

CHAPTER IV

Dietary intake of lactating women in relation to
milk constitution with particular reference to
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Studies detailed in the previous chapter showed the fat, protein, and essential amino-acid contents of breast milk to vary with the subject's socioeconomic status which may be considered to largely determine her nutritional status. This pointed to a positive relation between the dietary and milk contents of these constituents. This suggestion was further investigated by studying more systematically the milk levels of these constituents in relation to their dietary intake. The studies undertaken in this direction are described in this chapter.

EXPERIMENTAL

The subjects of this study were sixty lactating women between the second and fourth months of lactation whose infants were entirely breast fed. Since the concentration of subjects in a small segment of the possible range of nutritional variation may obscure the relation between diet and milk, care was taken to ensure that the subjects were distributed over a wide range by taking 15 each from the four income groups described in the previous chapter.

The relation between diet and milk composition was investigated by analysing both the milk and diet of each subject for fat, protein, and essential amino-acids according to the procedures described in Chapter II.

RESULTS

The data on dietary intake were classified into a frequency distribution with regard to each constituent, and the four quartile ranges for the same determined in each case. The results are shown in Table 8 along with recommended allowances for normal adults, and for lactating women where available. It can be seen that the diet is inadequate even in the upper quartile range as compared to recommended norms and that the inadequacy is relatively greater with regard to protein and calorie intake. The startlingly low calorie intake at 1200 calories of subjects maintaining lactation needs comment. This should perhaps be considered in the light of reports that subjects malnourished for prolonged periods are able to maintain a constant weight at 800 calories daily (Pollock, 1960).

Although no values are available on requirement of individual amino-acids during lactation, on the basis of a 50% increase in amino-acid requirement consistent with the increase in protein requirement, it would appear that the diet is relatively more deficient with regard to

Table 8

Dietary intake of fat, protein, and essential amino-acids in lactating women

Constituent (g/day)	Mean values for				Recommended daily allowances		
	First quartile	Second quartile	Third quartile	Fourth quartile	Lactating women (National Research Council, 1948)	80-100 ?	75 ?
Fat	18	37	61	89			
Protein	27	39	47	62	100		60
Carbohydrate	230	264	280	308	450 ?		380 ?
Calories	1190	1545	1857	2281	3000		2400
Leucine	0.91	1.31	1.78	2.65	-		2.2
Isoleucine	0.90	1.38	1.69	2.97	-		1.4
Valine	0.66	1.66	1.55	2.28	-		1.6
Histidine	0.64	0.90	1.11	1.74	-		-
Lysine	1.07	1.46	1.86	2.71	-		1.6
Phenylalanine	0.94	1.30	1.55	2.16	-		2.2
Arginine	1.09	1.45	1.76	2.30	-		-
Threonine	0.93	1.19	1.48	1.99	-		1.0
Methionine	0.42	0.61	0.82	1.31	-		2.2
Tryptophan	0.69	0.90	1.06	1.30	-		0.5

leucine, valine, methionine and phenylalanine.

The corresponding milk values are shown in Table 9, which also presents the product moment correlations between total dietary intake of fat, protein, and essential amino-acids and the amount present in 100 ml of milk. It can be seen from the same that the over-all picture is one of increase in milk level with increase in dietary intake in the case of fat, protein, and the majority of the essential amino-acids. The product-moment correlations between dietary and milk values are found to be significant with regard to fat, protein, and three of the amino-acids, viz., histidine, methionine, and tryptophan. The data are presented in greater detail in Tables 10 to 14 and Fig. 4.

Although there is a positive relation between dietary and milk composition, the increments, if any, in milk levels are found to be marginal beyond certain dietary levels, the third and fourth quartile groups showing no significant differences. Also, the relation would appear to be much more pronounced in the case of fat than in that of protein, as judged from the comparison of the respective correlation coefficients of 0.8 and 0.4 between diet and milk constitution. This implies that only part of the variability with regard to protein content would be accounted for by diet, and the remaining, presumably by other factors such as yield, period of lactation, general nutritional status of the subject etc.

Table 9

Fat, protein and essential amino-acid contents[@] in milk in relation to dietary intake

Constituent	Classification with regard to dietary intake				Product moment correlation between dietary intake and milk value
	First quartile	Second quartile	Third quartile	Fourth quartile	
Fat	4.13	4.30	4.86	4.70	0.79**
Protein	1.22	1.39	1.41	1.47	0.37**
Leucine	84	90	91	90	0.08
Isoleucine	81	85	87	84	0.10
Valine	56	57	64	65	0.15
Histidine	32	38	44	42	0.50**
Lysine	81	90	91	87	0.04
Phenylalanine	46	49	51	49	0.26
Arginine	52	53	53	52	0.13
Threonine	53	59	60	60	0.10
Methionine	18	19	21	22	0.40**
Tryptophan	10	13	15	17	0.65**

[@] Expressed as g/100 ml in the case of fat and protein, and mg/100 ml in the case of amino-acids.

