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FOR DEBATE

Policy of Exclusive Breast-feeding for Six Months: A re-examination

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Summary

Ogbu CN. Policy of Exclusive Breast-feeding for Six Months: A re-examination. *Nigerian Journal of Paediatrics* **2001; 28:53.** While it is well accepted that breast-feeding is natural and that human breast milk is a unique and appropriate food for full term healthy neonates, controversy continues to dog the recommendation that babies should be exclusively breast-fed for the first six months of life. In this paper, evidence is presented to show that while human milk alone can provide adequate macro- and micronutrients for normal growth and development of full term infants for the first 3-4 months of life, it is inadequate for older infants. Growth faltering whose effects on the rapidly growing brain is unknown, nutritional rickets, iron deficiency anaemia and zinc deficiency have been reported in infants exclusively breast-fed beyond four months of age. It is therefore, strongly recommended that exclusive breast-feeding should not last beyond four months of age, while breast-feeding could continue for as long as it is feasible and practicable for the mother. This should ensure normal growth and development of the infant who would also reap other benefits of breast milk and breast-feeding.

Introduction

BREAST-FEEDING or breast milk is the greatest gift a mother can give to her newborn infant. As a paediatrician, one absolutely supports breast-feeding and strongly advocates and encourages the breast-feeding of all infants for as long as it is feasible and practicable for the mothers. Indeed, one fully agrees with Anderson[1] when he said "human milk is a unique food and the preferred first food for the full term infants because its special characteristics are made by nature to match the nutritional needs and physiological limitations of the neonate". The focus of this paper is therefore, not on breast-feeding except in so far as it supports it, rather, it is on how long an infant should be exclusively breast-fed without impairing his growth and/or development.

Koshoo *et al* [2] had stated that "human milk is considered the 'gold standard' for establishing all nutrient requirements during the fist six months of life". It is this idea of 'gold standard' and the total involvement of health care providers, governmental, non-governmental and international agencies in the promotion of the policy of exclusive breast-feeding for six months, almost to the point of raising it to the level of a doctrine, that prompted me to call for a re-examination of the policy in view of the known facts about the composition of human breast milk and infant growth and development. This becomes more imperative in Nigeria and other third world countries where poverty and undernutrition are the lots of our rural women and children, and where the deficiencies that may develop during the period of prolonged exclusive breast-feeding may not easily be made up subsequently. Oski,[3] a renowned American haematologist, in writing about oxytocin and neonatal hyperbilirubinaemia said that "too often, the pressure 'to do' outweighs the need to examine 'what has been done', and as a result, either ineffective or harmful procedures become standard forms of therapy".

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It is therefore, necessary to objectively re-examine the policy of exclusive breast-feeding for six months in view of the documented growth failure observed in exclusively breast-fed infants beyond 3-4 months of age, to see if it should really be the policy. It is important that history should be our guide in establishing policies that prescribe standard forms of therapy or management particularly where there are some unanswered questions about the efficacy, safety and side effects of such therapy. The fact that our knowledge of the human organism is limited should make us humble enough to accept that the observed differences in growth and development between exclusively breast-fed infants beyond 3-4 months of age and non-exclusively breast-fed infants, may not be merely "physiological" or "natural". Our inability to see or detect the significance of these differences may simply mean that we do not have sufficient knowledge and/or tools sensitive enough to define the effects of these differences in the infants where they exist

There is no question that human milk is a unique and preferred first food for the full term neonate because its characteristics are tailor-made by nature to meet the nutritional needs and physiological status of the neonate. However, human milk has been shown in some studies [4,5] not to be the ideal food for the very premature neonates because of their relative nutritional deficiencies at birth and higher nutrient needs for rapid rate of growth during the first few months of life. For example, Davis[6] has shown that the weekly rate of mean weight gain, linear growth and increase in head circumference for preterm infants of 28-32 weeks' gestation fed breast milk only, were 100gm, 7mm and 6.9mm respectively, compared to 160gm, 9.8mm and 8.4mm for their counterparts fed artificial formula.

The questions here are (a) given our current knowledge of the nutritional needs for the normal growth and development of a healthy full term infant in the first six months of life and the nutrient composition of breast milk, is it truly nutritionally adequate as the only food for a full term infant during the first six months of life? (b) what compelling advantages does exclusive breast-feeding for six months duration have over 3-4 months duration? (c) Should we not accept the recommendation of Underwood *et al* [7] that "from a practical standpoint, the time of introduction of complementary feeding must cover a range of age", for example 3-4 months, since growth faltering of exclusively breast-fed infants have been found as early as three months of age.[7-10] To answer these questions, the presumed advantages or benefits of breast-feeding and breast milk are examined in this paper.

