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The Importance of Breast-Feeding for Optimal Child Health and Well-Being

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Breast-fed infants can thrive even under unhygienic conditions in areas of extreme poverty. The anti-infectious properties of human milk account for the very high resistance of the nursing infant to infection in general and in particular to diarrhea. In deprived tropical environments, most infants grow adequately, even if they have experienced fetal growth retardation or were born prematurely, as long as they are kept at the breast during the first 4 to 6 months of life. Breast milk has unique immunologic, nutritional, psychosocial, and economic benefits, and efforts should continue to promote breast-feeding in all societies.

Human milk is superior to any other kind of animal milk for infant feeding, and science and technology have failed to produce a formula comparable to it. The benefits of human milk relate to its special biochemical, immunologic, and psychosocial attributes, to which its lower cost and the way in which it reaches the child (breast-feeding) should be added.[1-4] The relationships established between mother and infant during breast-feeding influence child-rearing practices, favoring optimal child nutrition and psychologic development and maximal survival, while at the same time fostering maternal well-being.[5,6] The unique properties of human milk and of the act of breast-feeding can be divided into psychosocial, immunologic, nutritional, and economic factors, but they are closely interrelated.

Furthermore, in infancy, breast-feeding may decrease the risk of diarrheal disease, through decreased contamination as well as general and local immunologic benefits. Breast-feeding may be the most readily available means of reducing the problems of diarrhea and malnutrition. It is the best way to meet the nutritional, immunologic, and emotional needs of infants, as well as to avoid exposure to potentially disease-producing antigens present in other milk formulas.

Table 1. Anti-Infectious Agents in Human and Cow's Milk (concentration/dl)

Component	Milk	
	Human	Cow's
S-IgA (mg)	100	3
IgM (mg)	1	3
IgG (mg)	1	60
Lymphocytes/μl	2,700	
Macrophages/μl	2,000	
Bifidus factor(s)	*	
Lactoferrin (mg)	150	traces
Lysozyme/mg	50	0.01
Peroxidase**		
Interferon**		
Complement**		
Glycolipids**		
Polysaccharides**		
Hormones**		
Viral RNAse**		

Adapted from Mata and Wyatt.[7]
*Forty times more than in cow's milk.
**Factors thought to be more effective in humans.

IMMUNOLOGIC BENEFITS

The importance of human colostrum and milk in reducing the risk of diarrhea and other diseases may result from the fact that it contains about a dozen chemical substances that have complex and effective anti-infectious properties (table 1).[7,8] These substances neutralize, destroy, and eliminate viruses, bacteria, and parasites, which are known to cause enteritis, colitis, and other diseases.[1,7-9] Some of the principal substances are especially important, such as secretory immunoglobulin A (S-IgA), a protein assembled in the breast from two serum IgA molecules, a secretory piece and a J-chain molecule. S-IgA contains most of the antibodies synthesized by the mother in response to the multiple stimuli she has experienced throughout her life, and it is very resistant to the action of digestive enzymes.[10] The concentration of S-IgA is very high in colostrum and decreases in mature milk, although its absolute amount remains high throughout lactation, even 1 year post partum.[11] Another protein, lactoferrin, chelates free iron, making milk unsuitable for bacterial multiplication, although iron remains bioavailable for absorption.[12] The bifidus factor (or factors), a glucosaminide compound, is found in high concentration in human milk and is responsible, in part, for the proliferation of Bifidobacteria, anaerobic gram-positive bacilli that attain high levels in the large intestine of the young infant.[13] Bifidobacteria maintain a marked intestinal acidity, and, along with S-IgA and lysosyme, antagonize implantation and development of pathogens like Shigella, amebas, and other pathogens.[14]

Human colostrum and milk contain immunocompetent cells, particularly lymphocytes, polymorphonuclears, and macrophages. Milk lymphocytes respond to mitogens *in vitro*, undergo blastic transformation, and release immunoglobulins.[15] Furthermore, immune cells sensitized in Peyer's patches can migrate to distant organs, such as the mammary gland and other secretory organs,[16] where they may synthesize specific immunoglobulins.

