

## Contribution of Various Foods to Fat and Fatty Acids Intake Among Urban and Semi-Urban Women of Punjab

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**ABSTRACT** Three day dietary survey was carried out on 100 women each from semi-urban (Dhuri) and urban (Sangrur) areas of Punjab and their fat and fatty acid intake was calculated. *Desi ghee*/butter was most frequently used fat followed by *vanaspati* and rice bran oil. Total daily fat intake was 44 (25.8 en%) and 45.8 g (27.6 en%) while visible fat intake was 21 and 23 g in semi-urban and urban areas respectively. Daily intake of linoleic (LA) and linolenic acid (ALNA) was 5.2 (3.04 en%) and 0.75g (0.44 en%) in semi-urban area and 4.45 (2.27 en%) and 0.71g (0.43 en%) in urban area, respectively, while LA/ALNA ratio was 6.98 and 6.30 and was within the normal range of 5-10. Cereals contributed more than 50% of LA and ALNA each while visible fats contributed nearly 1/3 of LA and ¼ of ALNA. The ratio of SFA: MUFA: PUFA was 2.9: 1.7: 1.0 in semi-urban and 3.6: 2.0: 1.0 among urban women compared to desired level of 1: 1: 1, being adversely in favour of SFA. Visible fats provided between 50-60% of SFA and MUFA while milk provided 25% of SFA and 30% of MUFA. However, cereals were the main contributors of PUFA supplying >50% followed by visible fats providing nearly 30% of PUFA. Dietary modification in visible fat is recommended.

Fat is important component of human diet. The functional role of fat in the diet is manifold because it provides high energy, essential fatty acids, vehicle to carry fat soluble vitamins, nutrients and anti-oxidants, flavour and satiety value. In addition to fat, type of fatty acids consumed play significantly different roles in body metabolism. Human body can synthesize saturated and monounsaturated fatty acids from carbohydrates, however, linoleic (C18: 2) and alpha linolenic acid (C18: 3) cannot be synthesized by body and therefore, are essential dietary components. Ghafloorunissa (1996) has recommended that fat intake should provide a minimum of 15% of total energy with upper limit of 24-30 energy percent. Its quality should be such that it furnishes PUFA/SFA and linoleic acid/linolenic acid between 0.9-1.0 and 5-10, respectively. The current recommendations (WHO, 2003) are that human diets should contain minimum 3% en linoleic acid (LA) and 0.5 en% alpha-linolenic acid (ALNA).

A study conducted by Basu et al. (2001) on the male subjects reported that dietary fat provides 22 to 32% of total energy. Indian diets are cereal based and vegetable oils/fats used as cooking medium is major source of visible fat contributing about 80% of visible fat consumption. In the diets of large section of Indian population (NNMB, 1980 and Ghafloorunissa, 1989a), the fat present in cereals, pulses and vegetables (invisible fat) provides 16

g fat (7 en%), 5 g linoleic acid (2 en%) and 0.35 g alpha/linolenic acid (0.2 en%).

Metabolic studies showed that at a level of 6-7 en% of linoleic acid (n-6), about 0.2 to 0.5 en% long chain n-3 PUFA or 1.4 energy percent ALNA produced anti-atherogenic effects. Thus, the absolute levels as well as n-6 to n-3 ratio are essential for optimal health. Many studies provide the data on fat intake by Indian population. However, data on intake of individual fatty acids is scanty. Therefore, the present study has been undertaken to determine the quantity and type of fat consumed by women and to calculate the intake of essential fatty acids by them.

### METHODOLOGY

The present study was conducted in town of Dhuri (semi-urban) and city of Sangrur (Urban) in Punjab State. One hundred non-pregnant and non-lactating women in the age group of 30-60 years from each of the two areas were selected using non-stratified random sampling technique. Detailed background information of the selected subjects regarding income, food habits, food intake and quantity, type and frequency of various fats or oils was collected. The dietary intake was recorded using the 24 hour recall method for 3 consecutive days. Food intake of the subjects was converted into exact measurements using a set of standardized

utensils on a vol/vol basis. The visible fat was calculated from the dietary intake of subjects while the total fat intake was calculated using MSU Nutriguide Computer Programme (Song et al., 1992) based on Indian Food Composition tables. For the calculation of invisible fat intake by the subjects, the fat, linoleic acid (LA) and alpha linolenic acid (ALNA) content of various plant foods i.e. cereals, millets, legumes, pulses, green leafy vegetables, other vegetables (fruits not included) and fats and oils were taken from literature reports (Ghafoorunissa, 1989b., 2001; Narasinga Rao et al., 1989; ICMR, 1990, Sodhi, 2001). The SFA, MUFA and PUFA content of various plant foods and fats and oils were taken from the literature values (Halhuber and Halhuber, 1983; Ghafoorunissa, 1989a, b; Narasinga Rao et al., 1989; Syre and Saunders, 1990; Amandeep, 1994 and Chandra, 1999).

