Breastfeeding, a child survival strategy against infant mortality in Nigeria

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Babies grow and develop best when they are breastfed exclusively. Much emphasis has been placed on exclusively breastfeeding an infant during the first six months after birth. However, many women especially in the developing countries continue to introduce complementary feeding before the first six months. In Nigeria, high infant mortality rate still remains a major issue of concern. Several studies indicate that the cause of childhood mortality is due to lack of proper breastfeeding. In this review, we focus on the trends and patterns of breastfeeding, causes of infant mortality and breastfeeding of infants from birth to six months, followed by appropriate and adequate complementary feeding for two years and above, as a strategic intervention against infant mortality and the need to create awareness about the benefits of breastfeeding.

Keywords: Breastfeeding, child survival, complementary feeding, infant mortality, Nigeria.

BREASTFEEDING is strongly recommended by WHO and UNICEF as the ideal and appropriate method to feed infants for their optimal growth and development[1]. Breast milk is the ideal nourishing formula/food for infants which should be fed to the infant within the first one hour of birth and sustained for six months. Following this, appropriate and adequate complementary foods should be introduced alongside breast milk for one year or more[1]. According to health experts, breast milk is sufficient to meet the baby's nutritional needs for the first six months without introduction or addition of water, drinks or any other foods[2,3].

Several benefits of breastfeeding are: it stimulates the immune system of babies, protects them against acute respiratory infections, diarrhoea, urinary tract infections, necrotizing enterocolitis, bacterial meningitis, sudden infant death syndrome, lymphoma among others[4]. Breastfeeding also improves response to immunization and secretory IgA antibodies passed to these babies through intake of colostrum, the first milk produced for newborn babies[5–7]. Besides benefiting infants, breastfeeding creates a special bond between mothers and infants; it helps reduce weight gained during pregnancy and others. For an infant, the mother produces adequate breast milk which takes care of the nutritional needs. The breast milk is rich in carbohydrates, proteins, fats, minerals and vitamins, whereas infant formula available as an alternative in the market may not have similar benefits[8].

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Global trends

To monitor infant and child feeding practices, a global database is maintained by UNICEF. The database comprises survey data of 440 households from 140 countries. This annual survey is updated using objective criteria to assess the quality of data and is used to report trends in breastfeeding at global and regional levels as well as in countries[9].

The survey data suggests an increase in exclusive breastfeeding practices in less than six-month-old infants in developing countries (33% in 1995 and 39% in 2010). This increase was most notable in the West and the Central African regions, where exclusive breastfeeding among less than 6-month-old infants improved greatly from 12% in 1995 to about 28% in 2010 (ref. 10). Improvements were also noted in the southern and eastern parts of Africa from 35% in 1995 to 47% in 2010.

However, there is insufficient data on breastfeeding patterns for regions of East Asia, Pacific, Latin America, central Europe, eastern Europe, Caribbean as well as north and middle east Africa. But an insignificant change (about 30% during the preceding 20 years) is seen in breastfeeding infants of less than 6 months in East Asia and pacific regions. Moreover, inspite of notable improvements in specific regions, exclusive breastfeeding rates among less than six-month-old infants largely remain low in developing countries. In a review on global trends of breastfeeding, Cai *et al.*[10] observed data from 66 countries, which covers 74% of the population of the developing countries, against the 38% coverage of countries observed by a different group[11]. The study reported less than 40% suboptimal coverage of infants exclusively breastfed for the first six months of their lives.

Trends in Nigeria

To promote early introduction of breastfeeding after birth, the Baby Friendly Hospital Initiative (BFHI) was started in Nigeria. However, in 2003 the Nigerian Demographic

