

## Impact of early initiation of exclusive breastfeeding on newborn deaths

### Summary of Main Points

1. In low-resource, high mortality settings where infection causes a large proportion of newborn deaths, early initiation of exclusive breastfeeding can substantially reduce child mortality.
2. Initiation of breastfeeding within the first hour can help prevent neonatal deaths caused by sepsis, pneumonia, and diarrhea and may also prevent hypothermia-related deaths, especially in preterm and low birthweight infants.
3. Early initiation of exclusive breastfeeding serves as the starting point for a continuum of care for mother and newborn that can have long-lasting effects on health and development.

Insight is a series of technical briefs that address the continuum of care for good infant and young child feeding, from initiation of early and exclusive breastfeeding through complementary feeding in later infancy and the second year of life. Alive & Thrive aims to improve feeding practices during this critical period to save lives, prevent malnutrition, and promote optimal growth. The series is developed by the Alive & Thrive team: AED, BRAC, GMMB, IFPRI, Save the Children, UC-Davis, and World Vision.

The benefits of breastfeeding for infant nutrition, development, reduced morbidity and mortality, and prevention of long-term chronic diseases are now widely recognized.<sup>1,2</sup> The lower risk of mortality is primarily due to reductions in deaths caused by infectious diseases<sup>3</sup> and is most evident in infants who receive only breast-milk (exclusive breastfeeding) during the first 6 months.<sup>4</sup> Early initiation of breastfeeding provides additional benefits.

The World Health Organization (WHO) and UNICEF recommend initiation of breastfeeding within the first hour after birth and exclusive breastfeeding for the first 6 months followed by continued breastfeeding to age 2 years or beyond along with appropriate complementary feeding.<sup>5</sup> As described below, recent evidence indicates that early initiation of breastfeeding and exclusive breastfeeding are both linked with substantially lower neonatal mortality.<sup>6,7</sup> The data suggest a cause-effect relationship between early breastfeeding and reduction in infection-specific neonatal mortality.<sup>8</sup>

WHO and other organizations recommend delaying for at least the first hour routine newborn care procedures that separate mother and baby such as bathing and weighing.<sup>9,10</sup> This will allow mother and newborn uninterrupted skin-to-skin contact until the first breastfeed. Despite these recommendations, only 39 percent of newborns in the developing world are put to the breast within one hour of birth, and only 37 percent of infants under six months of age are exclusively breastfed.<sup>11</sup>

### Neonatal mortality: a global health priority

Each year approximately 4 million newborns die, most from preventable causes. Deaths in the neonatal period (the first 28 days of life) account for 41 percent of all deaths in children younger than 5 years (figure 1).<sup>12</sup> Most neonatal deaths happen during the first 7 days after birth, known as the early neonatal period.

Millennium Development Goal (MDG) 4 calls for a two-thirds reduction in the death rate for children under five, from 95 per 1000 live births in 1990 to 31 per 1000 in 2015.<sup>13</sup> By 2007 the world was less than half way toward achieving this goal, and death rates are not dropping fast enough to meet the 2015 target. None of the 46 sub-Saharan African countries is on track to reach the MDG target.<sup>14</sup>

Most of the progress in reducing under-five mortality is attributable to lives saved after the first 4 weeks of life, with very slow reduction in the risk of death in the neonatal period. As a result, the proportion of child deaths occurring during the neonatal period has increased. This reflects the relative success of interventions targeting deaths after the neonatal period and the lack of progress in tackling neonatal mortality, particularly in the early neonatal period.<sup>12,15,16</sup>

The burden of newborn death falls disproportionately on the world's poorest communities within the poorest countries or regions: almost 99 percent of neonatal deaths take place in low- and

middle-income countries, with two-thirds occurring in just 10 countries (table 1). A strong focus on sub-Saharan Africa and South Asia is crucial for accelerating progress. These two regions represent three-fourths of all neonatal deaths: 33 percent in sub-Saharan Africa and 41 percent in South Asia.<sup>15</sup>