From the amount of visible fat and oils, cereals and millets, milk, pulses and legumes, green leafy vegetables and other vegetables consumed by each individual and the Table values of fat and fatty acid content of these foods, the intake of fat and fatty acids was calculated and then added up to give overall consumption of fat and various fatty acids by each subject.

## RESULTS AND DISCUSSION

**Type and Frequency of Fats and Oils Consumed:** Survey data of type and frequency of fat (Table 1) revealed that *Desi-ghee* (Butter oil) was most frequently used fat followed by *Vanaspati* in both urban and semi-urban areas. Among the various vegetable oils, rice bran oil

**Table 1: Type and frequency of fats and oils consumed by women in semi-urban and urban areas\*.**

Type	Frequency (Semi-urban, n-100)			Frequency (urban, n-100)		
	Daily	Weekly	Fort- nightly	Daily	Weekly	Fort- nightly
Butter	32	24	13	24	25	6
Desi ghee	77	5	2	77	3	2
Vanaspati	41	5	8	63	5	5
Mustard	5	17	20	11	13	9
Groundnut	10	3	4	8	1	1
Rice bran	16	4	4	14	4	5
Cotton Seed	5	-	-	8	-	1
Sunflower	6	2	1	4	-	-
Refined mustard	4	3	2	4	2	2
Kardi Oil	5	1	1	3	1	-

\*Multiple response

was most frequently used due to its easy availability in the area and low cost due to presence of its processing unit in the vicinity. Most families were using combination of various fats for cooking purposes. Butter and *Desi ghee* was used for smearing *chapattis* or added on top of vegetable and legume preparations while *Vanaspati*/vegetable oils were used for cooking of various preparations in daily diets.

**Fat Intake by Subjects:** The data on the intake of fat and essential fatty acids have been presented in Table 2. The average visible fat intake by women was  $21 \pm 0.73$  and  $23 \pm 0.89$  g in the semi-urban and urban areas, respectively, with contribution of 47.7 and 52.5 percent to the total fat. NNMB dietary survey in the 10 states of India over the 20 years revealed that visible fat intake was only in range of 9-13 g where State of Punjab was not included (Krishnaswamy et al, 1997). Sodhi (2000) reported the visible fat intake of 25.3 and 23 g by the urban and rural Punjabi females and the values are close to the intake of present study. Invisible fat intake was  $23 \pm 0.21$  g and  $21.8 \pm 0.2$  g with the percent contribution of 52.3 and 47.5 to the total fat by semi-urban and urban females, respectively. Milk was the main source of invisible fat in the diets of women followed by cereals and millets. Respective contribution of milk and cereals and millets was nearly 64 and 30 percent in semi-urban and 65.9 and 30 percent in the urban areas to the total invisible fat. These results were in contrast to the NNMB data from other states where cereals and millets contributed more fat due to low milk intake. The contribution of invisible fat to the total fat was more than visible fat in the semi-urban area and less in urban areas.

The consumption of total fat was  $44 \pm 0.29$  and  $45.8 \pm 0.32$  g by the semi-urban and urban women, respectively. The fat provided about 25.8 and 27.6 energy percent in semi-urban and urban areas, respectively, which was within the upper limit of 24-30 energy percent recommended by Ghafoorunissa (1996) for prevention of cardiovascular diseases and diabetes. However, energy contribution of fat was higher than the recommendation of 20 en% from fat by ICMR (1990). The average consumption of total fat was in line with the study conducted by Gupta et al (1997) who reported the consumption of 26.7 percent energy from fat by rural subjects.

**Intake of Essential Fatty Acids:** The intake

**Table 2: Fat and Fatty acid (g/day) intake (mean ±S.E.) by women from various food sources in semi-urban and urban areas.**

Source	Semi-urban, n=100			Urban, n=100		
	Fat	L.A.	ALNA	Fat	L.A.	ALNA
	<i>Visible fat</i>					
Fats and oils	21±0.73	1.9±0.07	0.16±0.006	24±0.89	1.4±0.06	0.18±0.005
	<i>Invisible Fats</i>					
Milk fat	14.8 ± 0.87	0.24 ± 0.003	0.07 ± 0.004	14.4 ± 0.88	0.23 ± 0.004	0.07 ± 0.004
Cereals & millets	6.99 ± 0.12	2.6 ± 0.04	0.41 ± 0.005	6.6 ± 0.11	2.5 ± 0.05	0.36 ± 0.004
Pulses and legumes	0.97 ± 0.02	0.39 ± 0.002	0.07 ± 0.0007	0.62 ± 0.006	0.23 ± 0.002	0.06 ± 0.001
Green leafy vegetables	0.11 ± 0.008	0.009 ± 0.001	0.02 ± 0.002	0.11 ± 0.005	0.04 ± 0.002	0.01 ± 0.0005
Total visible fat	23 ± 0.21	3.3 ± 0.01	0.59 ± 0.003	21.8 ± 0.2	3.0 ± 0.2	0.53 ± 0.003
Total	44 ± 0.29	5.2 ± 0.019	0.75 ± 0.003	45.8 ± 0.32	4.45 ± 0.019	0.71 ± 0.0029