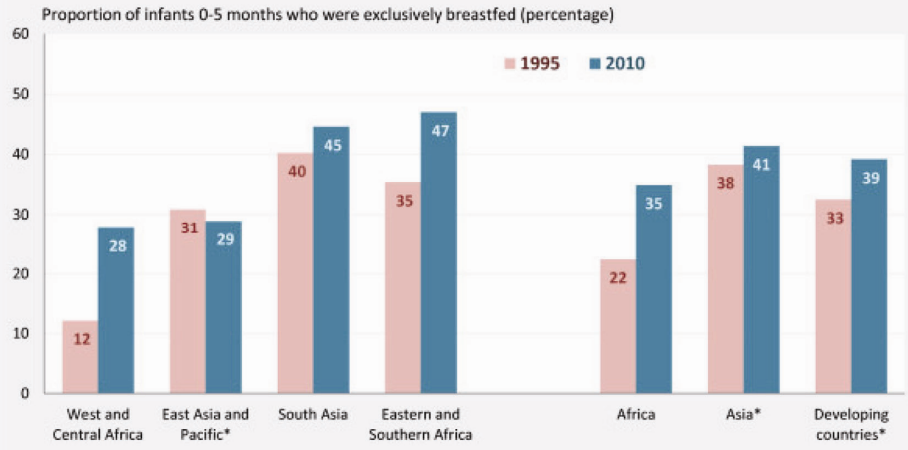

Figure 1. Trends of exclusive breastfeeding of infant less than six months excluding China. (Source: Refs 22, 54, and other national household surveys, around 1995 to 2010.)

and Health Survey (NDHS) found determinants of nutrition of infants and their mothers[12]. The survey examined practices of infant feeding and the duration of breastfeeding, complementary feeding and introduction of micronutrients like vita supplements among others. Breastfeeding was found to be the universal practice with about 97% of children breastfed in the past 5 years. But only 32% of these infants were fed breast milk within the first one hour of birth and about 63% were breastfed within 24 hours. This clearly reflects a delay in breastfeeding.

It is reported that only 16.4% of infants below the age of six months were exclusively breastfed. 26.1% of infants were exclusively breastfed from birth to the first one month, 18.5% at 2 months to 3 months after birth, 7.1% at 4 months to 5 months and 21.9% at 0 to 3 months of age[13]. The proportion of exclusively breastfed children fell from 20% at birth to 19% at 2 months, to 13% at 4 months and declined to 4% at 5 months. This indicates that exclusive breastfeeding rate was 4.5 times lower than the recommended 90% level of exclusive breastfeeding rate by WHO and UNICEF for infants less than 6 months of age[13].

A study on the determinants of breastfeeding among mothers in the eastern part of Nigeria, showed late initiation of breastfeeding with the first one hour of birth and also the rate of exclusive breastfeeding falling from 62.7% at birth to about 37.3% at 6 months[14]. The study concluded that the rate of exclusive breastfeeding was significantly correlated with the mother's age, parity status, education, exclusive breastfeeding awareness, attitude towards exclusive breastfeeding as well as the place of delivery. Another study reported that exclusive breastfeeding rates fell from 57.4% at 1 month of birth to 23.4% at 6 months[15]. Delivery in secondary and tertiary health facilities, the infant's age and higher occupational status were predictors of rate of exclusive breastfeeding.

Another cross-sectional study concluded that only 53% of mothers initiated breastfeeding within the first one hour of birth and only 31% of mothers exclusively breastfed their infants for 6 months[16]. This study revealed 53% higher coverage than exclusive breastfeeding rates reported in Sokoto and Kano states[17,18]. Surprisingly, this study[16] found that the exclusive breastfeeding rate was 31% higher than the 17% projected by the Nigerian Demographic and Health Survey[19].

Breastfeeding as a strategy in reducing infant mortality rates

Among the various strategies and interventions deployed to curb and reduce infant mortality, breastfeeding is found to be most effective, in terms of child survival strategies[20,21]. It is for this reason that breastfeeding is highly recommended by UNICEF and WHO and also the Nigerian breastfeeding policy for child survival and optimal growth[1,22].

A cohort study in Brazil[23] also showed that breastfeeding improved mortality of breastfed babies without taking birth weight into consideration. Findings from this study indicated that the odds of mortality at post perinatal periods were three times higher for babies who are non-exclusively breasted when compared to their exclusively breastfed counterparts.

According to Golding *et al.*[24], infant mortality rates are high due to inadequate dilution of infant formulas, process of preparation and unhygienic practices, consequently contaminating the infant formula milk or the feeding bottles[25,26]. While studying the benefits of breastfeeding in diarrhoea and pneumonia mortality, it was revealed that diarrhoea still remains a major cause of infant deaths less than 5 years of age, and was responsible for 800,000 infant deaths globally[27,28]. It has been reported that breastfeeding also protects against gastrointestinal infections as it contains substances having antimicrobial and immunological properties, anti-inflammatory factors, digestive enzymes, hormones and growth modulators, all protective against several infections[8].

Breast milk contains oligosaccharides that block attachment of pathogens to the mucosa of infants, thereby

preventing development of gastrointestinal infections[29]. Because breast milk helps in zinc and iron absorption[8], infants are protected against infections. Breast milk also contains lactoferrin, a protein which destroys disease-causing agents and reduces response to inflammation. It also forms an attachment to free irons in the intestines, consequently causing a decrease in the amount of iron which iron-dependent enteric pathogens ordinarily have access to.