Benefits of Breast Milk and Breast-feeding

These include nutritional, anti-infective, anti-allergic, economic, psychosocial, and contraceptive benefits.

Nutritional Benefits

As has been stated earlier, breast milk is tailor-made with the right quality and quantity of nutrients for the relatively immature but rapidly maturing gastrointestinal tract and other organ systems of the full term neonate. The 60 per cent whey protein content of breast milk, the good bioavailability of its micro-nutrients, e.g. iron, calcium and zinc and the low ash content are factors that make it special for the neonate. But beyond the neonatal period and as the weeks and months roll by, the macro- and micro-nutrient requirements for appropriate growth of the infant increase and eventually exceed the amount of these nutrients in breast milk even if they were fully absorbed. Atkinson, *et al*[11] have demonstrated through linear regression analysis of their data on breast milk from mothers of full and preterm infants that nitrogen concentration decreases significantly with progressing lactation. Studies[12, 13] employing amino acid analysis and exchange chromatography have found protein content of breast milk to be 0.8-0.9gm/dl. The Food and Agricultural Organization (FAO) and World Health Organization (WHO)[14] recommend 1.85gm/kg as the daily requirement for protein or the safe level of intake for normal growth at the age of 3-5.9 months. From the national growth monitoring chart, an average three-month old infant who is expected to weigh 6kg will require 1.85gm x 6 or 11.1gm of protein daily. Lonnerdal *et al* [15] have shown that well nourished nursing Swedish mothers produced an average of 752ml of breast milk daily at three months lactation. This is higher than what the average poorly nourished mother in the third world countries produces.[15] It has been found that Nigerian mothers in Benin City produced on average, 555ml of breast milk per day at three months lactation.[16] Naismith *et al* [17] have estimated the protein content of mature breast milk at Ibadan, Nigeria, to be 1.22gm/100ml. If we take this figure and a daily milk production of 555ml at three months lactation from a mother in Benin City, the exclusively breast-fed infant will have a daily protein intake of 6.77gm at three months of age. Butte *et al* [18] had reported a decrease in protein intake from human milk from 1.6gm/kg/day at one month of age to 0.9gm/kg/day at four months of age. They also reported that energy intake from breast milk declined from a mean level of 110

kcal/kg/day at one month of age to 71 kcal/kg/day at four months of age. These figures were similar to the findings of Krebs *et al*[19] who reported mean levels of 106 kcal/kg/day at two weeks, 79kcal/kg/day at three months, 70kcal/kg/day at five months and 57 kcal/kg/day at seven months of age. The average energy requirements based on measured intakes of infants in several countries as estimated by the FAO/WHO group[14] are 124 kcal/kg/day, for 0-1 month, 103 kcal/kg/day for 3-4 months and 95 kcal/kg/day for 6-7 months old infants. Breast milk therefore, provides about 88.7 per cent at one month, 77 per cent at three months, and 55.3 per cent at seven months of age of the daily energy needs of breast-fed infants.

Lipid represents about 90 per cent of all energy retained in the growing tissues and is retained as exchangeable energy store and for structural roles. It forms important components of all cell membranes and is a precursor for synthesis of various prostaglandins. Brain growth spurt which is the period of development when brain growth velocity is greatest, begins early in the third trimester and increases to term and then decreases during the first 6-18 months after birth.[20] The major quantitative components of postnatal brain lipid deposition are the saturated and monounsaturated fatty acids of myelin. It has been reported by Innis[20] that when total energy supply is below 70-80 kcal/kg/day, oxidation of stored fatty acids occurs. The deficiencies of these fatty acids – linoleic (18:2n-6) and linolenic (18:3n-3) in other animal species during brain development have resulted in the impairment of cognitive, visual and motor skills development.[20] At about 6-7 months of age, the total energy available to the exclusively breast-fed infants falls below 70 kcal/kg/day and oxidation of the exchangeable fatty acid stores may begin to occur perhaps to the detriment of the developing brain.

Apart from the macronutrient content of human breast milk being inadequate to support appropriate growth of the exclusively breast-fed infant beyond 3-4 months of age, some micronutrients are also inadequate for normal growth and development. Unlike other minerals, the concentration of zinc in foetal tissue is not large and as such, the neonate is born with inadequate reserves. Some studies[2,21,22] have reported zinc deficiencies with clinical symptoms of failure to thrive and typical skin lesions in exclusively breast-fed full term infants. It has been known that even mild deficiency of zinc in young children can depress growth and "an inadequate supply of a single nutrient in mature milk may limit both appetite and growth".[20] Nutritional rickets has also been reported in several studies[23,24] resulting from vitamin D and calcium deficiencies in exclusively breast-fed infants.