These anti-infectious mechanisms account for the nursing infant's very high resistance to infections in general, and in particular to diarrhea.[17,18] It has been recognized since the

origins of public health studies that morbidity and mortality are significantly higher in artifically fed infants as opposed to breast-fed infants, other factors being constant.[19] On the other hand, infants fed cow's milk suffer more from a constellation of diseases known as the "bottle-feeding syndrome" (table 2).[1] This observation is true for all societies, whether they are traditional, transitional, or industrial.

Table 2. Problems Related to Consumption of Cow's Milk and Formulas

Infantile obesity
Iron-deficiency anemia
Hypernatremia
Neonatal hypocalcemia
Transient aminoacidemia
Acrodermatitis enteropathica
Vitamin deficiency
Allergy, asthma
Hyperelectrolithemia
Marasmus, kwashiorkor
Diarrhea
Acute necrotizing enterocolitis
Otitis media
Dental caries
Malocclusion
Sudden infant death

The beneficial effects of human colostrum and milk were studied in the maternity ward of one of the largest hospitals of Costa Rica, the San Juan de Dios Hospital.[20,21] Drastic separation of mothers and infants and feeding of glucose solution and artificial formulas to all newborns was customary until 1976. In September of 1977, rooming-in was initiated, and later policies developed promoting mother-infant stimulation and the feeding of pooled colostrum alone or mixed with human milk to high-risk and premature neonates. Colostrum was given at 2.5–5 ml/kg body weight, by tube or bottle, starting several hours after birth. In the 5 years after these practices were initiated, a marked reduction in morbidity and mortality due to diarrhea, severe respiratory infection, and sepsis was recorded (table 3).[22] A similar beneficial effect of feeding human colostrum and milk to neonates was also recorded in Argentina and the Philippines.[23,24]

NUTRITIONAL BENEFITS

The importance of human milk for infant nutrition stems from its unique composition (table 4).[1,25,26] Its high lactose and lipid contents favor nutrition during the first few weeks of life, and they are particularly important for premature infants or those with fetal growth retardation.[27] The appropriate quality of the protein precludes development of transient neonatal aminoacidemia, which may be observed in artificially fed neonates, and which might impair psychomotor development and intelligence.[1] Furthermore, compared to that in cow's milk, the lipid of the fat globule of human milk contains more oleic and linoleic acids, phosphatidopeptides, and phosphatidylinositol, which are used in synthesis of neuronal substance.[28]

Cow's milk has higher potassium and sodium concentrations and also a higher solute and electrolyte concentration than human milk, and infants fed cow's milk may require water supplement. However, additional water is generally not required during exclusive breast-feeding,[29] a fact of great importance in tropical regions, where water is generally contaminated and scarce. On the other hand, infants reared with cow's milk formula may develop kidney disease as a result of large solute loads.[1]

Finally, human milk contains ligands for optimal transport of iron, zinc, and other trace elements, as well as adequate concentrations of vitamins A and C and folic acid.[1] Con-

Table 3. Changes in Neonatal Diarrheal Morbidity and Mortality Associated with Various Interventions, San Juan de Dios Hospital, Costa Rica

Year	Intervention	Number of live births	Number (%) of neonates <38 weeks	Diarrhea	
				Cases	Deaths
1976	Mother-infant separation, formula feeding	7,629	589(7.7)	135(229)*	3(3.9)*
1977	Rooming-in (A)	8,582	618(7.2)	72(121)	1(1.2)
1978	A + colostrum to high-risk neonates (B)	8,931	597(6.7)	62(104)	0
1979	A + B + early stimulation (C)	8,638	437(5.1)	55(126)	0
1980	A + B + C	8,978	412(4.6)	14(34)	0
1981	A + B + C	8,879	541(6.1)	1(1.8)	0
1982	A + B + C	9,271	620(6.7)	1(1.6)	0
Percent change in rates, 1976–82			−13	−99	−100

Adapted from Mata *et al.*[22]
*Parentheses indicate rate per 1,000 live births in pregnancies of <38 weeks gestation.