### Recent evidence on the impact of early initiation of breastfeeding on neonatal mortality

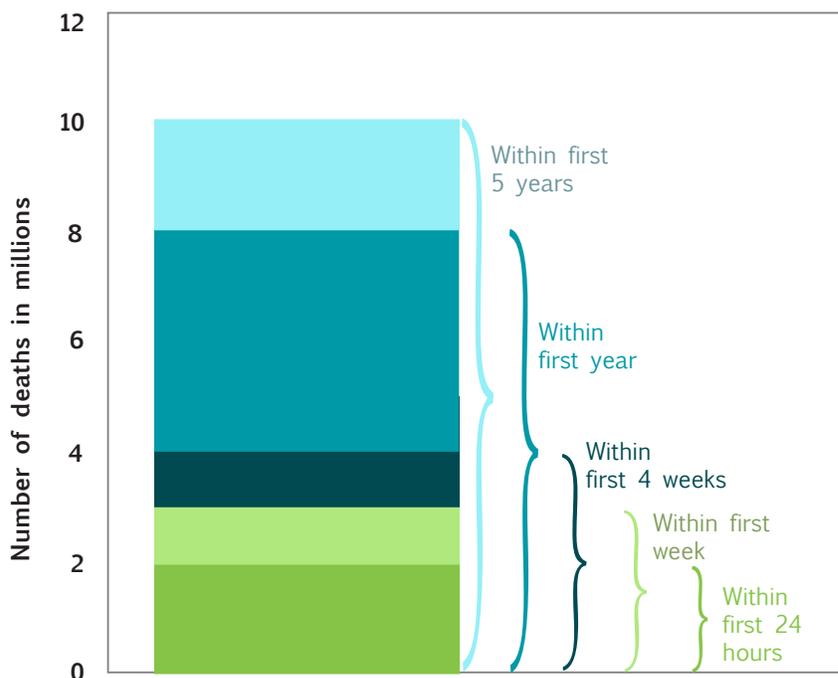
Two recently published studies evaluated the relationship between the timing of initiation of breastfeeding and neonatal death.<sup>6,7</sup> The studies also assessed whether the exclusivity of breastfeeding played an additional protective role. Both studies were conducted in rural settings where most newborns are delivered at home, access to health services is limited, and infections cause many neonatal deaths.

One of the studies, a community-based prospective cohort study in rural Ghana, was nested within a large maternal vitamin A supplementation trial conducted by investigators at the London School of Hygiene and Tropical Medicine in collaboration with the Kintampo Health Research Centre (KHRC), Ghana.<sup>6</sup> The other study, a similar community-based observational study in southern Nepal, was conducted jointly by investigators at the Johns Hopkins Bloomberg School of Public Health and the Nepal Nutrition Intervention Project, Sarlahi (NNIPS).<sup>7</sup> Table 2 provides descriptive information for the two studies.

The studies found:

- **The later the initiation of breastfeeding, the greater the risk of neonatal death.** Initiation of breastfeeding after the first 24 hours was associated with a 2.4-fold increased risk<sup>i</sup> of mortality in Ghana and a 1.4-fold increased risk

Figure 1. Global distribution of under-five deaths by age



Source: World Health Organization, Neonatal and perinatal mortality: country, regional and global estimates. Geneva: World Health Organization; 2006.

Table 1: Countries with the largest numbers of neonatal deaths

Country	Percentage of global neonatal deaths (n=3.99 million)	Neonatal Mortality Rate (per 1000 live births)
India	28%	39
China	9%	18
Nigeria	7%	47
Pakistan	7%	53
Democratic Republic of Congo	4%	47
Ethiopia	3%	41
Bangladesh	3%	36
Afghanistan	2%	60
Indonesia	2%	17
Tanzania	2%	35

Source: UNICEF, State of the World's Children 2010, "State of the World's Children. Special Edition. Celebrating 20 Years of the Convention of the Rights of the Child"; URL (report): <http://www.unicef.org/rightsite/sowc/fullreport.php>; URL (statistical tables): <http://www.unicef.org/rightsite/sowc/statistics.php>.

in Nepal when compared to initiation before 24 hours. The authors of the Ghana study estimated that 16 percent of neonatal deaths could have been prevented if all newborns had been

breastfed starting from day 1 and 22 percent if breastfed within the first hour of birth. The authors of the Nepal study estimated that initiation of breastfeeding within the first hour of birth could

i) Adjusted odds ratio

**Table 2: Studies of the association of timing of initiation of breastfeeding and mortality between day 2 and 28**

Study site	Study type	Study Sample*	Deaths between day 2 and 28	Timing of initiation of breastfeeding				Breastfeeding patterns in first month†		
				Within first hour of life	From 1st hour up to 24th	From 24th hour to 72nd	After first 72 hours	Exclusive	Predominant	Partial
Rural Ghana	Community-based prospective cohort study	10,947 breastfed infants	145 (1.3%)	41%	30%	27%	2%	70%	28%	2%
Southern Nepal	Community-based observational study	22,838 breastfed infants	297 (1.3%)	3%	54%	40%	3%	27%	‡	73%

\* Only infants who survived to day 2 were included in the analyses to minimize the possibility of “reverse causality” (i.e., that timing of initiation of breastfeeding could have been affected by serious illness on the day of birth).