One may argue that the adequacy or otherwise, of macro and micronutrients in breast milk with reference to the "standard" requirements, is a laboratory and statistical phenomenon but then, the important question is whether or not, an infant grows appropriately on exclusive breast-feeding for the duration of six months. If not, what are the implications for the physical and mental development of the infant? The fact that infants fed with cow's milk had better weight gain than those fed with human breast milk was observed as far back as the 16th century and it prompted Armstrong, the founder of the first Dispensary for Infant Poor in Great Britain to recommend in 1783, that "if an infant is to be bred by hand from birth, it ought to receive new cow's milk or better still, the milk of an ass if you can afford it".[25] His recommendation of the milk of an ass is probably from the fact that it contains a ratio of whey to casein similar to that of human milk but twice the amount of protein, which promotes rapid growth of the young of an ass. Since the time of Armstrong, it has been universally found and generally agreed that the weights of exclusively breast-fed infants "falter" after 3-4 months of age, compared to formula-fed infants of breast-fed infants who receive supplementary feeding.[8,9,18,26-29]

The finding of growth faltering in exclusively breast-fed infants after 3-4 months of age is not only longitudinal in time, but also latitudinal in various societies in the world. For example, Dewey *et al*[26] in the USA, Hitchcock *et al*[27] in the UK, Chavez *et al*[29] in Mexico and Chandra[8] in India, have all reported growth faltering (defined as weight at, or below the 10th National Center for Health Statistics (NCHS) percentile) in exclusively breast-fed infants after four months of age. Growth faltering has also been found in exclusively breast-fed infants in comparison with formula-fed infants serving as control groups.[25] Growth faltering is not only in weight but also in height and head circumference.[26,28] Duncan *et al*[28] reported that between birth and six months of age, 48 per cent of the exclusively breast-fed full term infants in their study lost 20 percentiles in weight, 61 per cent lost 20 percentiles in length and 20 per cent declined 20 or more percentiles in head circumference. The study by Raiha *et al*[12] is one of the very few studies that did not find any difference in weight gain between formula-fed and the exclusively breast-fed infants. However, they reported that total serum protein, a time honoured indicator of nutritional status, was lower in the exclusively breast-fed infants than those who receive formula. The find-

ing by Ahmed *et al*[30] that there was no difference in weight gain between exclusively breast-fed infants and breast-fed infants who received small amounts of water was not unexpected as the addition of non-nutritive or no increase in the caloric or protein intake should not make a difference in the weight gain. It would have been interesting if they had compared the incidence of diarrhoea in the two groups and contrasted it with the report of Popkin *et al*[31] that nutritive and non-nutritive supplementation (solids/liquids) worsen the likelihood of diarrhoea. Studies that show no growth faltering usually confine themselves to growth monitoring for the first four months of life and do not extend it to 5-6 months and beyond.

Dewey *et al*[26] from the Darling study reported equal weight gain between the formula-fed and breast-fed infants in the first three months but that weight gain by breast-fed infants was slower thereafter. They went on to suggest the need for a growth chart for the breast-fed infants. This may be begging the question! Why should they be different and what does this difference mean for their ultimate growth and development? The answer to what the effect of this difference would be on the ultimate growth and development of the infant is largely unknown, but Marks *et al*[32] showed that "undernutrition during the entire period of rapid brain growth (brain growth spurt) will result in a deficit in cell number and irreversible decrease in brain weight". This finding and the reports of Winick[33] on the adverse effects of malnutrition on brain development should not be ignored, particularly in third world countries where chronic malnutrition is a feature of many infants, for the questionable protective benefits of breast milk from infections. The 1993 UNICEF PIC survey estimated chronic undernutrition/stunting among under-five children in Nigeria to be 52.3 per cent.[34]

Dewey *et al*[25] in the Darling study, had shown that energy intake of breast-fed infants is lower than that of formula-fed infants at six and nine months even when other foods had increasingly formed the larger proportion of total energy intake. They also reported that breast-fed infants would leave unconsumed, about 25 per cent of all non-milk food offered to them at six and nine months. The implication of these findings is that an infant who suffers growth failure during the first six months, a period of brain growth spurt, may take a long time to achieve catch-up growth if he ever does catch up, because of this self-regulation of intake.