! The four quartile ranges are not necessarily comprised of the same subjects for the different constituents.

** Significant beyond the 1% level.

Table 10

Fat contents of diet and milk in lactating women

Classification with regard to dietary intake	No. of subjects	Dietary intake (g/day)		Milk value gm/100 ml
		Range	Mean	
First quartile	16	8 to 28	18 ±1.6	4.13 ±0.24
Second quartile	15	28 to 50	37 ±1.3	4.33 ±0.14
Third quartile	16	50 to 72	61 ±1.6	4.86 ±0.25
Fourth quartile	13	72 to 115	89 ±6.7	4.72 ±0.28

Table 11

Protein contents of diet and milk in lactating women

Classification with regard to protein intake	No. of subjects	Dietary intake (g/day)		Milk value g/100 ml
		Range	Mean	
First quartile	15	20 to 34	27 +1.3	1.22 +0.05
Second quartile	18	34 to 43	39 +1.1	1.39 +0.06
Third quartile	12	43 to 50	47 +1.5	1.41 +0.09
Fourth quartile	15	50 to 75	62 +1.6	1.47 +0.08

Table 12
Histidine contents of diet and milk in lactating women

Classification with regard to histidine intake	No. of subjects	Dietary intake (g/day)		Milk value mg/100 ml
		Range	Mean	
First quartile	15	0.04 to 0.75	0.64 +0.03	32 +3.1
Second quartile	16	0.75 to 1.02	0.90 +0.02	38 +2.5
Third quartile	14	1.02 to 1.37	1.11 +0.13	44 +2.7
Fourth quartile	14	1.37 to 2.20	1.74 +0.10	42 +1.7

Table 13

Methionine contents of diet and milk in lactating women

Classification with regard to methionine intake	No. of subjects	Dietary intake (g/day)		Milk value mg/100 ml
		Range	Mean	
First quartile	14	0.04 to 0.54	0.42 ±0.01	18 ±0.8
Second quartile	15	0.54 to 0.72	0.61 ±0.01	19 ±1.1
Third quartile	16	0.72 to 0.94	0.82 ±0.02	21 ±2.4
Fourth quartile	14	0.94 to 1.70	1.13 ±0.06	22 ±0.8

Table 14
Tryptophan contents of diet and milk in lactating women

Classification with regard to tryptophan intake	No. of subjects	Dietary intake (g/day)		Milk value mg/100 ml
		Range	Mean	
First quartile	15	0.50 to 0.84	0.70 +0.05	10 +1.7
Second quartile	16	0.84 to 0.96	0.90 +0.02	13 +0.9
Third quartile	15	0.96 to 1.17	1.06 +0.02	15 +0.7
Fourth quartile	14	1.17 to 1.50	1.30 +0.03	17 +1.2