Table 4. Nutrient Composition of Human and Cow's Milk*

Component	Milk	
	Human	Cow's
Energy (kcal)	75	66
Fat (g)	4.5	3.7
Lactose (g)	6.8	4.9
Protein (g)	0.9	3.5
Protein nitrogen (mg*)	1.3	5.3
Nonprotein nitrogen (mg*)	0.4	0.3
β-Lactoglobulin (mg)	0	300
Ash (g)	0.2	0.7
Essential amino acids (mg)		
Histidine	22	95
Isoleucine	68	228
Leucine	100	350
Lysine	73	277
Methionine	25	88
Phenylalanine	48	172
Threonine	50	164
Tryptophan	18	49
Valine	70	245
Calcium (mg)	34	117
Phosphorus (mg)	14	92
Sodium (meq**)	7	22
Potassium (meq**)	13	35
Chloride (meq**)	11	29
Vitamin A (I.U.)	190	102
Thiamin (μg)	16	44
Niacin (μg)	147	94
Vitamin (C) (mg)	4.3	1.1
Vitamin D (I.U.)	2.2	1.4
Vitamin E (mg)	0.18	0.04
Vitamin K (μg)	1.5	6.0

Based on Jelliffe and Jelliffe[1] and Hambraeus *et al.*[25]
*Values per dl, except for: *, value per ml; **, value per liter.

All alleged "inadequacies" of human milk can be satisfactorily explained.

sequently, breast-fed infants do not suffer from acrodermatitis enteropathica or iron-deficiency anemia. However, vitamin deficiencies may be observed in infants nursed by strict vegetarians who suffer from severe deficiency. (In fact, all alleged "inadequacies" of human milk can be satisfactorily explained.[30]) Artificially fed infants are prone to develop the above-mentioned diseases unless special care is taken to fortify their formula; furthermore, formula-fed infants have a higher risk of overweight or obesity and of allergies than breast-fed infants (see table 2).[1]

Women in traditional societies produce adequate amounts of milk, and the volume may be equal to or less than that produced by well-nourished women of industrial nations.[26] Human milk composition may vary according to fetal maturity,[31,32] but it does not easily vary across cultures and socioeconomic conditions[26] unless the maternal food intake and nutritional state are profoundly altered. A question does remain about how infants grow well with what appears to be insufficient volumes of human milk.[26, 33–35] The unique nutritional value of human milk in the first 3 to 6 months of life has been confirmed by prospective studies of infant growth throughout the tropics and subtropics.[20,27, 36–38] A study in the Guatemalan village of Santa María Cauqué showed not only that normal neonates grow optimally during the first months of exclusive breast-feeding, but also that preterm and small-for-gestational-age infants thrive, provided they begin at the breast from the very first days of life and are exclusively breast-fed for several months.[27]

ECONOMIC BENEFITS

Human milk is synthesized shortly before and during the act of breast-feeding as a result of the stimulus of nipple-sucking by the infant.[1] No containers, preparation, or storage is required, and this fact alone represents a significant saving in time and money in developing nations. The cost for synthesis of about 600 to 900 ml of human milk per day is less than the cost of any substitute, regardless of country, culture, or social level. In areas where there are serious economic constraints, the cost of human milk production is equivalent to one additional daily cup of cereal, cereal-pulse, or any other predominant local food, with a vegetable or fruit.[39] The importance of breast-feeding is especially clear when the cost of milk formula is expressed as percentage of wages.[40] To this figure should be added the additional expenditure for bottles, nipples, and boilers, as well as for medical attention, transportation to clinics, and medicines, owing to increased rates of morbidity in bottle-fed infants.[17,19] The savings in terms of improved nutrition and increased survival are immeasurable.

