

Dietary fat and fibre intakes of Malaysian adults: issues and implications when 'western targets' are set as dietary goals

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ABSTRACT

This article examines the fat and fibre intakes of Malaysian adults and highlights discrepancies and practical limitations if these intakes are to match the levels for these nutrients advocated in the World Health Organisation (WHO) and American Heart Association (AHA) 'diet models'. Local data on food consumption showed that the total fat intakes amongst Malaysian adults, contrary to common perception, were not high and the mean values obtained fell within the range of 40-66g or 22-26% kcal. As such, the dietary target of 30% kcal total fat or its intermediate target of 30-35% kcal, advocated by WHO and AHA mainly to address the problem of a high consumption of dietary fats in western populations, should not be adopted indiscriminately by Malaysians. Dietary fatty acid (FA) analysis by high performance liquid chromatography (HPLC) coupled with the use of food composition tables, showed that the typical Malaysian diet prepared with palm olein or palm olein-groundnut oil blends as cooking oil contained 3.2-4.0% kcal polyunsaturated fatty acids (PUFA), mainly as the ω -6 linoleic acid, which is also the predominant essential fatty acid (EFA) in humans. This level of linoleic acid, with an ω -6/ ω -3 FA ratio approximating 10, is adequate for basal PUFA and EFA needs but fell short of the 4-10% kcal linoleic acid recommended by WHO (1993) to counter the effects of the cholesterol-raising saturated fatty acids (SFA). This raised upper limit of 10% kcal linoleic acid (previously 7% kcal), which equals the level of PUFA implied in the AHA diet model, appears unnecessarily high considering that the cholesterol-lowering potential of linoleic acid is maximum at about 6% kcal, while the health hazards associated with long-term high intakes of PUFA have never been completely dismissed. The new WHO lower limit for dietary linoleic acid (4% kcal) would have a controversial impact of raising the previous minimal 3% kcal EFA to above 4% kcal (linoleic + alpha-linolenic acids). Similarly, the WHO recommendation for total dietary fibre of 27-40g (equivalent to a daily combined intake of 400g of vegetables and fruits, 30g of which should come from pulses) appears at present, too high a dietary target for the average Malaysian adult whose habitual daily diet was estimated to contain about 180g of vegetables plus fruits, providing only about 13-16g total dietary fibre. Appropriately, an expert panel on Malaysian Dietary Guidelines has recommended instead, 20-30% kcal total fat containing 3-7% kcal PUFA, and 20-30g total dietary fibre for the local population.

INTRODUCTION

Evidence from epidemiological cohort studies have established a strong positive correlation between saturated fats and coronary heart disease (CHD) [Keys, 1980], and total fat calories with cancers of the breast, colon and prostate (Carroll *et al*, 1968; Armstrong and Doll, 1975).

Consequently, the recommendation to reduce the intake of total fat, particularly saturated fats from animal sources, has become a common dietary guideline in many countries.

In contrast, diets low in animal fat and protein but high in vegetables, fruits, cereals or bread, eg. the vegetarian-type diet (Register *et al.*, 1973) or the “Mediterranean Diet” (Spiller, 1991), have been found to be protective against the above chronic diseases, as well as diabetes mellitus. These observations have prompted the emphasis on complex carbohydrates (starch and “non-starch polysaccharides”- NSP), vegetables and fruits, and the cholesterol-lowering linoleic acid in the formulation of population dietary goals. In this regard, WHO has played a lead role globally, with regular updates on the recommended intakes of the macronutrients- fat, protein, and carbohydrate, as well as other food components such as fibre, sugar and salt (FAO/WHO, 1978; WHO, 1982, 1986, 1990 & 1993). This article examines the total fat and fibre intakes amongst Malaysian adults, and reviews the discrepancies and practical limitations if these intakes are to match the levels advocated for these nutrients in the WHO and AHA “diet models”.

Dietary Fat

Dietary levels

In western populations during the 1970s and 1980s, the consumption of dietary fats has been reported in the high range of 36-43% kcal (Rizek *et al.*, 1983; James, 1988). Thus, both WHO and AHA then recommended 30% kcal total fat as a realistic dietary target, with an intermediate goal of 30-35% kcal from fat, to address the health problems associated with high total fat intakes in these communities (AHA, 1988; James 1988, WHO, 1990; James and Ralph, 1992). In 1993, however, a WHO Expert Committee advocated instead 35% kcal total fat as the upper limit for “active individuals who are in energy balance” and whose intake of EFA and other nutrients are adequate, and the level of SFA does not exceed 10% kcal. No mention was made of the ultimate goal of 20-30% kcal dietary fat contained in the earlier WHO recommendations (WHO, 1986 & 1990). The previous minimum fat intake of 15% kcal was retained but the general upper limit of 30% kcal total fat was now recommended instead for “sedentary individuals”. It would appear then that there was a discrepant shift towards higher upper limits for total fat intake advocated by the 1993 WHO Expert Committee. The introduction of upper limits for total fat according to two activity levels of individuals, although apparently technically sound, tend to complicate the recommendations.