Protective Effects of Breast-feeding

The host defense benefits of human milk are attributed to its content of humoral and cellular elements. Other non-specific factors such as lysozyme, lactoferrin, lactoperoxidase and complements are thought to play minor roles. A closer examination of the concentrations of these factors in breast milk over time may raise the question of their significance after 3-4 months of lactation. Mature milk has been reported to have only about two per cent of the cell concentration of colostrum which was reported by Smith and Goldman[35] as 2100 cells/mm^3 for macrophages and 205 cells/mm^3 for lymphocytes. Peiterson *et al*[36] have also reported the decline in human milk of IgA and IgG from 8.78arb U/L and 0.25g/L in colostrum to 0.3arb U/L and 0.03g/L respectively, after 2-3 weeks of lactation. IgM declined from 0.28g/l in colostrum to traces at 3-4 weeks of lactation. Quantitatively therefore, one wonders whether the protective effects of these components are not being exaggerated!

A number of studies[30,37-41] seems to suggest that breast milk is protective against infections in infants. The methodologies employed in these studies have been seriously questioned and conclusions drawn from them may be misleading, to say the least. Beaudry *et al*[36] in their study, relied on mothers' recall of illness six months after the fact to conclude that breast-feeding is protective against infection in the first six months of life. They did not provide standard definitions to ensure that gastroenteritis, diarrhoea etc mean the same thing to all the mothers. Cunningham[38,39] in his well documented retrospective studies showed significant differences between the breast-fed group and formula-fed group with respect to paternal educational level and maternal age, but analysis of the combined effects of these factors on morbidity was not done and it may have significantly affected the probability of seeking care at the hospital clinic rather than private clinic. It is interesting to note that the breast-fed infants in Cunningham's studies were not exclusively breast-fed but received various quantities of supplementary feeding. Popkin *et al*[31] surveyed infants exclusively breast-fed for only seven days prior to the survey and concluded that non breast-fed infants had higher incidence of diarrhoea than exclusively breast-fed infants. The period of this study was too short for any generalizations to be made from it. Fallot *et al*[40] in comparing private and hospital clinic patients created non-matchable groups with a bias for poorer, more preterm and low birth weight infants in the hospital group. Cesar *et al*[41] in a recent nested case-control study reported that infants not receiving breast milk were 18 times more likely to present with pneumonia than those receiving breast milk exclusively. This type

of study is fraught with many confounding variables some of which were not controlled for. More importantly, only 20 per cent of the infants studied exclusively breast-fed in the first month and this had dropped to only 1.6 per cent at six months, making the conclusions from such a small number questionable. By contrast, in a prospective well controlled study, Cushing and Anderson[42] showed no difference in diarrhoea episodes between breast-fed and bottle-fed infants.

The report by Black[43] that HIV-1 can be transmitted to infants through breast-feeding should make us reexamine our feeding recommendations particularly in the African region where the incidence of HIV is high and the HIV status of many mothers is not known at the time of delivery. The recent editorial by Latham[44] suggesting that an HIV infected mother may opt for a shorter total duration of breast-feeding and more emphasis on exclusive breast-feeding seems preposterous given the fatal implication of HIV infection of the infant. The WHO, UN, AIDS Agency and UNICEF recommend that "the most effective method of preventing breast milk transmission of HIV is breast milk avoidance".[14]

Kramer and Moroz [45] in a very well designed study failed to demonstrate any protective effect of exclusive breast-feeding and delayed introduction of solid food against atopic eczema.

Maternal-infant Bonding Effect

Spitz[46] had shown from his work with institutionalized infants that babies need intimate involvement with other human beings for their immediate survival as well as for their long-term emotional health. Indeed, Lozoff *et al* [47] in their excellent review article on mother-infant relationship, concluded that "infants die or develop with difficulty if given only food, warmth and protection". Klaus and Kennell[48] in their work on mother-infant interaction demonstrated adverse impact on the mother and her infant when they are separated during the sensitive period of bonding. They asserted that the first 12 hours after birth is probably the critical period in which bonding takes place in humans. It is generally agreed that breast-feeding promotes maternal-infant bonding, which engenders normal psychological and social adjustment and well being of the child. It is therefore very important that breastfeeding should be strongly advocated for as long as possible. However, exclusive breast-feeding should be advocated for as long as the baby thrives on breast milk alone, which is usually within the first 3-4 months of life. With the report by Klaus and Kennell[48] that the period to establish ideal maternal-infant bonding is within 12 hours of birth, it is difficult to argue that exclusive breast-feeding for six months is superior to exclusive breastfeeding for 3-4 months with respect to maternal-infant bonding. For the achievement of ideal maternal-infant bonding, the baby should be put to the breast as soon as possible after delivery and the quality of the maternal-infant interaction during and after breastfeeding should be emphasized.