PSYCHOSOCIAL BENEFITS

Its psychosocial effect is the most important attribute of breast-feeding, not only because of its psychologic benefit but also because of its implications for the rights of the child.[41] Breast-feeding generally is a *sine qua non* result of natural childbirth, where instinctive contact and interaction between mother and child are favored.[1,27] The mother, on her own or with the support of midwife, attendants, or friends, initiates skin, mouth, and sight contact, followed by nipple-mouth relationship and the successful establishment of breast-feeding shortly after delivery. Breast-feeding maximizes mother-infant stimulation, leading to firm bonding, long-lasting child-rearing practices, and optimal protection of the child[6] (table 5).

Breast-feeding maximizes mother-infant stimulation, leading to firm bonding, long-lasting child-rearing practices, and optimal protection of the child.

The physiology of lactation is a complex process in which endocrine and psychologic factors intervene. Some of these factors are triggered and sustained by the infant himself; others depend on maternal attitude and behavior. Simply stated, lactation results from the interaction of two psychophysiologic phenomena: the sucking response and the let-down reflex.[1] The sucking response is primarily mediated by discharge of prolactin under the potent stimulus of nipple-sucking by the infant, and results in milk synthesis and breast engorgement. The let-down reflex leads to discharge of oxytocin, which stimulates contraction of the myoepithelial cells of the alveoli and the expression of milk. The let-down reflex depends on the mother's state of mind, on her wish to breast-feed, and on her confidence that she can breast-feed. Optimal development of these reflexes is observed in traditional societies, where failure to breast-feed is practically unheard of,[27] and in industrial societies that have benefited from rooming-in.[43] Both reflexes have been significantly altered artificially, either iatrogenically, through promotion of formula and weaning foods, or by the effects of urbanization.

Table 5. Mother-Infant Interactions Favored by Breast-Feeding

Mother to infant	Infant to mother
Eye contact	Eye contact
Touch	Touch
High-pitched voice	Cry
Heat	Heat
Entrainment	Entrainment
Cuddling	Suction of nipple
Heart beat	Oxytocin
Odor	Odor
Microbial flora	
Immune cells	

Adapted from Klaus and Kennell.[8]

Mother-infant separation, still practiced today in many maternity hospitals throughout the world, is detrimental to successful breast-feeding and bonding. Infants separated from the mother after birth are at greater risk of acquiring infectious diseases, of being improperly nursed, and of being neglected or abused.[6] Since the infant is an "exterogestated fetus" for at least 7 to 9 months, breast-feeding and bonding and psychologic stimuli are required during this entire period until exterogestation is completed.[1,42] At 7 to 9 months, the child crawls, stands, and initiates independent walking, providing he was properly breast-fed; he has teeth and can eat; most of his brain, lungs, larynx, and enzyme systems have matured; and he begins to communicate with other people through language, play, and other mechanisms.[42] During exterogestation, the infant depends on the mother in the same manner that the fetus depends on the placental and maternal environment.

OTHER BENEFITS

Breast-feeding has beneficial effects after parturition by helping stimulate uterine retraction and diminishing bleeding and pain.[1,43] The practice of breast-feeding favors a positive maternal attitude toward her own sexuality and that of her offspring, and also favors a more balanced personality. Women who do not breast-feed tend to suffer more from neurosis, and they consume more drugs and cigarettes than nursing mothers.[1] Weight loss after puerperium and a return to prepregnancy weight are better accomplished by

nursing mothers.[44] Furthermore, breast-feeding affords significant protection against another pregnancy, particularly in traditional and transitional societies[1,45]; breast-feeding is an important determinant in the control of unwanted demographic growth.[46]

From the standpoint of human rights, breast-feeding is a sacrosanct right of the child,[41] because it represents the best nutrition, the best protection against disease, and the best mechanism for psychosocial stimulation. At the same time, breast-feeding enables women to fulfill one of their most important roles in society.

