Medicine and Society

Economic value of breastfeeding in India

ARUN GUPTA, KULDEEP KHANNA

INTRODUCTION

Breastmilk is a natural resource of tremendous value. Experience from some countries has shown that investing in its promotion is among the most cost-effective health interventions for child survival. It is equal in importance to practices such as immunization and vitamin A supplementation and surpasses oral rehydration therapy. Breastfeeding requires very little investment and the returns are invaluable for the child, the mother and the family, society, health care institutions and governments.

Perhaps the single most important health problem in the developing world is childhood malnutrition. Breastfeeding has a crucial role to play in combating this and the decline of breastfeeding poses a profound threat to child health. Increasing modernization and urbanization, continued ignorance, and decades of apathy on the part of health professionals have led to a decrease in breast-feeding in many parts of the world. In recent years, the dangers of this trend have been increasingly realized. However, while recognition of the importance of breastfeeding in promoting child health has been growing, little research has been done on its economic implications.

Breastmilk can be viewed like any other food commodity in many respects. Its value can be considered in purely monetary terms and the cost of supplementary food for the lactating mother compared with the cost of artificial feeding for infants. Such a view, however, fails to do justice to the true economic value of human milk. Its economics can be regarded more broadly as the way in which people allocate their resources towards achieving a certain quality of life. A number of valuable non-monetary contributions made by human milk emerge, which may or may not be quantifiable, such as reduction in sickness, lower mortality, better nutrition, reduced incidence of allergic illnesses, improved psychosocial bonding of mother and child, and overall better health of the infant and young child.

Breastfeeding has also been related to possible enhancement of cognitive development.¹ There are advantages for the mother as well—breastfeeding reduces the incidence of post-partum bleeding,² leads to faster uterine involution,² reduces the risk of breast cancer³ and ovarian cancer,⁴ delays resumption of ovulation and increases child spacing,⁵ improves bone re-mineralization⁶ after childbirth in women resulting in a reduction in hip fractures⁷ in the post-menopausal period. Finally, it is likely that all the benefits of human milk are presently not known.⁸

To get the best from breastfeeding, we need to create a 'warm chain' of support—skilled care for mothers to build their confi-

Breastfeeding Promotion Network of India, BP-33, Pitampura, Delhi 110034, India A. GUPTA, K. KHANNA

Correspondence to A. GUPTA

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dence and show them what to do and protect them from harmful practices. If this warm chain has been lost from our culture, or is faulty, then it must be made good by the health services.⁹

ECONOMIC VALUE OF BREASTMILK PRODUCED IN INDIA

Breastfeeding is 'priceless'. Advocacy of exclusive breastfeeding requires an appreciation of its importance by society. Economic measurements cannot put a value on any expression of love or altruism. Most women view breastfeeding with pride. However, placing human milk on food balance sheets could increase its perceived value. While the value of manufactured baby foods is included in the calculation of the gross national product (GNP), the value of breastmilk is not.¹⁰ The real size of this contribution as food supply to a nation is impressive and demonstrates to policy-makers the importance of this activity in identifiable terms.

An assessment of the value of total breastmilk produced in India and its contribution to the economy of the nation can be made with some reasonable and realistic assumptions.

In 1998, India had an estimated population of 944.6 million and a crude birth rate of 25.8 per 1000 population. With 24.38 million annual births and an infant mortality rate of 73 per 1000 live births, there are 22.6 million children alive at one year of age.

According to the National Family Health Survey, the only nationwide study on infant feeding, the incidence of exclusive breastfeeding was 50.9% in the 0–3 months age group and 26.4% in the 4–6 months age group (Table I). Mothers who added only water in addition to breastfeeding in the first 6 months were included in the exclusive breastfeeding group. We assume that these mothers are not losing production of breastmilk, but in fact they may be.

Partially breast-fed children who receive artificial milk are assumed to receive two-thirds of their milk requirement from breastmilk in the first 6 months, half in the next 6 months and onefourth in the second year of breastfeeding.