† **Exclusive:** breastmilk and nothing else, not even water, with the exception of vitamin supplements and prescribed medicines.

**Predominant:** breastmilk plus other non-milk fluids.

**Partial:** breastmilk plus animal milk, infant formula, or solid foods.

‡ The Nepal study did not include a “predominant breastfeeding” category because of the common use of goat or buffalo milk within 24-48 hours of birth.

**Source:** References 6 and 7

have prevented 19 percent of neonatal deaths. The apparent beneficial effects of early breastfeeding remained significant after controlling for other factors known to be linked with mortality around the time of birth and during infancy.

• **Greatest impact on mortality through exclusive breastfeeding.** Exclusively breastfed infants were at lower risk of neonatal death than partially breastfed infants, regardless of the timing of initiation of breastfeeding. Partial breastfeeding means that an infant received breastmilk plus animal milk, infant formula, or solid foods.

• **Benefits in settings with high and low prevalence of low birthweight.** The beneficial effects of early and exclusive breastfeeding were found in both sites, with the prevalence of low birthweight at 7 percent in Ghana and 30 percent in Nepal.

The authors of the Ghana study also examined the association between early breastfeeding and infection-specific

**Studies in Nepal and Ghana suggest that initiation of breastfeeding within the first hour of birth could prevent about 20 percent of neonatal deaths.**

neonatal mortality.<sup>8</sup> Of infants in the study who died between day 2 and day 28, two-thirds died from infections and one-third from non-infectious causes. Late (after 24 hours) initiation of breastfeeding was associated with a 2.6-fold increased risk<sup>i</sup> of infection-related neonatal mortality, and partial breastfeeding was associated with a 5.7-fold increased risk of this outcome. No significant relationship was observed between early infant feeding practices and neonatal deaths related to non-infectious causes. These findings suggest a biologically

plausible cause-effect relationship since breastfeeding would be expected to have an impact on infectious causes of neonatal deaths but little or no impact on non-infectious causes.

Both studies considered only deaths occurring after 48 hours, excluded high risk infants from the analysis, and adjusted for potential confounders, but the results might still be confounded by other, unmeasured differences between infants with early vs. late initiation of breastfeeding or exclusive vs. partial breastfeeding.

### Potential links between early initiation of exclusive breastfeeding and lower neonatal mortality

Approximately 86 percent of global neonatal deaths are due to three main causes:<sup>16</sup>

- Severe infections: sepsis/pneumonia, tetanus, and diarrhea (36 percent)
- Asphyxia (23 percent)
- Preterm birth (27 percent)

In very high mortality settings where the neonatal mortality rate is above 45 per 1000 live births, infection contributes to almost half of all neonatal deaths.<sup>16</sup> Early initiation of exclusive breastfeeding may reduce neonatal mortality through the following biological pathways.

- **Provides immune factors present in colostrum.** Beginning breastfeeding immediately after birth ensures that the newborn receives the “first milk” (colostrum), the baby’s first “immunization”. Colostrum protects the newborn from illness by providing a number of immune factors, as well as anti-microbial and anti-inflammatory agents.<sup>ii</sup>

- **Protects against exposure to infectious pathogens.** Early introduction of breastmilk as the exclusive food prevents ingestion of infectious pathogens that can cause gastrointestinal damage.<sup>19,20</sup>

Prelacteal feeds such as water, other liquids, or ritual foods are often a source of pathogens. Unclean water mixed with infant formula powder puts the newborn at high risk of infection. Invasive microorganisms may also be present in the formula powder itself, which can contribute to neonatal sepsis.<sup>21</sup>

- **Promotes optimal maturation of the gut and immune system.** Early ingestion of breastmilk provides nutrients that promote maturation of the intestines and immune system and protect against infectious pathogens.<sup>22</sup> Early gut “priming” is particularly crucial for preterm infants. Research shows that early feeding with non-human milk proteins may severely disrupt this important gut priming.<sup>23</sup>