Fat consumption varies widely among different communities in Malaysia (Table 1). For example, the mean population fat intake was only 11% kcal in remote Kampung Bongkol, Sabah (Ng, 1984), but was considerably higher for 14 rural villages in the Peninsula, viz. 18% kcal (Chong *et al.*, 1984). More recently, Chee *et al.* (1996) reported mean dietary fat intakes of about 23% kcal for the estate adult males in two separate states in the Peninsula, while Ng’s urban ‘hostel diet’ (1995) contained 26% kcal total fat. Comparable total fat intakes approximating 25% kcal were also reported by Ismail *et al.* (1995b & 1996) for moderately-active young Malaysian adults, viz, members of the national sepak takraw squad undergoing centralised training, and soldiers at Terendak base camp. These Malaysian data on total fat intake conflict with the perception amongst some local health workers that Malaysians in general, are

“consuming too much fat”. This view is not substantiated by food consumption data but is probably prompted by the observation that the prevalence of overweight and obesity amongst Malaysian adults is on the rise in both rural and urban populations (Wan Mohamad *et al.*, 1996; Ismail *et al.*, 1995a), and by the rapid infiltration nationwide of fast food centres specialising in fried foods.

Applying a probable error of $\pm 10\%$, which approximates 2 standard deviations, to the more recent findings above on total fat intake, it is estimated that the majority of Malaysian adults in the Peninsula are consuming 20-29% kcal of total fat. Therefore, it would not be appropriate to use the 30% kcal “western target” for total fat as the population dietary goal for Malaysians. Applying the same rationale, it would also be inappropriate for diet counsellors in Malaysia to presume that their clientele are consuming above 30% kcal total fat and unwittingly advocate “no more than 30% calories from fat” or formulate patient meals containing 30-35% kcal from fat based on the perception that meals with $<30\%$ kcal from fat are ‘unpalatable’. In cognisance of the above, a more appropriate “Malaysian target” for total fat intake which is consistent with “healthy eating” amongst Malaysians would be 20%-25% kcal. On this topic, the Expert Panel on Malaysian Dietary Guidelines (1998) has recommended 20-30% kcal total fat as the “healthy range”, with a minimum of 15% kcal in order to satisfy energy, PUFA and EFA needs.

Table 1: Fat consumption amongst different population groups in Malaysia versus the WHO & AHA target for dietary fat

Population group	Kampung Bongkol, Sabah (Ng, 1984)	'Poverty' villages (Chong <i>et al.</i> 1984)	Estate adult males (Chee <i>et al.</i> 1996)	Sportsmen/soldiers (Ismail <i>et al.</i> 1995b & 1996)	Adult males, urban (Ng, 1995)	WHO & AHA 'target'
Total fat intake (% kcal)	11	18	23	25	26	30

Intakes of SFA and PUFA

WHO's recommendation for total dietary SFA has been consistent over the last decade-and-a-half, viz. $<10\%$ kcal. This restriction appears unnecessarily strict for the general population since not all dietary SFA raise plasma cholesterol levels- a fact which has the consensus of the global scientific community. Of the SFA with atherogenic potential, myristic acid and trans FAs are the main villains (Hayes and Khosla, 1992; Mensink and Katan, 1990). However, these atherogenic FAs are usually present in only small amounts ($<0.5\%$ kcal) in the average Malaysian diet, unless substantial amounts of coconut oil, santan or hydrogenated vegetable oils are used in food preparation or frying. Lauric acid is much less hypercholesterolemic than myristic acid (Hegsted *et al.*, 1965), while palmitic acid of a vegetable origin, eg. from palm oil, tends to be neutral (Hayes *et al.*, 1991; Ng *et al.*, 1991; Ng, 1994) unless habitual cholesterol intakes are high, i.e. >400 mg/day, which down-regulates LDL cholesterol-receptor activity leading to an expansion of the circulating pool of LDL cholesterol (Khosla and Hayes, 1994). On this last point, it is encouraging to note that the typical urban Malaysian diet contains only 250-300 mg cholesterol (Ng, 1995).

Dietary upper limits for PUFA advocated by WHO have, in pendulum-fashion, changed over the years, viz. 10% kcal in 1986, 7% kcal in 1990, and back to 10% kcal (as linoleic acid) in 1993. These upper limits for PUFA were recommended mainly to offset the cholesterolemic potential of high intakes of SFA (>10% kcal). With regard to this purpose, the intake of 10% kcal linoleic acid may represent a “metabolic overkill” as the cholesterol-lowering potential of linoleic acid is not linear but has a maximal effect at about 6% kcal. It was also estimated in the same meta-analysis that only about 3% kcal linoleic acid is required to prevent plasma cholesterol elevation when dietary myristic acid are present in negligible amounts (Hayes and Khosla, 1992).

