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Human Milk in the Second Year

Nutritional and Economic Considerations for Indonesia

by

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"The Breasts are more skillful at compounding a feeding mixture than the hemispheres of the most learned professor's brain".

(Oliver Wendell Holmes 1809 - 1894).

That mother milk provides the ideal infant diet is accepted by all but the most myopic diehards of the processed milk industry. Mortality in breast fed infants may be as low as one tenth of that experienced amongst their unfortunate bottle fed peers who often succumb to the ravages of diarrhea, marasmus and opportunistic infections (Harfouche, 1970). Mother milk approaches an ideal composition for the human, is cheap, sterile, readily available and, provides protection against certain infections.

Beginning about the sixth month, breast milk alone ceases to provide an adequate supply of nutrients, particularly calories, to the growing child and it is at this time that the addition to the diet of so called "weaning foods" should be initiated. This important introduction of staple cereal in no way implies that cessation of breast feeding should accompany initiation of such weaning food. Somatic growth rates remain high during this period with brain cell number increasing past the end of infancy and rapid increase of brain size extending to the end of the second year (Winick, 1970). Malnutrition occurring during this period, even if subsequently treated, appears to leave lasting sequelae including permanently reduced mental and physical capacity (Cravioto and Delicardie, 1970; Hertzig et al., 1972; Karjadi et al., 1971). The critical importance of this 6 month to 2 year age period can be seen from the typical weight pattern of children seen throughout much of Asia. Figure 1 displays data taken from a recent survey in a rural Javanese community. Body weights for the first 6 months of life are within

a reasonable range of normal, about 5 - 10% under the international standard. A major deviation occurs between six months and 2 years, after which the weights tend once again to parallel the standard but at a significantly lower mean value. This relative weight deficit then remains much the same for the remainder of childhood. This period then, from 6 to 24 months, is obviously a crucial one in the child's life where even marginal nutritional inputs may have substantial long term benefits. It is in this context that I will discuss the importance of breast feeding the "secotrant", or child in the second year of life.

The human mother has a remarkable ability to produce good suality milk, as was dramatically documented by Cicely Williams during her imprisonment by the Japanese. Women in the concentration camp on the very verge of starvation continued to nurse and rear healthy children (Williams, 1946). Numerous studies from the developing world have demonstrated this ability. Daily breast milk volume varies considerably and is difficult to measure with accuracy. For poor women in the tropics volumes ranging from 400 - 800 ml. per day are seen during the first year of lactation, output falling in the second year to 200-450 ml. Table 1 (Bailey, 1965; Blankhart, 1966). Protein content of human milk is more constant than volume, and with the unusual exception of women with nutritional edema, averages about 1.2 gm% (Table 2). This does not seem to vary appreciably with duration of lactation. Underwood (1970) followed 27 poor women in rural Pakistan from parturition through 24 months of lactation and found no deterioration of milk quality. Bailey (1965) in New Guinea has described unchanging protein content and volume in mother milk through the second year of lactation and Blankhart (1970) in Bogor reported that continued lactation in the second year provided from 15 to 50% of all protein in the diet. Essential fatty acids remain at levels considerably above those found in full cow's milk (Mellander et al., 1959). The average Asian mother, then, can produce at least one eight ounce glass of milk per day through the second year, providing 3 - 5 grams of reference protein, essential fatty acids for brain growth, and 200 - 500 units of Vitamin A. This amount of quality animal protein, while meeting only 20 - 40% of the daily requirement will serve to increase the amino acids lysine, threonine, and methionine, limiting factors in cereal protein, and thereby will enhance the nutritional value of the diet beyond the simple additive value of the milk itself.

What is the cost of the mother, or alternatively, what nutritional supplement must she receive to produce

TABLE 1 : *24-hour volume of Breast Milk (ml).*

Age of Child (months)	1-6	7-12	13-18	19-24	25-36	37-48	Reference
INDIA	530-730	600	480	400	425	345	2
NEW GUINEA	500	420	330	230	210	130	2
BOGOR	400-820	360-520	190-460		—	—	3

TABLE 2 : *Composition of Breast Milk (gm/100 cc)*

	Protein	Fat	Lactose	Reference
YOGYAKARTA	1.67	3.3	7.14	1
NEW GUINEA	1.01	2.36	7.34	2
INDIA	1.04	3.10	7.1	
SOUTH AFRICA	1.35	3.90	7.1	
ENGLAND	1.19	4.78	7.0	
U.S.A.	1.27	4.54	7.1	
AUSTRALIA	1.41	4.95	6.46	
VITAMIN A	100 - 150 IU/100 cc.			
Fe	80 - 150 mg/100 ml.			