- **Helps protect against hypothermia.** Early, frequent breastfeeding, especially if accompanied by skin-to-skin contact

with the mother, helps to keep the baby warm and has the potential to prevent hypothermia-related morbidity and mortality.<sup>6,24</sup> Newborn infants are particularly at risk for hypothermia during the first 12 hours after birth, mainly because of heat loss from the evaporation of amniotic fluid in the immediate post-birth period.<sup>25</sup> Exposure to cold and hypothermia is a well-known risk factor for neonatal morbidity and mortality, including an increased risk of pneumonia and sepsis in newborns and young infants.<sup>25</sup>

- **Facilitates sustained breastfeeding.** Early suckling is associated with successful establishment and maintenance of breastfeeding throughout infancy,<sup>26-29</sup> which can contribute to a lower risk of mortality beyond the first few days of life.

In summary, initiation of breastfeeding within the first hour can help prevent neonatal deaths caused by infections such as sepsis, pneumonia, and diarrhea and may also prevent additional hypothermia-related deaths, especially in preterm and low birthweight infants in developing countries.

### Program and Policy Implications

The studies discussed above provide solid evidence that simple, inexpensive interventions have the potential to dramatically reduce neonatal mortality in low-income countries where most births take place at home and access to health services is poor. Facilitating early initiation of exclusive breastfeeding should be part of infant and young child feeding and nutrition programs, child survival initiatives, and the package of delivery care practices in both facility-based and home-based delivery care settings.

Table 3 shows that significant progress needs to be made to ensure that newborns get the best start in life.

**Table 3: Breastfeeding indicators and antenatal/delivery care coverage in six regions**

Region	Early initiation of breastfeeding (2003-2008)	Exclusive breastfeeding (children <6 months at time of survey) (2003-2008)	Antenatal care (any/at least 1 visit) (2000-2008)	Skilled attendant at delivery (2000-2008)
Eastern and Southern Africa	59%	42%	72%	41%
Central and Western Africa	36%	22%	71%	50%
Middle East and North Africa	47%	30%	78%	76%
South Asia	27%	45%	68%	42%
East Asia and the Pacific	46% (*)	(-)	91%	91%
Latin America and Caribbean	48%	41%	94%	91%
World	39% (*)	37%	78%	64%

**Notes:** The percentages for the “World” category include industrialized countries and the Central Eastern Europe/Commonwealth of Independent States when information is available.

(\*) Excludes China

(-) Data not available

**Source:** UNICEF, State of the World’s Children 2010, “State of the World’s Children. Special Edition. Celebrating 20 Years of the Convention of the Rights of the Child”; URL (report): <http://www.unicef.org/rightsite/sowc/fullreport.php>; URL (statistical tables): <http://www.unicef.org/rightsite/sowc/statistics.php>.

ii) Secretary Immunoglobulin A (IgA) is present in highest concentration on the first day of birth and diminishes progressively thereafter.<sup>17</sup> Secretary IgA interferes with adherence of pathogens to the mucosa of the respiratory and gastrointestinal tract, which helps prevent pneumonia and diarrhea. Colostrum also contains high concentrations of leukocytes, protective white blood cells that can defend against bacteria and viruses.<sup>17,18</sup>

Currently, the percentage of infants who are breastfed within the first hour of life and breastfed exclusively varies widely across countries and regions. Several actions can be taken to facilitate early and exclusive breastfeeding.

- **Identify barriers to early and exclusive breastfeeding and then develop appropriate messages, policies, and procedures.** Understanding socioeconomic and cultural barriers to early and exclusive breastfeeding, the attitudes and practices of health care providers and birth attendants, and procedures in health facilities is a critical first step. Messages need to be targeted to mothers, grandmothers, health professionals, and those who assist in home deliveries.

- **Prepare women for birth, breastfeeding, and newborn care.** Infant feeding plans should be made before delivery. The importance of immediate and exclusive breastfeeding can be reinforced in antenatal and postpartum care, child and nutrition counseling, and community mobilization. A recent study in Nigeria showed that women who received psychosocial support during childbirth from a birth companion initiated breastfeeding earlier than those without a birth companion.<sup>30</sup>

- **Equip frontline health workers to promote and support early and exclusive breastfeeding.** Even when there is adequate contact with skilled health professionals, breastfeeding practices are not optimal.<sup>11</sup> This highlights the need for better in-service and pre-service training of frontline health workers, including birth attendants, with an emphasis on counseling skills and actions they can take to help the mother and baby establish and maintain good breastfeeding practices.<sup>10,31</sup> Effective support and counseling in the

first days after birth increases exclusive breastfeeding rates.<sup>32</sup> The trend toward institutional deliveries and the presence of skilled attendants at birth provides an opportunity for scaling up facility-based breastfeeding promotion through routine delivery care services, especially in countries where institutional deliveries are high or rapidly increasing.