Similarly, the AHA diet model contains 30% kcal total fat with 10% kcal PUFA as reflected in the 1:1:1 FA ratio advocated for SFA, MUFA (monounsaturated fatty acids) and PUFA, respectively. As in the WHO diet model, this level of PUFA is unnecessarily high because of the reasons stated above. In Malaysia, cooking oils contribute about half the of adults (Ng, 1995). As such, manipulation of the dietary PUFA content can be conveniently achieved by simply selecting the appropriate vegetable oil as cooking oil. The typical Malaysian diet has a dietary FA profile approximating 3:3:1 with linoleic acid levels in the range 3.2-4.0% kcal and SFA about 11% kcal (Ng, 1995). In practical terms, 10% kcal linoleic acid (about 25g of the FA) can only be obtained if a polyunsaturated vegetable oil (eg. soyabean oil, corn oil, or sunflower oil) or a vegetable-oil blend with a high proportion of one or more of these linoleic acid-rich oils, is used as the cooking oil in meal preparation. This high level of linoleic acid cannot be obtained by the simple manipulation of the other components of the local diet. Local nutritionists, dietitians, nutrition educationists, and other health professionals who unwittingly advocate the AHA 1:1:1 dietary FA profile should be aware of the above-mentioned practical implications.

Thus, of the series of WHO recommendations for PUFA, the 1990 version (3.0-7.0% kcal) appear the most appropriate for adoption by Malaysians, which is also in line with the British Nutrition Foundation Task Force’s recommendation that there was no need to increase further the intake of linoleic acid, considering that the intake of this PUFA in the British population has increased to 6.7% kcal in recent years (1992).

Implications on minimal EFA requirements

It must be recognised that any lower limit recommended for linoleic acid must be consistent with that recommended for EFA, as linoleic acid is by far the main EFA (the other EFA being α -linolenic acid). The 1993 WHO recommendation for a minimum of 4% kcal linoleic acid has at least two important implications, viz.:

- 1) the minimum EFA (linoleic acid + α -linolenic acid) intake would be raised from 3.0% kcal (WHO, 1990) to at least 4.4% kcal if the w-6/w-3 FA ratio is to be 10 or lower, and
- 2) diets providing <4.4% kcal EFA would then be deemed nutritionally inadequate, as the “new” basal EFA needs are not met

There is no scientific basis to imply that basal EFA requirements need to be increased from the previous 3.0% kcal to 4.4% kcal. The minimum EFA levels required to prevent EFA deficiency was estimated at 1% kcal (Holman and Johnson, 1983) but this could be as low as 0.5% kcal,

considering the unusually high EFA content of the butterfat used in Hansen's studies (Cuthbertson, 1976). Thus, at 3% kcal EFA, there is already an ample margin of safety for the general population. The lack of EFA deficiency symptoms even in populations which do not meet this minimum dietary level of EFA supports this last point.

Potential harmful effects of high PUFA intake

There has been concern that long-term consumption of PUFA-rich diets may have adverse health effects such as increased risk to cancer (Braden and Carroll, 1986), cholelithiasis (Sturdevant *et al.*, 1973), immunosuppression (Ring *et al.*, 1974; McHugh *et al.*, 1977) and reduction of the protective high density lipoprotein cholesterol (Sheperd *et al.*, 1978). More recently, linoleic and MUFA, contrary to expectation, have also been shown to be thrombogenic, i.e. elevate the plasma levels of fibrinogen and factor VII coagulant activity (Sanders, 1996). High intakes of PUFA would also augment lipid peroxidation *in vivo*, thus imposing an increased demand for dietary antioxidant nutrients, especially vitamin E.

Since the use of polyunsaturated vegetable oils or their blends is necessary for diets containing 10% kcal linoleic acid, it is noteworthy that such PUFA-rich vegetable oils are susceptible to oxidation during frying (ITERG, 1972). The oxidation products or "polar materials" formed in these polyunsaturated vegetable oils, being non-volatile, tend to accumulate in the frying medium, get absorbed into fried foods, and can have deleterious effects on health.

In the pathogenesis of cancer, the adverse influence of PUFA is due primarily to the linoleic acid component and impacts mainly in the development phase, i.e. enhance the metastatic spread of tumour cells (Klurfeld, 1995). Studies on mammary tumorigenesis in rats fed 20% ω/ω or 40% kcal fat (Carroll *et al.*, 1981; Ip *et al.*, 1985) have indicated that the critical level for the tumour-promoting effect of linoleic acid (acting as EFA) was about 3.0-4.4% ω/ω or 6.0-8.8% kcal. Thus, it would be premature to consider that the adverse effects of linoleic acid in humans are only significant when dietary levels exceed 10% kcal, although a critical level of 12% kcal was cited by the British Nutrition Foundation (1992).