Assuming that the average Indian mother lactates for a period

TABLE I. Infant feeding: Percentage distribution of modalities used

Age	Breast-		No breast-		
(in months)	milk only	Plain water	Other liquids	Solid/mushy food supplements	feeding or modality not known
0-3	50.9	22.0	23.4	1.4	2.3
4–6	26.4	26.2	33.3	10.5	3.7
7–9	9.4	17.7	30.9	36.8	5.3
10-12	4.0	9.5	21.0	57.5	8.0

Source: National Family Health Survey, India, International Institute of Population Sciences, Mumbai (October 1994)

TABLE II. Total breastmilk production per child

Breastmilk produced	Age of child (in months)			
	0-6	7-12	13-24	
Daily (in ml)	600	500	400	
Production capacity/child (L)	109	91	146	
Production over 2 years (L)		346		

TABLE III. Estimated breastmilk production in India

Item	Age	Total		
	0-6	7-12	13-24	
Surviving children (million)	24.38	23.49	22.6	
Total production capacity	2657	2137	3299	8093
(million L)				
Lactating mothers (%)	95	85	75	
Potential production	2524	1816	2474	6814
(million L)				
Mothers breastfeeding (%)				
Total	63	20	14	
Partial	23	30	21	
Actual production (million L)	2170	908	866	3944

of two years and produces breastmilk according to the age of child, the amount of breastmilk produced over two years by an average mother would be 346 L (Table II).¹¹

Multiplying the production capacity per child in different age groups (Table II) by the surviving children in the respective age groups gives an estimate of the total production capacity of breastmilk which is shown in the second row of Table III. Thus, the total breastmilk production over 2 years is an estimated 8093 million L. If 95% of mothers in the first 6 months, 85% of mothers in the second 6 months, and 75% of mothers in the second year after childbirth are lactating, it results in the reduction of this capacity to 6814 million L (total potential production over 2 years). Even this potential breastmilk capacity is not utilized fully as children are artificially fed. Multiplying the percentage of mothers breastfeeding in each age group by the potential production capacity in the respective age groups allows us to estimate the actual breastmilk production, which over 2 years is 3944 million L (Table III). In the absence of firm data these estimates of breastmilk production and losses are more of an educated guess by experienced observers, and could be readily modified by readers.

MARKET VALUE OF BREASTMILK

Valued at the cost of fresh animal milk (Rs 15/L), the market value of realistic production of breastmilk would be Rs 59.16 billion. Were it to be replaced by tinned milk at the cost of Rs 30/L, the value doubles to Rs 118.32 billion. If this amount of milk was to be imported, it could require US\$ 4.7 million.

BREASTMILK AS A NATIONAL RESOURCE

Figure 1 places the economic value of breastmilk in the overall context of the national economy. The economic value of breast-feeding for each year is compared with various central plan developmental sectors. It is equal to the plan outlay of the Departments of Industry and of Power, more than the allocation for Railways and three times that for Education, Health and Family Welfare, and Science and Technology. It is almost ten



FIG 1. Economic value of breastmilk in relation to other sectors. Source: Central Plan Allocation, Central Budget 1998–99, Government of India (presented on 1 June 1998)

times the allocation for the Department of Women and Child Development.

COST OF PRODUCING BREASTMILK

The mother requires extra calories for production of breastmilk. These calories come from the enhanced diet that the mother consumes and from the fat stored during pregnancy. A mother requires 185 g of rice and 30 g of pulses costing around Rs 4 in addition to the normal diet to produce one litre of milk.¹² The total cost of producing 3944 million L of breast milk is approximately Rs 15.78 billion. If we deduct this cost from the market value of realistic breastmilk production (based on tinned milk), the value of breastmilk would still be about Rs 102.54 billion.

COST OF ARTIFICIAL FEEDING

Artificial feeding is very expensive for families, institutions, governments and health care organizations.

Households

Families pay for infant formulae and other breastmilk substitutes, feeding and sterilizing equipment, fuel, etc. as a result of which the cost of artificially feeding a child with a bottle comes to about Rs 1100 per month (Table IV). This amount is equivalent to 43% of the minimum wages of a skilled urban worker, 25% of the salary of a class IV employee or 12% of the salary of a trained graduate teacher (Fig. 2). This amount is large enough to pinch the household budget of every family, even the very rich. This amount could have bought either 220 kg of wheat, 40 dozens of oranges, or 50 kg of vegetables for a family every month.

Comparing costs with other countries, Table V shows the percentage of minimum wages spent for one month on breastmilk substitutes for a 3-month-old baby. This costing does not include

TABLE IV. Cost (in rupees) of bottle-feeding a child over six months

Month	Bottle	Nipple	Fuel	Powder milk	Total
First	76*	26	20	660	782
Second		26	20	840	924
Third		26	20	1020	1104
Fourth		26	20	1200	1284
Fifth		26	20	1200	1284
Sixth		26	20	1200	1284
Total					6662

* on the assumption that onlyone purchase is sufficient for 6 months



FIG 2. Percentage of salary spent on bottle-feeding by people from different strata of society

TABLE V. Cost of bottle-feeding a child in other countries

Country	Cost per kg (in US\$)	Cost per month (in US\$)	Minimum wage per nonth (in US\$	% of wage per month
Germany	16.40	67.24	1149	6
Poland	24.51	100.49	394	26
Slovakia	8.33	34.15	79	43
Indonesia	6.73	27.60	55	50
Malaysia	7.42	3042.00	143	21
Philippines	11.00	45.10	119	26
New Zealand	8.78	36.00	764	5

the time-cost, as it takes time to purchase, prepare and administer artificial feeds. A three-month-old infant needs over 3 L of water a day for mixing and boiling, which may take hours to fetch in rural areas. The time required for learning correct feeding and hygienic techniques may be considerable. The preparation of feeds, washing and sterilization of utensils is time-consuming, particularly for a mother who possesses only one bottle.

