Some aspects of Vitamin A consumption in a rural area in West Malaysia

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Introduction

OBSERVATIONS ON VITAMIN A starvation (sic) among immigrant Indians in Malaya were made by Field (1931). More recently, Vitamin A deficiency was found to be a major cause of blindness in children by McPherson (1955). Biochemical studies, involving the determination of serum carotene and Vitamin A levels in children and adults, were conducted by a team from the Inter-departmental Committee on Nutrition for National Defence (ICNND) in 1962. "Low" or "deficient" levels of serum Vitamin A and carotene were found in about 30 per cent of children under five years of age. Vitamin A deficiency in children was found in further studies conducted by Thomson and others in 1964.

The vitamin A and carotene contents of some Malayan foods were investigated by Leong, 1939; Chandrasekharan, 1969; and Chong and Soh, 1969.

However, investigations into Vitamin A consumption have, in the past, been conducted as parts of wider dietary studies together with the consideration of other nutrients (Thomson, 1960; ICNND, 1962; Jackson, 1970).

The purpose of this study was:

(i) To examine the Vitamin A consumption in a rural area in West Malaysia
(ii) To study the effect of a festival day on
  (a) Overall Vitamin A consumption
  (b) Consumption of the retinol/non-retinol portions of Vitamin A.

Method

Four Malay villages, with a total of 205 households, were selected in the District of Rembau, Negri Sembilan. The population of these villages is engaged in padi-planting and most of the households also own rubber smallholdings. All these households were visited and a 24-hour recall of food consumed by each household was obtained. This was done by third year medical students as part of a rural health survey. The households were visited only once and different households were surveyed on different days. Since these households were fairly homogeneous with regard to their socio-economic status, ethnic group (all Malays), occupations and religion (all Muslim), and since the diet in this rural area had been found in previous studies to be fairly monotonous (Teoh and Cheng, 1967), this method of study, although having certain disadvantages (of possible memory lapses and difficulty in food quantity estimation), was deemed to be the best available under the existing circumstances of limited time and availability of manpower.

The survey of these four villages took six days. The first day of the survey was on a day after a festival day (Hari Raya Haji), thus the information obtained for the 24-hour recall was for the festival day itself. This was designated as Day F and subsequent days were labelled as Day F+1, Day F+2, and so on. The survey was carried out in the months of February-March 1969 which were not during the local fruit season and just before the local rice harvest.

The data obtained in the field were processed and the nutrient intake for each household was calculated by means of a computer programme (Teoh, Lau and Cheng, 1968) using stored data from food composition tables compiled for use in West Malaysia (Department of Social and Preventive Medicine, University of Malaya, 1968).

The following indices were subsequently obtained:

a. **The total intake of Vitamin A for each household in terms of "Vitamin A value":** this is the sum of both the retinol and non-retinol portions of the intake in terms of "retinol equivalence" (WHO, 1967; PAHO, 1970). "Retinol equivalence is calculated as the sum of mcg retinol, mcg Beta-carotene multiplied by one-sixth and mcg other carotenoids multiplied by one-twelvth.

b. **"Percentage requirements met" for each household in respect of Vitamin A:** this was calculated on the following basis:

$$\frac{\text{Total Vitamin A intake calculated from the 24-hour recall of food consumed by a household}}{\text{Total suggested daily intake of Vitamin A for the same household.}} \times 100$$

The suggested daily intakes of Vitamin A were those recommended by the World Health Organisation (1967) and these were applied to all members of each household who participated in the meals under consideration, taking into account their ages and sexes. Summary indices (means, medians and standard deviations) were then

Table 1 — Vitamin A consumption — "percentage requirements met" by specified indices and day of survey.

Indices	Day of Survey						Total
	F	F+1	F+2	F+3	F+4	F+5	6 days
Median % RM*	39.19	33.95	83.19	59.42	34.50	46.94	46.68
Mean % RM	43.01	61.30	99.02	74.54	60.72	56.51	64.23
S.D. + % RM	38.33	63.28	91.61	78.29	75.29	54.92	70.30
Lowest value % RM	2.90	0.82	6.73	0.35	0.00	0.00	0.00
Highest value % RM	123.69	227.56	321.52	364.83	362.32	201.54	364.83
No. of Households surveyed	32	29	15	56	54	19	205

* % RM = "Percentage requirements met"
\+ S.D. = Standard Deviation

Table 2 — Vitamin A consumption — number of households by level of "percentage requirements met" and day of survey.

Percentage Requirements Met	Day of Survey						Total 6 days
	F	F+1	F+2	F+3	F+4	F+5	
0 — 79% ("low")	26	21	7	36	39	15	144
80% and above ("satisfactory")	6	8	8	20	15	4	61
Number of Households	32	29	15	56	54	19	205

($X^2 = 7.65$, df = 5, $0.156 < P < 0.221$)

calculated for the group of households surveyed each day.

c. **The retinol component of the total Vitamin A intake for each household.** These were obtained from the total Vitamin A intake as part of the calculations.

d. **The percentage contribution to the total Vitamin A intake in each household from various food groups.** The food stuffs consumed by the households surveyed were classified into 11 food groups and the contribution of each food group to the total intake of Vitamin A value was calculated. For each of the days of the survey, the mean values for each group of households were obtained.

Results

"Percentage Requirements Met"

On a household basis, the above index was calculated and the mean and median values for each lot of households studied for a particular day of the survey was obtained (see Table 1).

For all the households for the six days of the survey, the median value for "percentage requirements met" (% RM) was 46.68%, indicating a low level of consumption generally. The index of % RM by the various households was classified arbitrarily into categories, viz: "low", 0-79% RM, "satisfactory", 80% RM and above (see Table 2).