Economic Benefits

Breast-feeding is convenient and readily available to the baby. The economic cost of the recommendation in this paper is insignificant being only the cost of proprietary formula for 2-3 months. However, supplementary food does not have to be proprietary formula. Mothers in poor societies should be educated on highly nutritive local foodstuff that could be made into a puree and used as supplementary food. The emphasis on infant feeding should therefore, be on the education of mothers on hygienic food preparation and good nutrition.

Contraceptive Effects

The focus of this paper is on how long exclusive breast-feeding should last and not on breast-feeding *per se*. The recommendation here is that exclusive breast-feeding should ideally be for the duration of 3-4 months, that is up to the period where growth faltering is usually noted in the infant. Thereafter, breast-feeding should be continued along with supplementary food for as long as it is feasible for the mother and infant. The contraceptive effect of breast-feeding should therefore, not be lost by changing the duration of exclusive breast-feeding from six months to 3-4 months and continuing breast-feeding for as long as 1-2 years.

Status of the Policy of Exclusive Breast-feeding for Six Months

The policy of exclusive breast-feeding for six months has not earned the trust of mothers inspite of all efforts to promote it. Okolo[34] reported that 40 per cent or more of infants would have been introduced to complementary foods before the age of four months in Nigeria. In a suburb of Lima in Peru, Brown *et al*[49] reported a decline of exclusive breast-feeding from 99 per cent in the first week to 12 per cent at one month of age. Popkin *et al* [31] working in the Cebu

region of the Philippines reported that 63 per cent of exclusively breast-fed infants received supplementary diet by the age of two months. Most mothers know when their infants are growing or not growing and it may be reasonable to accept Whitehead's[50] proposal that we should "let the mother be the judge" as to when to commence supplemental foods.

Conclusion

Human milk is a unique and appropriate food for a full term healthy neonate, and breast-feeding is a very natural and nurturing activity that engenders ideal emotional and psychosocial development of the infant. People and groups who believe in guidelines for patient management have advocated the policy of exclusive breast-feeding for six months to maximize the benefits of breast milk and breast-feeding. The establishment of the policy was further strengthened by poorly designed and hurriedly carried out studies asserting that breast milk protected infants against infections.

The advocates of this policy chose to ignore a well known and documented fact that while human milk alone provides adequate macro- and micronutrients for normal growth of the full term infant for up to 3-4 months of age, it is insufficient to promote normal growth up to six months of age. Growth faltering, nutritional rickets, iron deficiency anaemia, and zinc deficiency have been reported in exclusively breast-fed full term infants beyond 3-4 months of age as manifestations of these insufficiencies. From Armstrong's report in 1783[25] to date, it is difficult to find in the literature, any well designed studies on growth monitoring that has not documented growth faltering after four months of exclusive breast-feeding. The effect of this on the infant is largely unknown but it can be compounded in the poorer societies of the third world countries where chronic undernutrition is the lot of infants and young children. Writing in 1934, Grulee *et al*[51] stated that "fifty years ago, a post-neonatal mortality rate less than one half of today's overall US rate was observed in breast-fed welfare infants given solid food supplement beginning in the fifth month. Such information has led observers with considerable experience on infant nutrition to recommend that solid food only provides the difference between an infant's caloric needs and what the mother can supply by nursing". The focus on supplemental food for breast-fed infants should shift to the education of the mothers on highly nutritious local foodstuff and the hygienic ways to prepare them in order to avoid contamination by infectious organisms. In so doing, the infant will get the full benefits of breast-feeding as well as adequate calories and other nutrients for normal growth and development.

From the above review, the available evidence if examined objectively and honestly, does not support exclusive breast-feeding for up to six months of age. The evidence also does not support the thinking that continuing breast-feeding with supplemental feeding negates the anti-infective, psychosocial, economic or contraceptive benefits of breast-feeding. There is urgent need to carry out biochemical, pathological, physiological and cognitive studies to determine the effect of growth faltering on the rapidly growing brain of the infant at this period. Until these definitive studies are carried out, the recommendation being proffered, based on the objective analysis of the studies on exclusively breast-fed infants and breast milk is that exclusive breast-feeding should be for the period of 3-4 months of age only, and that breast-feeding should be continued for as long as it is possible for the mother. It is also recommended that emphasis on infant feeding and nutrition should be placed on the education of the mothers on highly nutritious local foodstuff and on hygienic ways of preparing them for the infants. These recommendations will ensure normal growth and development of the infant and the full benefits of breast milk and breast-feeding.

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