent of any diet and play an important role in both health and disease. Excessive consumption of fats in diet, especially those derived from animals sources, elevates blood cholesterol, which is then responsible for atherosclerosis, leading to cardiovascular and other related disorders. Epidemiologic data has shown that Asians Indians have one of the highest prevalence of type 2 diabetes mellitus and coronary artery disease, compared to other populations in the world. There are primarily two types of fats in diet, visible and invisible. The amount of fat needed by an individual should be able to meet the requirements of essential fatty acids, provide palatability and yet should not produce any adverse effects. It is estimated that about 15 – 25 g of visible fat meets both the requirements of essential fatty acids and 3-6% of the total energy needs. In a country like India, even a rural diet which is primarily cereal based, the amount of invisible fat that is present is about 15 g and this is able to contribute nearly 6% of total energy requirements. It is also recommended that under no circumstances should the calories derived from fat exceed 30% i.e. more than 80 g per day. The amount of visible and invisible fat diet in India varies across the country. Surveys by various agencies have worked out values for the consumption of visible and invisible fats in India. Fats is an important source of essential fatty acids, namely Linoleic acid (n-6) and Alpha linolenic acid (n-3). Essential fatty acid should be in an optimal ratio in diet. A desirable n-6/n-3 ratio is between 5-10. A ratio above 50 is injurious to health. In our country, in populations which consume rapeseed, mustard, soyabean or palmolein oil, the ratio of n-6/n-3 is in the desirable range.

KEY WORDS: Fats, Atherosclerosis; Cardiovascular disease; Type 2 diabetes mellitus; visible fat; Invisible fats; Essential fatty acids.

INTRODUCTION

Fats constitute an extremely important component of any diet. Fats serve as a source of energy and supply much more calories than that provided by

carbohydrates and proteins. They help in the absorption of fat-soluble vitamins. Fats are very essential for making the food palatable. Some fats, known as essential fatty acids, (EFA), are derived from vegetables and are vital for the structure and function of body cells (1).

There has been a resurgence of interest in the role that fats play in health and disease. Excessive consumption of fats in diet, especially those derived from animals sources, elevates blood cholesterol, which is then responsible for atherosclerosis, leading to cardiovascular and other related disorders.

Epidemiologic data has shown that Asian Indians have one of the highest prevalence of type 2 diabetes mellitus and coronary artery disease, compared to other populations of the world. We have really no control over the genetic factors involved in the causation of these two deadly disorders, which are responsible for a high degree of morbidity and mortality, but we can definitely monitor the role that diet, exercise and other environmental factors have to play in regulating these disease.

Fat in diet that nutrient factor, controlling which could help us in our endeavour, the consumption of dietary fat in our country depends on several factors, because India is a vast country with diversities of cultures, climate, eating habits, socio-economic strata and the availability of food, which varies from region to region. Various aspects of fat intake like the quality and quantity of fat consumed by our population need to be addressed to.

Fat is an important source of essential fatty acids (EFA) namely Linoleic acid (LA, n-6) and Alpha linolenic acid (ALNA, n=3). In the body these are converted to long chain polyunsaturated fatty acids (PUFA). These are essential components of cell membranes. The balance between the two EFA influence the functions of the vascular and immune systems. It also influence thrombogenic mechanisms and kidney functions. The EFA also play an important part in the transport of cholesterol.

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TYPES OF FAT IN DIET

There are primarily two types of fats in diet, visible and invisible. Visible fats derived from animals source are solid, like ghee and butter, while those obtained from vegetable source like groundnut, mustard, sunflower, til and safflower oils are liquid fats. Vanaspati oil is vegetable derived, but is a solid visible fat, after undergoing a process called 'hydrogenation'. It is extremely popular in India, but is very harmful for health.

Invisible fat is present as an integral part of the food. It is present in cereals, pulses, milk oilseeds, eggs, meat, vegetables, tubers etc. The invisible fat content of food contributes significantly to the total fat content of food and also supplies essential fatty acids. Diets containing nuts, oilseed, soyabean and animals food have a higher content of invisible fats. A cereal – based, rural diet, in India can meet 50% of the requirements of EFA in the body, even when no visible fat has been added. Invisible fats also meet nearly 10-15% of the total energy (en) requirements of the body.