Corporate sector

Artificially-fed babies become sick more often and for longer periods than breast-fed babies. Hence, working mothers who do not breast-feed have to be away from work more frequently, to take care of a sick child, attend medical clinics, and stay in the hospital if the child is admitted. Corporate breastfeeding support programmes in the USA resulted in a 27% decrease in absentee-ism and a 36% decrease in health care costs.¹⁰

Other savings by breastfeeding

It is likely that disease-producing effects develop extremely rapidly when artificial feeds are not correctly prepared. Poverty is characterized not only by limited money but also by constraints on time, energy and patience of mothers, who are likely to overdilute powdered milk to make it go further. This can lead to severe undernutrition and eventually marasmus. Poor mothers are unlikely to be aware of the need to sterilize bottles and seldom have the necessary facilities, fuel or time to clean them well. It follows that the more limited a mother's time and resources, the more valuable breastfeeding will be for her. As artificially-fed infants usually suffer from disease more than breast-fed ones, extra time as well as money will be needed to care for them. For the sick child, the time lost in disease leads to delayed psychomotor or mental development. For the parents, it is in the form of time lost from labour and/or housework, which is spent in the care of the child and transport to and from medical facilities. Waiting for treatment can take several hours and a number of days are spent if the child is hospitalized.

PROTECTION AGAINST DISEASES

Breastfeeding is associated with a lower morbidity in comparison with artificial feeding, at all ages. In a study conducted in Delhi,¹³ the average incidence of morbidity in breast-fed infants was 4 episodes per child annually as compared to 14.4 episodes in artificially-fed infants. Diarrhoea and vomiting occurred 5 times more frequently amongst artifically-fed infants (66 episodes per 100 child-months) than breast-fed ones (13.5 episodes per 100 child-months).

Breastfeeding decreases the risk for a large number of acute and chronic diseases. Research has shown that breastfeeding decreases the incidence and/or severity of diarrhoea,¹⁴ lower respiratory tract infections,^{15,16} otitis media,¹⁷ bacteraemia,¹⁸ bacterial meningitis,¹⁹ botulism,²⁰ urinary tract infections,²¹ and necrotizing enterocolitis.²² There are a number of studies that show a possible protective effect of breastfeeding against sudden infant death syndrome,²³ insulin dependent diabetes mellitus,²⁴ Crohn's disease,²⁵ ulcerative colitis,²⁶ lymphoma,²⁷ allergic diseases,²⁸ and other chronic digestive diseases.²⁹

Diarrhoea

Every child in India suffers an average of 1.6 episodes of diarrhoea per year for the first five years.³⁰ Treatment costs at the village level are about Rs 40 per episode. About 10% of these children require hospitalization which costs around Rs 1000 per episode (estimated hospitalization for 2 days at Rs 500 per day). If the incidence of breastfeeding decreases, the number of episodes of diarrhoea may increase five-fold. Assuming a reduction of 50% in episodes of diarrhoea by increasing the incidence of exclusive breastfeeding, we may be able to prevent 80 million episodes of diarrhoea every year that would otherwise cost Rs 7.2 billion to the nation.

Acute otitis media (AOM)

Breast-fed babies are at a lower risk for AOM in the first year than artificially-fed babies. Infants breast-fed for 2 months or less have a 3.3 times higher incidence of AOM than infants breast-fed for 6 months.³¹ A study by Teele *et al.*³² showed that more than 80% of children had AOM by 3 years of age and more than 40% had 3 or more episodes. Extrapolating from this study, it may be calculated that approximately 50 episodes of AOM occur per 100 children every year. This works out to about 35 million episodes of AOM in India annually in 70 million children below 3 years of age. This may be costing the health care system Rs 5.25 billion with a reasonable assumption expenditure of Rs 150 per episode.

As artificial/bottle-feeding is known to increase ear infections three times, the health care system could have saved Rs 3.5 billion.