DECLINE IN BREAST-FEEDING IN DEVELOPING COUNTRIES

Non-human milk became available for human consumption after domestication of animals about 15,000 years ago,[1] but techniques for feeding substantial amounts of non-human milk to infants, and industrialization of pasteurized and powdered cow's milk and of bottles and nipples occurred only recently, in the present century. Concomitantly there occurred rapid changes in lifestyles (in part due to improved communication and transport), a tendency toward urbanization and nuclear families, a boom in the food industry and transnational industries, and proficiency in the use of mass-communication media to advertise substitutes for human milk. These factors have combined to effect a change in infant feeding practices as societies have evolved from the traditional toward the industrial.

Nevertheless, many traditional societies still exist where the practice of breast-feeding is highly successful and extends for considerable lengths of time, e.g., 18 months to 3 years or even longer.[1] Traditional populations living in isolated tribes in the forests and jungles of Latin America, Africa, Asia, and the South Pacific islands may exhibit high levels of health and adequate nutrition, as expressed by weight-for-height relationships among children[47] (although childhood mortality may be high if agents of diarrhea, measles, and other infectious diseases are introduced into the settlement).

In contrast, traditional rural societies living under crowded and unsanitary conditions, for instance in the highlands of Mexico, Guatemala, Bolivia, Ecuador, and Peru, suffer from high rates of morbidity and mortality due to infectious diseases, especially diarrhea. In these societies, breast-feeding is highly successful and child nutrition is good during the first few months of exclusive breast-feeding,[1,27] but the nutritional state generally deteriorates as a consequence of repetitive infections superimposed on inadequate supplementation of a faltering human milk supply at about 4 to 5 months.[48] Foods are given in small quantities and often are contaminated with diarrheal agents.[49]

Populations in transition from traditional to modern lifestyles predominate throughout the rural areas and slums of the tropics and subtropics. Areas of the urban poor contain people from rural communities as well as others who have lived in cities all their lives; such populations are trapped in poverty and underdevelopment. Under such conditions, failure to breast-feed and premature weaning are common,[1,50] due to a constellation of factors characteristic of improvised urban life. Any success of deprived urban families in fostering child nutrition with artificial formulas is proportional to the level of education and hygiene. Happily, a reverse trend toward increasing rates of breast-feeding has been observed in recent times in some transitional populations[21] as well as in some industrialized countries.[51]

FACTORS INTERFERING WITH BREAST-FEEDING

For practical reasons, influences interfering with breast-feeding are divided into societal, iatrogenic, and commercial factors (table 6). *Societal influences* include disintegration of the family structure and a proclivity toward the nuclear family, both the result of changes in patterns of life in modern society. The increased pregnancy rate among adolescents augments the risk of delivery of low-birth-weight infants,[1] initiating the cycle of artificial feeding, diarrhea, marasmic malnutrition, and repetitive hospitalization.[52,53] In addition, the environment has an outstanding influence, since poor personal hygiene and deficient environmental sanitation favor infection with agents of diarrhea and other communicable diseases. The problem is aggravated by crowding and by unavailable or deficient primary health services to protect children through vaccines and community education.

Table 6. Factors That Interfere with Breast-Feeding

Societal
Inadequate prenatal education
Migration from rural areas to cities
Change from extended to nuclear family
Inappropriate incorporation of women into labor force
Medical and Sanitary
Inadequate prenatal care
Deficient delivery practices (unnecessary cesareans, anesthesia, episiotomy)
Mother-infant separation in hospital
Feeding glucose solution and formula to neonates
Lack of support in post-partum period
Promotion of supplementary feeding
Use of inappropriate hormonal contraceptives
Commercial
Unethical education of health personnel
Use of "milk nurses" in maternity wards
Promotion of milk formulas
Promotion of early introduction of processed and packaged foods

Diarrhea, malnutrition, and hospitalization are often preceded or accompanied by child neglect and abuse, an increasing problem in transitional societies throughout the world.[1,6,43,52] For example, a Costa Rican study showed that the rate of malnutrition was several times greater in abused children than in children of the same age from the general population (table 7).[53] A significant number of battered children had low birth weight, were artificially fed, had malnutrition, and had been frequently hospitalized. Failure to breast-feed and premature weaning are aggravated by social deprivation and economic stress that may force a woman to work when there is no support at home to care for her children.[54] Both problems worsen with natural and man-made disasters, particularly urban violence and war.