- **Adopt and/or enforce national codes of marketing of breastmilk substitutes.** In some countries aggressive marketing of breastmilk substitutes poses a major challenge to improving breastfeeding practices and needs to be curbed. Early initiation of exclusive breastfeeding has the potential to help overcome the influence of such marketing by facilitating a positive early breastfeeding experience and helping mothers establish breastfeeding before they are pressured to introduce breastmilk substitutes.

- **Track breastfeeding indicators.** Collecting data on early and exclusive breastfeeding as part of the health management information system will help assess progress and identify gaps.

## Research Priorities

Research is needed on how to reach women in different settings and how to encourage them to practice early and exclusive breastfeeding. Identifying the optimal type, content, and duration of communication programs to increase early initiation and care for mother and baby can also advance program efforts. Operations research on ways to overcome barriers to early initiation in both facility and home-based delivery care settings is also needed. Another priority is assessing strategies to ensure that mothers of pre-term and low birthweight infants receive the extra support needed for breastfeeding and breastmilk expression.<sup>33</sup>

Effective partnerships and coordination will allow research results to be translated into tangible actions that can have a global impact on child survival and well-being.

Alive & Thrive, launched with a grant from the Bill & Melinda Gates Foundation, is an initiative to improve infant and young child feeding in Bangladesh, Ethiopia, and Viet Nam and inform policies and programs around the world.

For more information  
visit our website:  
[www.aliveandthrive.org](http://www.aliveandthrive.org)