DESIRABLE LEVEL OF FAT IN DIET

The amount of fat needed by an individual should be able to meet the requirements of essential fatty acids, provide palatability and yet should not produce any adverse effects. It is estimated that about 15-25 g of visible fat meets both the requirements of essential fatty acids and 3-6% of the total energy needs. In a country like India, even a rural diet which is primarily cereal based, the amount of invisible fat that is present is about 15g, and this is able to contribute to nearly 6% of the total energy requirements. It is also recommended, that under no circumstances should the calories derived from fat exceed 30% i.e. more than 80 g per day. The amount of visible and invisible fat in diet in India varies across the country. Surveys by various agencies, especially the National Institute of Nutrition, Hyderabad, have estimated the values of the consumption of visible and invisible fats in India (Table 1)

Table 1: Fats available in Indian Diet (source: National Nutrition Monitoring Bureau, 1980 (1))

Type of Fat	Range	Average	Example
Visible Fat	9-25 g	12-14 g	Vegetable oil 10g Vanaspati oil 2.5 g Ghee 2.0 g
Invisible Fat	20-50 g	29g	Rice 3.5% Wheat 2.0% Pulses 2%

Current recommendation for total energy (2400 calories/consumption unit/day) intakes of Indian population suggest that LA should provide 3 (en) per cent. This works out to 8 g/ person/day. Two-thirds of this can be supplied by the invisible fat present in habitual Indian diet and to provide the remaining one-third, one would require: 20 g palmolein, 12 g rapeseed or mustard, 7 g groundnut, 5 g sesame, 4 g sunflower or 3 g safflower oil (2). The requirements of LA in pregnancy and lactation increase and 4.5 and 6 (en) per cent respectively are required. Consumption of cereals, fats and milk provide sufficient amounts, but to meet the total needs, 30g (12 en per cent) and 45g (17 en percent) of vegetable oil would be needed.

A level of 22 g visible fat per person per day, is the recommendation to meet health needs. It should not exceed 55 g. in rural diet, it is predominantly vegetable oil that is used, animals fat is negligible. The rural intake of vegetable oil varies from 2-19g (average 10g, National Nutrition Monitoring Bureau, (NNMB), 1971). The availability of edible oil in the country and the consumption by difference sections of the population is dependent to a large extent on the income (Table 2)

Table 2: Edible oils: The availability consumption Equation

Availability	
Edible oil produced	3.44 million tones
Edible oil imported	1.1 millions tones
Vanaspati available	0.9 millions tones
Per caput availability	16 gm/day
Oil consumed	
15% Rural population	25%
80% Not so rich urban	35%
5% urban rich or over-affluent	40%
[125-130] gm daily, ghee and edible oil]	

In the urban population, the intake of fat in diet varies according to the income group. The calories derived from visible fat increase in the highest income group. Ghee derived from cow's and buffalo's milk is a very popular fat used in Indian diet. It is saturated fat and has 100 g fat per 100 g consumed.

QUALITY OF FAT

Essential fatty acids, LA(n-6) and ALNA (n-3) should be in an optimal ratio in diet. The minimum

requirement of LA is 3 (en) per cent while that of ALNA is 0.3-1 (en) per cent. A desirable n-6/n-3 ratio is between 5-10. A ratio above 50 is injurious to health. In our country, populations which consumer rapeseed, mustard soyabean or palemolein oil, the ratio of n-6/n-3 is in the desirable range. In some populations who are influenced by newspaper advertisements and who can afford the highly priced, safflower oil, the ratio is above 30 and is undesirable (Table 3). Sesame oil (til) is used all over the country because of its reasonable price. It contains lower levels of saturated fatty acids and higher levels of LA than groundnut oil and is more desirable. Rapeseed/mustard oil contain a desirable level of n-6/n-3 fatty acids and is also a major source of visible fat.

Table 3: Dietary ratio of LA/ALNA (n-6/n-3) in various Edible, oils, in different income groups in India (source: Ghafoornisa. Fats in Indian diet. NF 1 Bulletin vol 10. No.2 April 1989)

	HIG	MIG	LIG	RURAL
Invisible fat intake (g)	28.6	20	12.8	18.6
Visible fat intake (g)	43	27	16.0	11.0
Safflower oil	39.6	32.6	33.9	30.0
Groundnut oil	22.7	19.3	20.1	21.3
Palmolein oil	10.0	9.7	11.5	14.9
Soyabean oil	9.5	9.6	10.3	11.9
Mustard oil	3.7	4.2	4.9	7.5

HIG : High income group. MIG : Middle income group

LIG: Low income Group

VISIBLE FATS

The very rich all over the country use ghee in diet, in varying quantities. Oils are an important cooking medium for most communities except some, where ghee could be used for the purpose. The major oil used in North India include mustard, sesame, groundnut and soybean. Corn oil and sunflower oil are used by the richer community. In the South, cooking oil include palm oil, groundnut, coconut, til oil and gingelli oil. In Calcutta, mustard oil is most commonly used, while in Chennai, a mix of groundnut, sesame and coconut are more popular (Table 4)

Table 4: Fatty acid Composition of some important Edible oils used in India

Oils	Saturates	Unsaturates	Part of India where used
Coconut oil	87.9	8.6	South
Mustard	10.7	88.6	North, East
Groundnut	20.9	79.1	North, South
Soyabean	13.1	86.1	North
Palm oil	47.9	47.7	South
Sunflower	9.1	81.3	North
Safflower	8.8	92.2	North

Vegetable oils, which undergo a chemical process called 'hydrogenation' are sold in India in the name of vanaspati oil. These contain significant amounts of saturated fats and trans fatty acids, which when their total dietary intake exceeds 8-10(en) percent. Since they are reasonable priced, they are consumed by a large segment of the population.