TABLE 3 : *Protein in Breast Milk over time in Poor Women*

	1-2 mos.	6	9	12	18	24	Reference
PAKISTAN	1.44	1.26	1.22	1.19	1.36	1.31	16
NEW GUINEA	0.97	0.97				0.84	2
BOGOR	1.2		1.3	1.3	—	1.75	3

this milk at no nutritional cost to herself? Careful balance studies show that human milk is made with extremely high efficiency-90% or more for calories and 40-60% for protein depending upon the source (Thomson et al., 1970). Table 4 shows the calculation of nutritional supplement to an Indonesian diet to produce one litre of milk, the total market cost of the added food being Rp. 28. The cost of 250 ml./day during the second year then becomes only Rp. 7 per day.

The economic value of this nutritional input figured on a national scale becomes quite impressive: Table 5. Two hundred and fifty milliliters per day or 90 litres/year/child, were this quantity of milk purchased, taking a conservative low market value for milk at Rp. 100/litre, this would cost Rp. 9,000 per child or ¼ of the Indonesian per capita gross national product.

With a birthrate of about 40/1000, Indonesia's population of 120×10^6 will increase by 4.8×10^6 each year. Subtracting a high estimate of deaths in the first year of 165/1000 live births, 4 million infants enter their second year annually. At 90 litres of mother milk per child this gives 360×10^6 litres of milk at a market value of over 85 million US dollars per year. Subtracting the cost at Rp. 28 per litre to provide complete maternal supplement the net value to the Indonesian economy of breast milk in the second year alone is $ 62 million or some 80% of the annual health budget for 1972 - 1973. Table 6 summarizes a survey of rural weaning ages in Indonesia (Tan et al., 1970). It is clear that the value of breast milk in the second year is not lost on the rural Indonesian mother. The horrible trends toward bottle feeding that have ravaged the infants of some Latin American countries have fortunately not reached rural Indonesia. Unfortunately the trend in urban areas is quite different - more than 70% being weaned by one year in a recent survey in Yogyakarta city (University Gajah Mada, 1974). This may in part be associated with the prevalent teaching in medical and nursing schools that weaning from the breast should be advised about one year of age.

Although some physicians cite a belief that milk quality declines with prolonged lactation, Blankhart's careful studies in Bogor, West Java (Blankhart, 1966) as well as Gopalan's extensive work in India (Gopalan, 1958) should dispel this idea. The argument that lactation is a drain on the mother's health is readily set aside in face of the far greater nutritional need of the growing child. Indeed, Bailey (1970) cites Jensen's comment that there is no evidence of "milking the flesh off the cow's back".

Widely quoted is Oomen's report from Jakarta in 1954 (Oomen et al.,

TABLE 4 : *Nutritional Supplement to make one litre of Human Milk*

Material	Calorie	Protein	Rupiah
184 gm rice	665	14	18.5
45 gm tempe	66	8	9
	731	22	
X Efficiency	0.9	0.55	
human milk per litre	660 cal.	12 gm	Rp. 28

TABLE 5 : *Economic Value of Mother Milk in Second Year of lactation*

250 cc/day ..... 90 litre 2nd year
Rp. 100/litre = Rp. 9.000/secotrant

BIRTH RATE 40/1000 x 120 x 10^6 POPULATION
4.8 x 10^6 INFANTS

LESS 165/1.000 DEATHS
4.0 x 10^6 secotrants

EACH RECEIVES 90 litres .....
360 x 10^6 litre

VALUE Rp. 36,000 x 10^6 or US $ 87 million

TABLE 6 : *Weaning Age (Tan et al., 1970)*

Age (yr)	W. Java	C. Java	E. Java	Bali	S. Sumatra
1	10	1	5	1	7
1 - 2	67	48	69	26	51
2	11	46	20	56	37
Not known	12	5	6	17	5