For almost every one of the days the survey, the majority of households (average of 70.2%) were in the "low" category. No significant difference was detected in the pattern of distribution of households with regard to their consumption levels from one day of the survey to the next.

Percentage of Retinol and Non-retinol Intake

On the average, for the 205 households studied, the Vitamin A intake was composed of 14.12% retinol and 85.88% non-retinol (Table 3). The highest retinol intake was during the festival day (Day F) and the day after (Day F+1).

When the households were grouped according to the proportion of retinol in their diets, those with a proportion of 0-19% retinol were considered as "low" and those with 20% retinol or over in their intakes were considered as "not low". The distribution pattern of households for each of the days of survey is presented in Table 4. There was a significant difference in the pattern of distribution of the households from one day of the survey to

Table 3 — Vitamin A consumption — percentage of total intake as retinol and non-retinol by day of survey.

Percentage of Vitamin A Intake	Day of Survey						Total 6 days
	F	F+1	F+2	F+3	F+4	F+5	
Retinol	33.09	22.39	13.62	10.42	5.56	10.57	14.12
Non-retinol	66.91	77.61	86.38	89.58	94.44	89.43	85.88
Number of Households	32	29	15	56	54	19	205

Table 4 — Vitamin A consumption — number of households by percentage of retinol intake and day of survey.

Retinol % of Total Intake	Day of Survey						Total
	F	F+1	F+2	F+3	F+4	F+5	6 days
0 — 19% ("low")	14	14	13	29	37	14	121
20% and above ("not low")	18	15	2	27	17	5	84
Number of Households	32	29	15	56	54	19	205

($X^2 = 14.13$, df = 5, $0.010 < P < 0.016$)

the next. The proportion of households in the "not low" group for Days F and F+1 was higher than for the other days.

Percentage contribution by various food groups

A number of food groups contribute to the total intake of Vitamin A, mainly vegetables and fruits, meats and condiments. The mean percentages contributed by the various food groups for various days of the survey are presented in Table 5.

For Days F and F+1, the contributions by the food group "meat and egg" reached 25 per cent. On the average for all six days, animal sources contributed only 24.7 per cent of the Vitamin A intake. The rest were from vegetable sources which could only contribute the less efficient precursors of Vitamin A, viz. Beta-carotene and other carotenoids.

Discussion

The sources of Vitamin A may be from foods of animal or vegetable origins. Retinol, which is Vitamin A alcohol, is derived from foods of animal origin whilst the non-retinol component represents the Vitamin A that may be obtained by the body from precursors in the form of Beta-carotene and other carotenoids mainly by the consumption of vegetables and fruits. Retinol is a more efficient source of Vitamin A than Beta-carotene or the other carotenoids as these have to be converted into Vitamin A before utilisation and losses are thereby sustained.

Although there did not seem to be an increase in the consumption of Vitamin A on the festival day, there was a significant change in the retinol component of the intake. This perhaps may be explained by the observation that on Days F and F+1, all the households visited served buffalo meat for their meals. Since this meat was relatively expensive, only small amounts were purchased. Further, since expenses were already incurred in the purchase of meat, less vegetables were included in the meals of these two days. Hence, although the retinol component of the intake was raised by this practice, the overall intake remained the same. From Day F+2 onwards, meat supplies were exhausted and vegetables were again purchased. This was relatively cheaper and larger amounts could be obtained. But although this could be done, the overall intake remained more or less the same as these vegetables supplied Vitamin A in the form of Beta-carotene and other carotenoids which are only one-sixth and one-twelfth as effective as retinol respectively.

The above results seem to indicate that both the quantity and quality of Vitamin A intake in this particular rural area of West Malaysia is low. Therefore, it is felt that should any programme for the improvement of Vitamin A consumption be carried out, not only should the level of consumption be raised, but the retinol/non-retinol ratio of the intake should also be changed.

Summary

The Vitamin A consumption of 205 households in a rural area in West Malaysia was studied. In general, it was found that the Vitamin A intake was low, the median value of "percentage requirements met" by households being 46.68%. Seventy per cent of the households had intakes lower than the suggested daily dietary intakes. The effect of a festival day was to increase the retinol component but not the total amount of Vitamin A consumed.

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Table 5 — Vitamin A consumption — mean percentage contribution to total Vitamin A intake by food group for each day of the survey.

Food Group	Day of Survey						Total
	F	F+1	F+2	F+3	F+4@	F+5@	6 days
1. Cereals	—*	—	—	—	—	—	—
2. Starchy roots	—	—	—	1.8	—	—	0.5
3. Sugars	—	—	—	—	—	—	—
4. Legumes	2.8	6.4	10.2	10.7	9.1	25.2	9.7
5. Vegetables/fruits	29.1	10.4	58.6	53.8	51.8	51.1	47.6
6. Meats/eggs	25.2	25.5	4.7	18.2	15.4	11.8	18.0
7. Fish	—	—	—	0.3	2.2	—	0.7
8. Milk	7.2	11.8	3.7	3.9	5.5	4.0	6.0
9. Oils/fats	2.8	1.7	11.2	0.8	0.1	—	1.7
10. Condiments	32.5	14.1	11.6	10.1	12.3	2.6	14.2
11. Miscellaneous	0.3	—	—	0.3	—	—	0.1
Number of Households	32	29	15	56	54	19	205

* — indicates negligible or zero

@ — Days F+4 and F+5 contained households that did not consume foods containing Vitamin A.

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