Iatrogenic influences result from incorrect or inadequate application of technology, especially by the health sector. Specifically, hospital norms based on data that are now obsolete are still being used and result in drastic separation of mothers and infants after delivery, and in recommendation of artificial formulas and glucose solutions for neonates[1-3,43] On the other hand, doubtful advice and procedures taught to mothers—or advice withheld when it is needed—has a negative influence on breast-feeding. Other iatrogenic determinants, such as violent childbirth and inadequate care of neonates, interfere with breast-feeding. In advanced societies there is today a trend toward improved prenatal care and detection of high-risk mothers, better diagnosis of high-risk pregnancy, a greater proportion of nonviolent deliveries, a decrease in the use of anesthesia, cesareans, episioto-

Table 7. Factors in the Child Abuse Syndrome (CHAS), National Children's Hospital, Costa Rica, 1977

Factor	Occurrence with CHAS (%)	Occurrence in general population, 1977–78 (%)
Broken family	63	40
Mother younger than 20 years old	39	20
Low birth weight (<2.5 kg)	29	7.2
Premature weaning (<7 days)	50	15
Two to four previous hospitalizations	25	<5

Source: Mata *et al.*[53]

mies, and other traumatic interventions, an increase in rooming-in and early breast-feeding, and stimulation of preterm and high-risk neonates by their mothers.[43] In addition, effort has been made to humanize hospital services, in order to reduce maternal anxiety and to favor the sucking response and let-down reflexes.

Commercial influences are the direct result of massive industrial production of infant formula and devices for artificial feeding of infants, a phenomenon that began early this century and reached its peak after World War Two.[1] Until recently, the techniques used by transnational corporations were unethical, in that they dispersed sophisticated, persuasive advertisements through the mass communication media in underdeveloped tropical and subtropical regions.[55] The marketing techniques included manipulation of the prices, presentation, and promotion of products, and persuasion of the medical and paramedical professions. This phenomenon occurred because business may ignore health ethics or social sensitivity, while it exhibits an unlimited thirst for money. Eventually, public opinion and outrage at these practices caused a build-up of pressure for international action. The United Nations endorsed—almost unanimously—the *International Code of Marketing of Breast-milk Substitutes*.[56]

PROMOTION OF BREAST-FEEDING

There is much debate today about the best way to promote breast-feeding in countries that exhibit a decline in the practice. (In traditional societies, breast-feeding does not pose a problem for most women and the practice generally extends for a few years.[1,27]) Many hospital interventions have demonstrated the importance of early mother-infant interaction and rooming-in in promoting breast-feeding.[1,43] For example, in Costa Rica nutrition and fertility surveys in 1975 and 1976 showed that 26–30% of Costa Rican women did not breast-feed at all, while the duration of breast-feeding was one of the shortest recorded among developing nations.[50,57] As a study of ways of counteracting this, in 1977 a series of interventions was instituted in the San Juan de Dios Hospital, with the first intervention effected being rooming-in (1977), followed by promotion of breast-feeding (1978).[20–22] Administration of colostrum and milk to preterm and high-risk neonates started in 1978, and mother-infant stimulation in the delivery room in 1979.[22] The rooming-in program did not require special equipment or modification of physical space. Colostrum and milk were extracted with mechanical breast pumps and were kept under refrigeration until used, generally within 8 hr of collection. Pooled colostrum was fed by tube in amounts of 2.5 to 5 ml/kg body weight, and as early as 6 to 8 hr after birth.

> Many hospital interventions have demonstrated the importance of early mother-infant interaction and rooming-in in promoting breast-feeding.