In contrast to the effects of linoleic acid, most studies with ω -3 FA have shown an inhibitory effect on tumour growth (Kort *et al.*, 1987; Karmali *et al.*, 1984; Karmali *et al.*, 1987). Thus, the ω -6/ ω -3 FA ratio may have a vital influence on tumour cell growth. At dietary linoleic acid levels approximating 10% kcal, it would practically be extremely difficult in the Malaysian context, to maintain the ω -6/ ω -3 FA ratio at 5-10. Therefore, the metabolism of α -linolenic (ω -3 FA) would be adversely affected by that of linoleic acid (ω -6 FA) since the metabolic pathways of these two FA families share common enzymes. This last point is important and serves to refute suggestions that dietary ω -6 PUFA at 10% kcal or more is "safe".

Dietary Fibre

The term 'total dietary fibre' used in this text refers to non-starch polysaccharides i.e. NSP (pectins, beta-glucans, gums, mucilages, and seaweed/bacterial polysaccharides), lignin and resistant starch as defined by Gurr and Asp (1996). Recommendations on total dietary fibre intake are influenced by the negative association of stool weight on disorders such as colon

cancer, constipation and diverticular disease. Cummings and Bingham (1992) suggested that a population stool weight of 150g/head/day, which requires an NSP intake of about 21g/day, would protect against the disorders mentioned. These authors also realised that this would require a substantial change in the United Kingdom diet and probably unachievable in the foreseeable future.

Available local data has indicated that the average urban Malaysian diet contains only about 180g of vegetables and fruits, and 13-16g of total dietary fibre (Ng, 1995). This total fibre intake is of course far below the 27-40g recommended by WHO (1990), contributed in part by the fact that breakfast cereals are not widely consumed by Malaysian adults. However, the WHO recommendation is prompted by the adoption of 400g per day of vegetables and fruits in China, and the observation that high intakes of dietary fibre in regions or countries, such as southern Italy and Greece are associated with low rates of CHD and some types of cancers (WHO, 1990). The 400g vegetables and fruits recommended do not include potatoes, other tubers and cassava, and at least 30g of the 400g vegetables should be pulses, nuts and seeds.

To meet the WHO recommended intake of 27-40g of total dietary fibre, the average Malaysian adult would have to double his intake of vegetables and fruits, which is a formidable task indeed. Considering the practical implications and the current estimated total fibre intake of Malaysians, the expert panel on Malaysian Dietary Guidelines (1998) has recommended a population dietary goal of 20-30g as consistent with "healthy eating".

In other parts of the globe, the scenario on fibre intake is similar to the Malaysian example given, viz., average intakes of dietary fibre do not match up to WHO recommendations. For example, NSP intake in the United Kingdom is about 12.5g/day (Cummings and Bingham, 1992), while in Australia, the intake of dietary fibre is estimated to be about 25g/head/day (Topping, 1993).

CONCLUSION

General recommendations by international organisations or foreign professional bodies should not be adopted indiscriminately without due consideration to their practical or economic implications on the local population. For total fat intake the "30% kcal" target or its interim alternative, 30-35% kcal, which are often recommended for western communities where dietary fat exceed 35% kcal, should not be adopted as a population dietary goal for Malaysians whose fat intakes are currently in the range of 20-29% kcal. It is not logical to have a dietary target above the habitual intakes of the nutrient by the population concerned, unless in the specific case of undernutrition. Therefore, a more realistic or logical dietary goal for total fat in the case of Malaysian adults would be "20-25% kcal", with due consideration for the minimal PUFA or EFA requirements of 3% kcal.

The 1993 WHO recommendation of basal 4% kcal linoleic acid would imply that habitual diets supplying 3.0-4.0% kcal PUFA (mainly as linoleic acid) are both PUFA and EFA-deficient, which would certainly evoke controversy.

In Malaysian habitual diets, it is not possible to obtain 10% kcal linoleic acid unless a

polyunsaturated vegetable oil or blend is used in meal preparation. Based on the arguments presented in this communication, 10% kcal linoleic acid appears excessive, and the 7% kcal upper limit for the PUFA as contained in the 1978 and 1990 WHO recommendations would be more appropriate for adoption by the local population. In addition, there is insufficient evidence to indicate that long-term high intakes of linoleic acid is safe and available literature suggests instead the contrary.

In the case of dietary fibre, the range of 27-40g total dietary fibre advocated by WHO (equivalent to 400g of combined vegetables and fruits per day) appears too high a practical target for Malaysian adults considering that they are currently consuming less than half this amount. As such, a practical target of 20g minimal total dietary fibre, with a 'healthy range' of 20-30g, has been recommended instead.

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