Acute respiratory infection (ARI)

The incidence of ARI is reported to be three times higher in artificially-fed as compared to breast-fed infants. Respiratory syncytial virus (RSV) infection is a common, serious illness of the lower respiratory tract in small children. Millions of cases of RSV infection are seen in dispensaries and health centres every year and many of them are admitted to hospital. Breast-fed babies receive specific antibodies and cell-mediated immunological factors and are about half as likely to be hospitalized with RSV as are artificially-fed babies.

OTHER BENEFITS

The requirement of animal milk increases if the production of mother's milk is reduced due to reduced breastfeeding and this would lead to great pressure on the environment. To produce 1000 million L of animal milk per annum, 0.6 million animals (producing 5 L milk/day) are required. They would need around 75 000 acres of land for grazing and cost more than Rs 5 billion for daily maintenance. In the rural setting, wood is used for boiling bottles and making feeds which leads to loss of forest cover and environmental degradation. These can be stopped or at least reduced if the number of mothers who exclusively breast-feed their babies are more.

As a family planning method

Breastfeeding leads to reduced fertility for many months. In a recent study, it has been shown that breastfeeding leads to reduction in potential fertility by 30% throughout Asia.³³ In India, a mother lactating for 10 months is amenorrhoeic for 8 of these months,³⁴ which corresponds to 16.5 million couple-protection years. The value of this protection is around Rs 4.95 billion (average cost of protection per couple is Rs 300 per year—calculation based on the family planning programme budget).

EXPERIENCE IN OTHER COUNTRIES

In former Yugoslavia, it was estimated that if breastfeeding at 4 months of age could be increased from 30% to 70%, then US\$ 449 million could be saved for purchase of breast-milk substitutes. In addition, 99 000 respiratory infections, 33 000 ear infections, 123 cases of early onset diabetes, 84 cases of childhood cancer and 152 cases of ovarian cancer could be averted each year.³⁵

In Pakistan, imports of formulae cost US\$ 4 million in 1982– 83, US\$ 8.5 million in 1987–88 and US\$ 43.5 million from July 1995 to April 1996.³⁶

The net value of breastmilk produced in Ghana if breastfeeding were optimal would be US\$ 165 million. The estimated lost breastmilk production is worth US\$ 33 million.³⁷

In Norway, hospitals pay US\$ 50 for each litre of breastmilk. Norway produced 8.2 million L of breastmilk in 1992 that was worth US\$ 410 million.³⁸

In several African countries it is estimated that breastmilk is produced at an average of 10 kg per capita. Even if breastmilk were valued at only US\$ 1 per litre, the GNP of Zimbabwe would increase by 1% and that of Mali by 6% if the value of breastmilk was included in the GNP calculation.³⁹

For each baby breast-fed for 6 months, the US government can save US\$ 450–800 in welfare and health care costs.⁴⁰

In Mexico, a hospital-based breastfeeding project cost only US\$ 4 per life saved, which is far less than interventions such as measles vaccine or oral rehydration therapy.¹⁰

In Iran, exclusive breastfeeding increased from 10% in 1991 to 53% in 1996. During that period, the cost of importing breastmilk substitutes declined by US\$ 50 million.¹⁰

Illness attributable to artificial feeding in USA costs US\$ 291 million in a year for infant diarrhoea, US\$ 225 million for RSV,

US\$ 660 million for AOM and US\$ 10–125 million for insulin dependent diabetes mellitus.⁴¹

If the prevalence of exclusive breastfeeding up to 3 months of age were to increase from 60% to 80% in Australia, US\$ 11.5 million would be saved on health care costs for AOM, insulin dependent diabetes mellitus, gastrointestinal diseases and eczema alone.⁴²

CONCLUSION

Replacing breastmilk with any other feeding method for infants and young children results in a high cost to the child and the mother, family, society and the national economy. In most developing countries, the use of simple effective relactation techniques may offer greater hope for infants deprived of their mother's breastmilk rather than giving artificial infant feeding. Replacement feeding methods place stress on the environment, lead to environmental pollution, and directly exacerbate population pressures through increased fertility in young mothers. Breastmilk is a national resource and is currently threatened by a shift towards bottle-feeding. This is not only physiologically undesirable and places children at high risk of illness and death but costs the economy substantially as well. In addition to the extra food taken by the mother, other costs included in breastfeeding are those to provide adequate maternity entitlements for the working mother such as maternity leave and to have child care facilities at the workplace, to provide mothers with up-to-date knowledge about exclusive breastfeeding and to educate health care providers. Obstetricians and paediatricians have a major role to play, especially during the antenatal and postnatal periods. Mother-tomother support groups should help mothers in increasing their self-confidence. All efforts to preserve, promote and encourage breastfeeding should be made and all possible measures taken to reduce the regrettable trend towards bottle-feeding in our country.

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