## References

1. León-Cava N, Lutter C, Ross J, Martin L. Quantifying the Benefits of Breastfeeding: A Summary of the Evidence. Washington, DC: Pan American Health Organization; 2002.
2. Horta BL, Bahl R, Martines JC, Victora CG. Evidence on the Long-term Effects of Breastfeeding: Systematic Reviews and Meta-analyses. Geneva: World Health Organization; 2007.
3. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet*. 2000 Feb 5;355(9202):451-5.
4. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*. 2008 Jan 19;371(9608):243-60.
5. World Health Organization, UNICEF. Global Strategy for Infant and Young Child Feeding. Geneva; 2003.
6. Edmond KM, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delayed breastfeeding initiation increases risk of neonatal mortality. *Pediatrics*. 2006 Mar;117(3):e380-6.
7. Mullany LC, Katz J, Li YM, Khatry SK, LeClerq SC, Darmstadt GL, et al. Breast-feeding patterns, time to initiation, and mortality risk among newborns in southern Nepal. *J Nutr*. 2008 Mar;138(3):599-603.
8. Edmond KM, Kirkwood BR, Amenga-Etego S, Owusu-Agyei S, Hurt LS. Effect of early infant feeding practices on infection-specific neonatal mortality: an investigation of the causal links with observational data from rural Ghana. *Am J Clin Nutr*. 2007 Oct;86(4):1126-31.
9. World Health Organization. Thermal Protection of the Newborn: A Practical Guide. Geneva: WHO; 1997.
10. Chaparro CM, Lutter C. Beyond Survival: Integrated Delivery Care Practices for Long-term Maternal and Infant Nutrition, Health and Development. Washington DC: Pan American Health Organization; 2007.
11. United Nations Children's Fund. Tracking Progress on Child and Maternal Nutrition. New York: UNICEF; 2009. Available at: [http://www.unicef.org/publications/files/Tracking\\_Progress\\_on\\_Child\\_and\\_Maternal\\_Nutrition\\_EN\\_110309.pdf](http://www.unicef.org/publications/files/Tracking_Progress_on_Child_and_Maternal_Nutrition_EN_110309.pdf). Accessed December 1, 2009.
12. Lawn JE, Kerber K, Enweronu-Laryea C, Bateman OM. Newborn survival in low resource settings-are we delivering? *BJOG* 2009;116(Suppl.1):49-59.
13. World Health Organization. Health and Millennium Development Goals. Geneva: WHO; 2005. Available at: <http://whqlibdoc.who.int/publications/2005/9241562986.pdf>. Accessed December 1, 2009.
14. World Bank. Global Monitoring Report 2009: A Development Emergency. Washington DC: World Bank; 2009. Available at: [http://siteresources.worldbank.org/INTGLOMONREP2009/Resources/5924349-1239742507025/GMR09\\_book.pdf](http://siteresources.worldbank.org/INTGLOMONREP2009/Resources/5924349-1239742507025/GMR09_book.pdf). Accessed December 1, 2009.
15. United Nations Children's Fund. The State of the World's Children 2009. New York: UNICEF; 2009. Available at: <http://www.unicef.org/sowc09/docs/SOWC09-FullReport-EN.pdf>. Accessed December 1, 2009.
16. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: When? Where? Why? *Lancet*. 2005 Mar 5-11;365(9462):891-900.
17. Welsh JK, May JT. Anti-infective properties of breast milk. *J Pediatr*. 1979 Jan;94(1):1-9.
18. Schack-Nielsen L, Michaelsen KF. Advances in our understanding of the biology of human milk and its effects on the offspring. *J Nutr*. 2007 Feb;137(2):503S-10S.
19. Goldman AS. Modulation of the gastrointestinal tract of infants by human milk. Interfaces and interactions. An evolutionary perspective. *J Nutr*. 2000 Feb;130(2S Suppl):426S-31S.
20. Badruddin SH, Islam A, Hendricks KM, Bhutta ZA, Shaikh S, Snyder JD, et al. Dietary risk factors associated with acute and persistent diarrhea in children in Karachi, Pakistan. *Am J Clin Nutr*. 1991 Oct;54(4):745-9.
21. Drudy D, Mullane NR, Quinn T, Wall PG, Fanning S. Enterobacter sakazakii: an emerging pathogen in powdered infant formula. *Clin Infect Dis*. 2006 Apr 1;42(7):996-1002.
22. Walker WA, Watkins JB, Duggan CMD. Nutrition in Pediatrics: Basic Science and Clinical Applications. 3rd ed. Hamilton, Ontario; BC Decker; 2003.
23. Brandtzaeg PE. Current understanding of gastrointestinal immunoregulation and its relation to food allergy. *Ann N Y Acad Sci*. 2002 May;964:13-45.
24. Christensson K, Bhat GJ, Amadi BC, Eriksson B, Hojer B. Randomised study of skin-to-skin versus incubator care for rewarming low-risk hypothermic neonates. *Lancet*. 1998 Oct 3;352(9134):1115.
25. Pio A, Kirkwood BR, Gove S. Avoiding hypothermia: an intervention to prevent morbidity and mortality from pneumonia in young children. *The Pediatric Infectious Disease Journal*. 2010;29(Number 2).
26. Salaria EM, Easton PM, Cater JI. Duration of breast-feeding after early initiation and frequent feeding. *Lancet*. 1978 Nov 25;2(8100):1141-3.
27. Chandrashekar TS, Joshi HS, Binu V, Shankar PR, Rana MS, Ramachandran U. Breast-feeding initiation and determinants of exclusive breast-feeding - a questionnaire survey in an urban population of western Nepal. *Public Health Nutr*. 2007 Feb;10(2):192-7.
28. Lawson K, Tulloch MI. Breastfeeding duration: prenatal intentions and postnatal practices. *J Adv Nurs*. 1995 Nov;22(5):841-9.
29. Ekstrom A, Widstrom AM, Nissen E. Duration of breastfeeding in Swedish primiparous and multiparous women. *J Hum Lact*. 2003 May;19(2):172-8.
30. Morhason-Bello IO, Adedokun BO, Ojengbede OA, Olayemi O, Oladokun A, Fabamwo AO. Assessment of the effect of psychosocial support during childbirth in Ibadan, south-west Nigeria: a randomized controlled trial. *Aust N Z J Obstet Gynaecol*. 2009 Apr;49(2):145-50.
31. LINKAGES Project. Facts for Feeding: Birth, Initiation of Breastfeeding, and the First Seven Days after Birth. Washington: AED; 2003.
32. Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 2008 Feb 2;371(9610):417-40.
33. LINKAGES Project. Facts for Feeding: Feeding Low Birthweight Babies. Washington: AED; 2006.