These interventions have proved to be highly successful, in that women were happier and more relaxed than before the interventions were effected. Mothers already nursing engaged in counseling arriving women about breast-feeding and child care. The staff's attitude also improved, especially because nurses and aides had more time available for other chores. The most important result of the interventions was almost universal breast-feeding of neonates not separated from the mother for medical reasons. A 95% rate of breast-feeding was observed, contrasting with the 70–72% rate observed in Costa Rica before the interventions.[50,57] The interventions also markedly reduced the morbidity and mortality rates for the first few days of life (see table 3). The increase in bonding and breast-feeding was accompanied by a dramatic reduction in the rate of abandoned infants, as measured at the time of discharge of the mothers of healthy infants, and during the whole hospital internment for ill infants. Thus, healthy, normal neonates from unwanted pregnancies or with social pathology were abandoned at a rate of 10 per 10,000 live births before the interventions, but abandonment ceased after 5 years of interventions (table 8). Furthermore, abandonment of ill infants has declined significantly, in part due to stimulation of the mother, who is allowed to enter the neonatal ward for interaction with her infant.[21,22] Failures were often associated with an inability of the mother to visit the hospital.

The continuation of breast-feeding after hospital discharge was measured in all delivering women in a cohort belonging to a typical mountainous rural area in Southern Costa Rica. The area, Puriscal, consists of 8 districts and a total of 152 localities of rural dispersed and rural concentrated population.[20,21] Over all, more than 80% of infants remained at the breast at 1 month of age, and more than 75% at age 3 months. At 6 months of age, about 50% of infants were still being nursed, a marked difference from the rate observed in Costa Rica before the interventions. Rates of breast-feeding were different in some regions of Puriscal. In the rural concentrated population, nursing tended to be less prolonged than in the rural dispersed population, where women were visited at least monthly for collection of information and for support to the mother. In this subcohort, more than 90% of infants were still nursed at 1 month of age, more than 75% remained at the breast at age 6 months, and more than 65% were breast-feeding at 9 months of age.[20,22] There is no doubt that changes aimed toward rooming-in can be expected to increase breast-feeding and to improve infant nutrition and health.[1,22,43,58–60]

COMMENT

Much work remains to be done in promotion of breast-feeding. Improvements in hospital norms, health education, formula marketing regulations, and related areas are required in many regions of the world. The following recommendations are urgent:

- Development of universal rooming-in and early mother-infant stimulation practices, and feeding of human colostrum and milk to preterm and high-risk neonates.
- Humanization of health and medical services in maternity hospitals, in order to foster nonviolent delivery and decrease the

Table 8. Effect of Hospital Interventions on Child Abandonment Rates,[a] San Juan de Dios Hospital, Costa Rica

Year (Oct–Sept)	N	Intervention[b]	Neonates[c]		
			Healthy	Ill[d]	Total
1976–1977	8,988		9(10)	10(11.1)	19(21.1)
1977–1978	9,143	A	3(3.3)	7(7.7)	10(10.9)
1978–1979	8,737	A + B	1(1.1)	5(5.7)	6(6.9)
1979–1980	8,972	A + B + C	1(1.1)	5(5.6)	6(6.7)
1980–1981	8,837	A + B + C	2(2.3)	2(2.3)	4(4.5)
1981–1982	9,045	A + B + C	0	4(4.4)	4(4.4)
Percent reduction, 1976–82			100	60	79

Adapted from Mata *et al.*[25]

[a]Newborns abandoned because of death, mental illness, or mental retardation of the mother were excluded from the table.

[b]See table 3 for intervention effected.

[c]Newborns abandoned (rate per 10,000 live births).

[d]Hospitalized, preterm, or with various pathologies.

rates of failure to breast-feed, of premature weaning, and of hospitalization.

- Legislation to support nursing mothers and to protect them from a premature return to work.
- Education of medical and health personnel and the public about the benefits of breast-feeding, causes for its failure, and ways to promote breast-feeding.
- Regulation of unethical promotion of infant formula and other baby foods.
- Coordination of the actions of the planning, health, education, and communication sectors to improve promotion of breast-feeding.

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