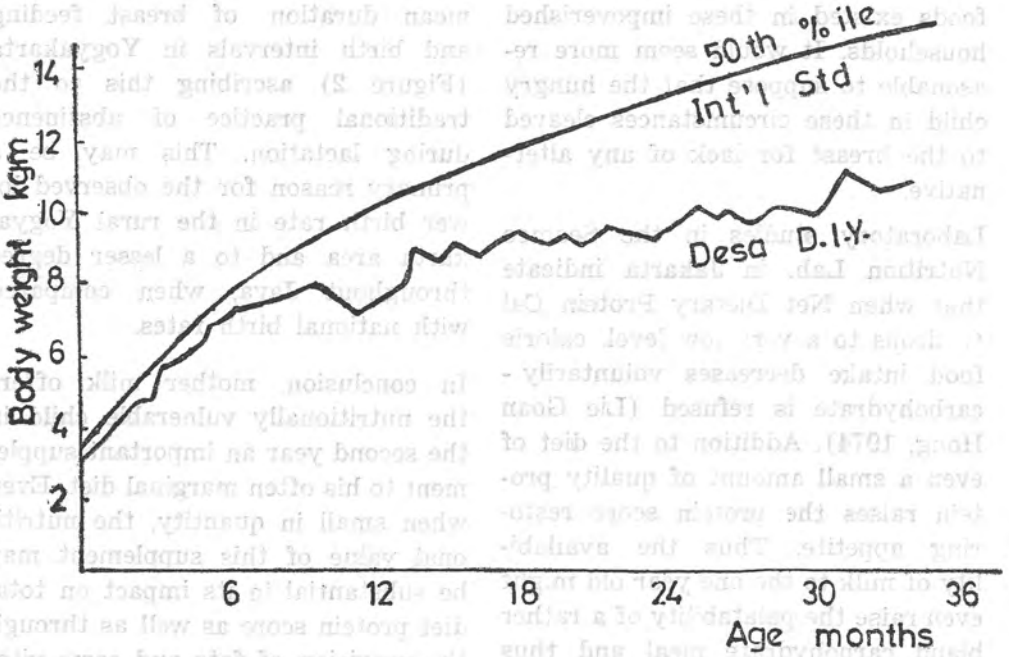
1954) in which he noted an association between what he termed "prolonged breast feeding", that is beyond one year, and clinical malnutrition. He stated that habituation to the breast prevented effective introduction of a balanced cereal-legume diet, but admitted that the breast was used to "alleviate the hunger feeling" (menghentikan rasa lapar) suggesting that in fact no substitute foods existed in these impoverished households. It would seem more reasonable to suppose that the hungry child in these circumstances cleaved to the breast for lack of any alternative.

Laboratory studies in the Seameo Nutrition Lab. in Jakarta indicate that when Net Dietary Protein Cal % drops to a very low level, calorie food intake decreases voluntarily - carbohydrate is refused (Lie Goan Hong, 1974). Addition to the diet of even a small amount of quality protein raises the protein score restoring appetite. Thus the availability of milk to the one year old might even raise the palatability of a rather bland carbohydrate meal and thus increase calorie intake from his normal diet.

Although lactation through the second year should be advised on nutritional ground alone, the overall benefit to family and national health through birth spacing is becoming increasingly apparent. Lactational amenorrhea lasts for 9-18 months and is associated with low fertility in non-contracepting couples (Van Ginneken, 1974). In Bangladesh, Chen et al., (1974) estimates that amenorrhea accounts for 17 months of an observed 33 month birth interval. Reduction of lactation period below 12 months would bring an estimated 20% rise in the birth rate. Masri and Manning (1974) have reported a close correlation between mean duration of breast feeding and birth intervals in Yogyakarta (Figure 2) ascribing this to the traditional practice of abstinence during lactation. This may be a primary reason for the observed lower birth rate in the rural Yogyakarta area and to a lesser degree throughout Java, when compared with national birth rates.