**Table 3: SFA, MUFA and PUFA intake (mean ±S.E.) by women from various food sources in semi-urban and urban areas (g/day)**

Source	Semi-urban, n=100			Urban, n=100		
	Fat	MUFA	PUFA	SFA	MUFA	PUFA
	<i>Visible Fat</i>					
Fats and oils	10.6±0.14	5.96±0.1	1.95±0.07	13.2±0.17	6.8±0.097	1.9±0.06
	<i>Invisible Fats</i>					
Milk fat	4.6±0.27	2.96±0.17	0.27±0.01	4.5±0.28	2.9±0.17	0.26±0.02
Cereals & millets	1.2±0.02	0.81±0.01	3.1±0.05	1.1±0.02	0.78±0.01	2.9±0.05
Pulses and legumes	0.22±0.004	0.11±0.005	0.5±0.02	0.09±0.003	0.05±0.002	0.2±0.009
Total visible fat	6.1±0.098	3.9±0.06	3.8±0.03	5.7±0.1	3.7±0.06	3.3±0.02
Total	16.7±0.01	9.8±0.07	5.8±0.05	18.9±0.14	10.5±0.04	5.2±0.04

of essential fatty acids i.e. linoleic and linolenic acid was 5.2 (3.04 en%) and 0.75g (0.44 en%) in semi-urban and 4.45 (2.74 en%) and 0.71 g (0.43 en%) in the urban area, respectively. The intake of linoleic acid (LA) in the present study was comparable and that of alpha-linolenic acid (ALNA) was higher than the intake of 3.0 en% and 0.16 en% by men belonging to high income group as reported by Kaur and Hira (1997). The intake of LA was within the recommendations of 3% while that of ALNA was slightly lower than the recommendations of 0.5%. Cereals and millets were the main contributors of LA and ALNA providing more than 50% of each of the two essential fatty acids followed by visible fats, which contributed 32-36% of LA and 21-25% of ALNA. Milk fat, pulses and legumes each contributed nearly 5% of LA and 10% of ALNA in the daily diets of the women from both the areas. Ghafoorunissa (1998) also reported that requirements of linoleic acid are met due to their high levels in vegetable oils and cereals.

The ratio of LA/ALNA calculated from the values reported in Table 2 was 6.98 and 6.30 in the semi-urban and urban areas, respectively. The LA/ALNA ratio was more than the one reported by Gupta et al (1997) but was within the

recommended ratio of 5-10 (Ghafoorunissa, 1996 and WHO, 2003).

**Intake of SFA, MUFA and PUFA:** The data regarding SFA, MUFA and PUFA intake are presented in Table 3. The mean daily intake of SFA, MUFA and PUFA was 16.7, 9.8 and 5.8 g by the semi-urban and 18.9, 10.5 and 5.2 g by the urban females, respectively. The SFA in the present study was providing less than 15 en%, which was contrary to the study by Volatier and Verger (1999) who reported more than 15 en% from SFA. Further, MUFA and PUFA intake was less in both the areas compared to reported values of MUFA and PUFA providing 13.5 ± 4.7 and 6.9 ± 1.8 energy percent among rural subjects (Gupta et al., 1997). Visible fats and vegetable oils provided 60-70% of SFA and 60-66% of MUFA in the daily diets of women from both areas. Milk was the next major contributor of SFA in daily diets providing nearly 25% of total SFA in both areas. Further, milk also contributed 30% of total MUFA in the diets of semi-urban women and 27.5% in the diets of urban women. Contribution of cereals and millets to both SFA and MUFA was below 9% in both the areas. However, cereals were the main contributors of PUFA providing more than 50% of total PUFA

in both areas followed by visible fats and oils which provided nearly 30% of PUFA. Contribution of milk to PUFA was only around 5%.

The ratio of SFA: MUFA: PUFA consumed by women was 2.9: 1.7: 1 in the semi-urban and 3.6: 2.0: 1.0 in the urban area, respectively. The ratio in the present study was adversely towards SFA compared to the recommended ratio of 1: 1: 1 for maintaining good health. The mean intake of visible fat was slightly higher than the suggested safe level of 20g/d and the total fat intake was within upper limit of 24-30 energy percent suggested by Ghafoorunissa (1996) but higher than the limit of 20 en% suggested by ICMR. The ratio of n-6/n-3 fatty acid was within recommended value of 5-10 for good health but SFA: MUFA: PUFA ratio was adverse indicating higher intake of saturated fatty acids and lower intake of PUFA. Out of the total SFA, in daily diets, 69-70% are provided by visible fats and oils alone, therefore, nutrition education is recommended to partly replace *Vanaspati* and *Desi ghee* with suitable vegetable oils to bring this ratio within the desirable range.

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