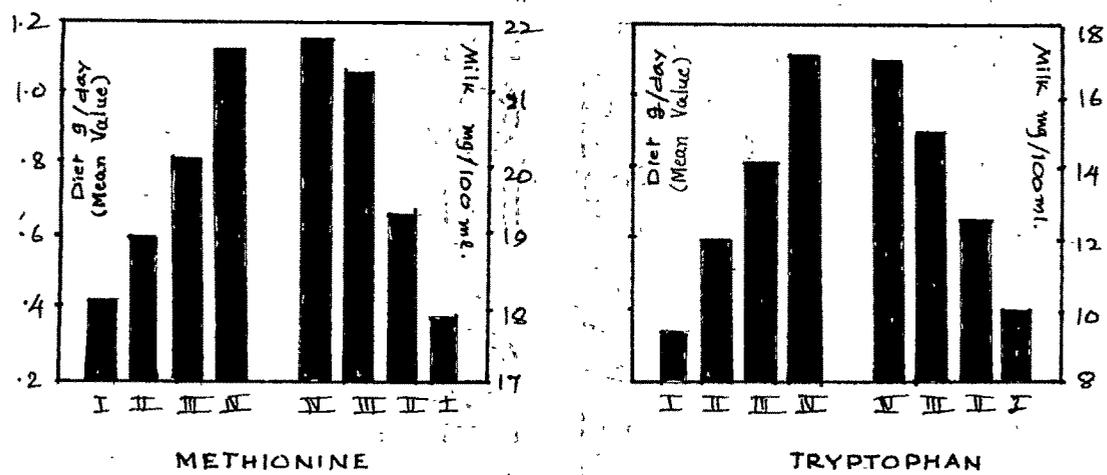
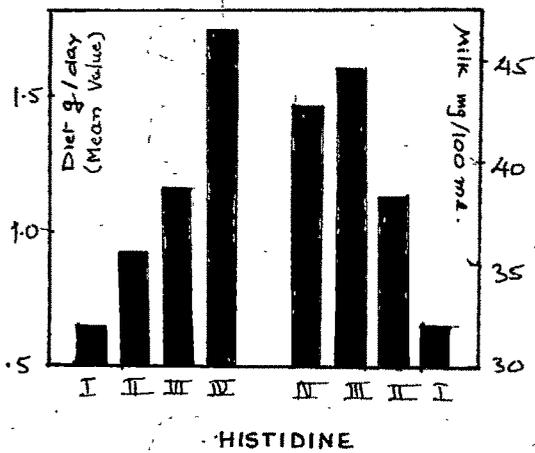
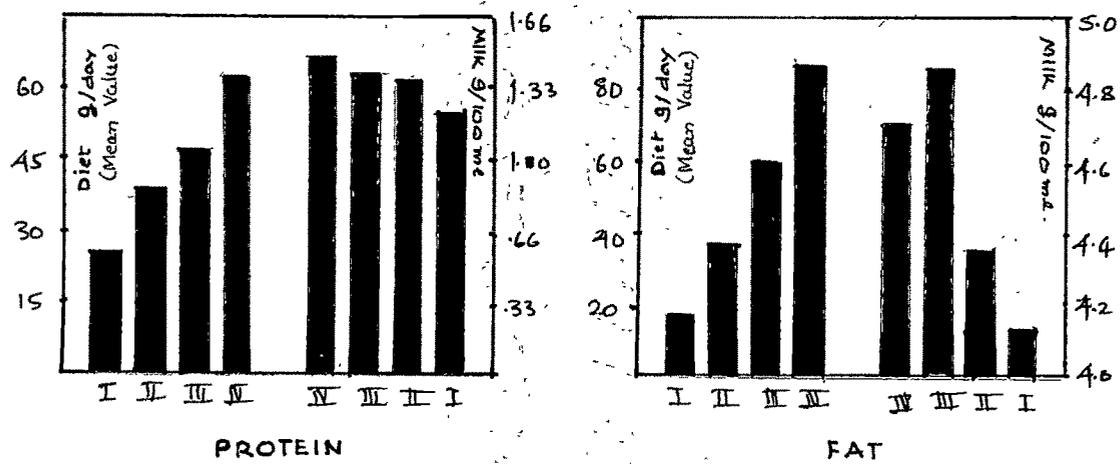


Fig. 4

Relation between dietary intake and milk constitution

I, II, III, and IV stand for the respective quartile groups according to dietary intake.

DISCUSSION

The observation made in the present study that there is a positive relation between dietary intake and milk composition with regard to fat and protein confirms the trend suggested in the previous chapter. This relation is, however, found only within a certain range of dietary intake.

The positive relation observed between dietary and milk fat is in line with the findings of Deem (1931), Ruzicic (1934), and Escudero and Pierangeli (1940-41), but is at variance with that of Kleiner et al. (1928), and Gunther and Stanier (1951). It must be pointed out that the initial fat intake of 150 g per day reported by Kleiner et al. for their subjects is higher than that corresponding to ceiling levels of milk in this study, viz., 60 g. Also it must be pointed out that Gunther and Stanier obtained a small rise in milk levels with fat supplementation although this was not statistically significant.

Similarly, the failure to detect a relation between dietary and milk proteins by Gopalan (1958) and Gunther and Stanier (1951) can be explained in terms of like considerations as the subjects in these two investigations

had an initial protein intake higher than that corresponding to ceiling levels of milk in this study. (61 g in the former and 76 g in the latter). As a matter of fact, Gopalan (1958) while commenting on his findings has not ruled out "the possibility that protein supplementation may have an appreciable beneficial effect on lactation in women subsisting on very low levels of protein".

SUMMARY

The diet and milk of 60 lactating women were analysed with regard to fat, protein, and essential amino-acids.

With regard to most of the constituents, the milk values were found to increase with increases in dietary intake upto certain levels of the latter. The product moment correlations between dietary and milk values were found to be significant at the 1% level in the case of fat, protein, histidine, methionine, and tryptophan.