In conclusion, mother milk offers the nutritionally vulnerable child in the second year an important supplement to his often marginal diet. Even when small in quantity, the nutritional value of this supplement may be substantial in its impact on total diet protein score as well as through the provision of fats and some vitamins. The cost of dietary raw materials for the mother is less than 30% of the market value of the milk. The health of the child and his family is further enhanced by the delay in arrival of his next youngest sibling, resulting from reduced fertility in the lactating mother. What better way for an Indonesian mother to

Fig. 1


50th %ile
Int'l Std
Desa D.I.Y.
Body weight kgm
14
12
10
8
6
4
2
6
12
18
24
30
36
Age months

contribute her part to the addition of US $ 62 million to the economy, nurture her own child and help meet national population control targets than by heeding the words of Al Qur'an II-233 "Mothers shall suckle their children for two whole years".

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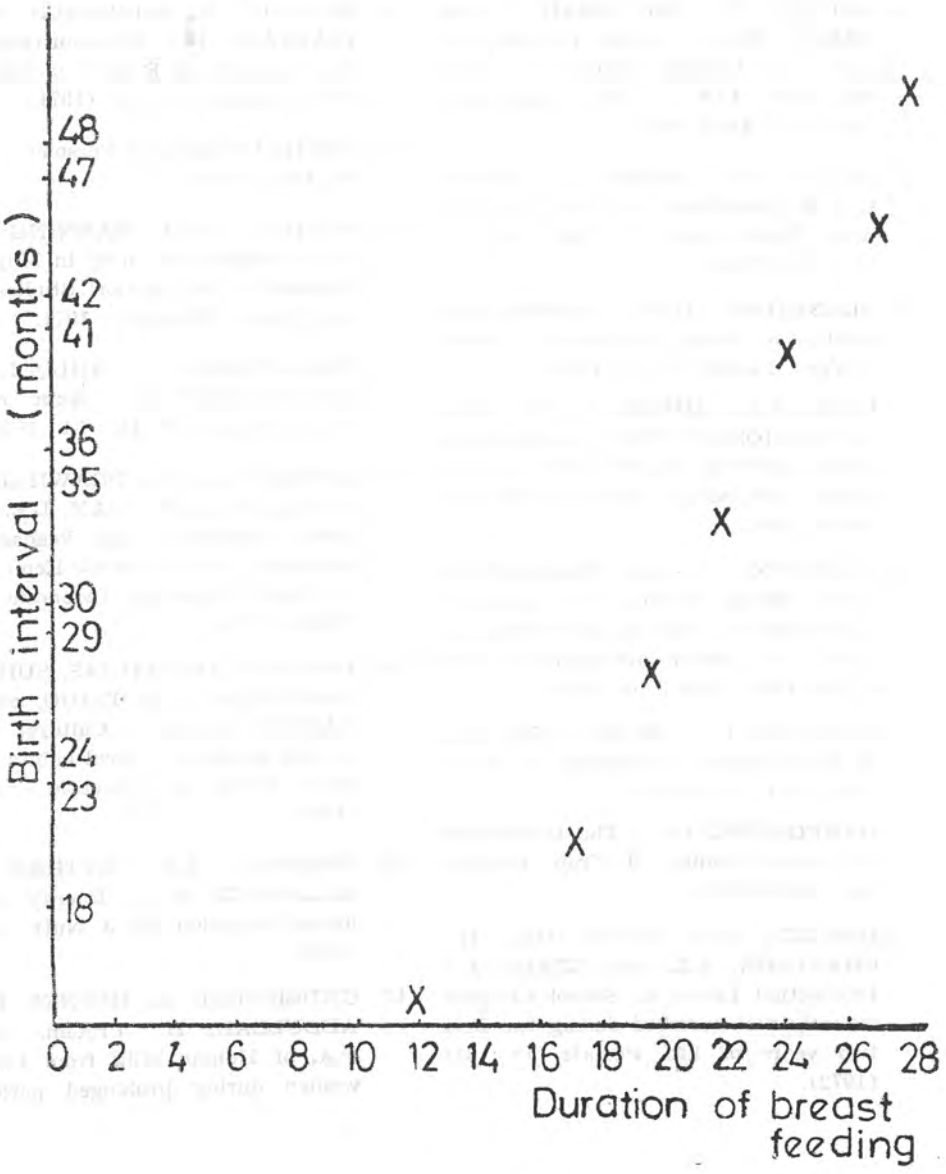
FIG. 2: RELATIONSHIP OF BIRTH INTERVAL TO DURATION OF BREAST FEEDING RURAL CENTRAL JAVA

from Masri + Manning 1974



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