INVISIBLE FATS

Accurate methods of extraction and gas chromatography have been able to determine the content of invisible fats in cereals and pulses, used commonly both in urban and rural populations all over India (3). It has been estimated that cereals and pulses contain 3% and 2% fat respectively. Cereals are able to provide 1.3% LA and 0.08% ALNA. Pulses provide 1.2% LA and 0.28% ALNA. The invisible fats in the ten states monitored, range from 20.5 g to 50.5 g daily. The lowest figures are for Uttar Pradesh (20.6g) and Orrisa (20.7 g), while the highest consumption is the Kerala (50.5g). An analysis of the diet shows that almost all components of diet provide invisible fat and it varies from one region of the country to another (Table 5).

Table 5: Invisible fats in Indian diet

Food Item	% contribution to invisible fat intake in different states	
Staple cereals	70-77% in 6 states 88% in Orissa 61-62% in 2 states	
Tapioca	31% in Kerala	
Milk	3-21%, average 11.4% Highest in Gujurat, Lowest in orissa	
Pulses	0.5%	Kerela
	4%	Madhya Pradesh
Fish	21.3%	West Bengal
	12.3%	Tamil Nadu
	10.5%	Kerala
Meat and Eggs	Exact figures not available	
Condiments & spices	24.3%	Tamil Nadu
	22.4%	Andhra Pradesh
	17%	Karnataka
	12.5%	Kerala
Coconut	60.1%	Kerala
	25.1%	Karnataka

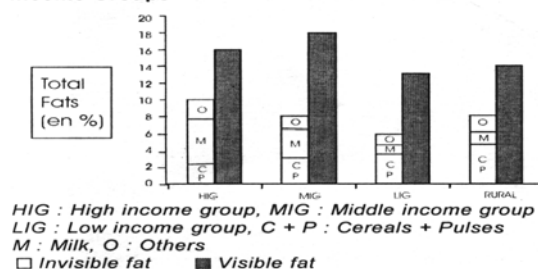
Dietary surveys from ten urban cities were made available, but Calcutta and Chennai were chosen as representatives. The dominant cereal in both Calcutta and Chennai is rice. Fat makes an important contribution to energy intakes. Invisible fat intake is higher in Chennai while visible fat is used much more in Calcutta, although the total work out to be the same. In the lower income group (the industrial worker and the slum dwellers of Calcutta), however, the amount of visible fat consumed is less than that in the same class of population of Chennai. In Calcutta, the major oil used is mustard, while in Chennai, it is a mixture of groundnut and sesame. In Chennai, all five social classes have an energy contribution from Linoleic acid that is close to the national average of 0.28%. In Calcutta, the lower three classes are close to this, but the two higher groups have an increased contribution of 0.39% through linolenic acid derived from tubers like potatoes, condiments, spices, milk and fish.

Similarly diet in Karnataka and Kerala were compared to assess the intake and sources of various types of fats. While rice, ragi and jowar contributed to the intake of invisible fats in Karnataka, in Kerala it was only rice. Tapioca was an important source of invisible fat (4.56g) in Kerala. Coconut is also consumed in large quantities in Kerala and provided much more fat compared to Karnataka (30.37 g vs 9.15g). Therefore, the total consumption of invisible fat in Kerala is significant more than in Karnataka (50.52 g vs 37.35g). However, visible fat is consumed more in Karnataka as compared to Kerala (9 g vs 3 g). In Karnataka, fats supply 13.9% of the energy, while in Kerala they supply 22%. Table 6 shows the composition of some regional meals and it is seen that a south Indian meal has the highest fat content as compared to other meals.

FAT INTAKE RELATED TO INCOME

The consumption of visible and invisible fats varies in diet of different income group. Diets of high income group (HIG) families have about 10 (en) % of invisible fat provided by cereals, pulses

Figure 1 : Visible and Invisible Fats in Diets of Different Income Groups



and milk, besides other sources. Visible fat intake is about 16 (en) % which makes it a total of about 26 (en) %. Invisible fat intake in the middle income group and lower income group is 8 (en) and 6 (en) % respectively while that for the rural population is 8 (en) %. It can be appreciated that cereals and pulses contribute to almost half of the total invisible fats in rural population and this is more when compared to other groups. In contrast, a higher consumption of milk in HIG, provides more invisible fat as compared to the rural population.

CONCLUSION

Fat consumption in Indian diet varies from region and also significantly in various income groups. It is interesting to note that the rich, unfortunately, derive their major intake from visible fat, which is something in the 'health hazard' range. The 'not so rich' and rural population get the main source of fat from cereals and pulses and much less from visible fat, because of the affordability factor.

Table 6: Fat Composition of some Regional Indian Meals

Recipe	Fats (g)
1. 1. South Indian Meal	28.1
2. 2. Bengali Meal	24.8
3. 3. Punjabi Meal	21.9
4. 4. Gujrati Meal	24.5

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