Breast milk versus infant formula

The benefits of breast milk and infant formula are at par with each other. The immune system of a breastfed child is less compromised compared to a child fed with infant formula[8]. The role of breast milk in an infant's immune system cannot be replicated by infant formulas. It has been observed that infants fed with infant formula are at higher risks of contracting respiratory and gastrointestinal infections.

Many antibodies such as immunoglobulin A (IgA) are produced in breast milk, when the mother comes in contact with antigens present in the environment. IgA is absent in infant formulas. While breastfeeding, the IgA is passively passed to the infant, which protects infants from pathogens by developing passive immunity[5,8]. Also, IgA protects against allergies by inhibiting large molecules of proteins from permeating the small intestinal wall. Vitamin E, which is known as an antioxidant, is present in relatively high quantities in colostrum found in breast milk, particularly in premature babies. Also, presence of high levels of vitamin E benefits preterm infants. Vitamin E has antioxidant properties which protect infants from deleterious side effects of toxicity from oxygen that may damage the eyes and the lungs.

Moreover, non-breastfed infants are vulnerable to pathogens that can cause diarrhoea and other infections. Studies suggest that infants are exposed to many infections during the process of weaning[30,32], even though these weaning foods may contain nutrient supportive ingredients for growth of infants. Respiratory infections such as pneumonia continue to be a major contributing cause of infant mortality of children below five years. In 2010, pneumonia caused about 1.383 million child deaths below five years[26].

It was reported that breastfeeding protects children from respiratory infections, especially in industrialized countries[33]. It is known that breast milk contains several immune cells, immune modulators, antibodies and growth modulators protecting the infant against respiratory infections. Secrotory IgAs are transferred to children by mothers in colostrum, among several growth factors that help stimulate the child's immune system[34,35]. Oligosaccharides inhibit the binding of pathogens to the mucosa of the infant, thereby preventing pneumonia and several respiratory infections[35]. Exclusive breastfeeding, thus has the capacity to reduce childhood mortality of children less than five years of age by about 13%. Thus breastfeeding is the most practical and effective means of decreasing infant mortality[20]. Also, in terms of economic importance of breastfeeding, it can be help in reducing malnutrition risks caused by improper weaning foods and recurrence of infections especially in low income families.

Global trends on infant mortality

Infant mortality can be defined as the death of an infant before his/her first birthday[1]. The number of infant deaths less than one year of age out of one thousand live births is calculated as the infant mortality rate[36]. The number of infant deaths less than one year of age in a region divided by the live births in a particular year and multiplied by 1000 is the infant mortality rate for that region. Causes of infant mortality include sudden infant death syndrome (SIDS), injuries such as suffocation, accidents, complications during pregnancy, complications during delivery, other infections, premature births (before 37 weeks gestational period), perinatal asphyxia, diarrhoea and respiratory infections amongst others[37].

Several countries worldwide have infant mortality rates of about 30 infants out of 1000 live births[38]. In many African countries, infant mortality is comparatively higher than that in other parts of the world. According to available data, six countries namely Nigeria, China, Pakistan, Democratic Republic of Congo, India and Ethopia have high infant mortality rate and the rate is more in the sub-Saharan Africa[39].

According to analysis by the World Health Organization, 4.6 million infant deaths occurred in the first one year of life, accounting for 74% of all under-five mortality. In terms of relative risk of infants dying before their first birthday, the African WHO region is five times higher with infant mortality rates of 60 per 1000 live births than the WHO European region with 11 per 1000 live births.

In 2013, a database[40] on mortality rates of infants under 5 years of 193 countries with years of information was compiled. According to meta-analysis done in 2009, a decrease in neonatal mortality prevalence was observed. Approximately 3.3 million babies died within the first month after birth when compared to the 4.6 million recorded deaths in the year 1990. It was also found that had highest infant mortality rates namely India with 27.8% out of 19.6% of global live births, Nigeria having 7.2% out of 4.5% global live births, Pakistan with 6.9% out of 4% global live births, China with 6.4% out of 13.4% global live births and Democratic Republic of Congo with 4.6% out of 2.1% of global live births[41].

Neonatal mortality rates declined from 33.2 deaths per 1000 live births to 23.9 deaths per 1000 live births between the periods of 1990–2009 (ref. 41).

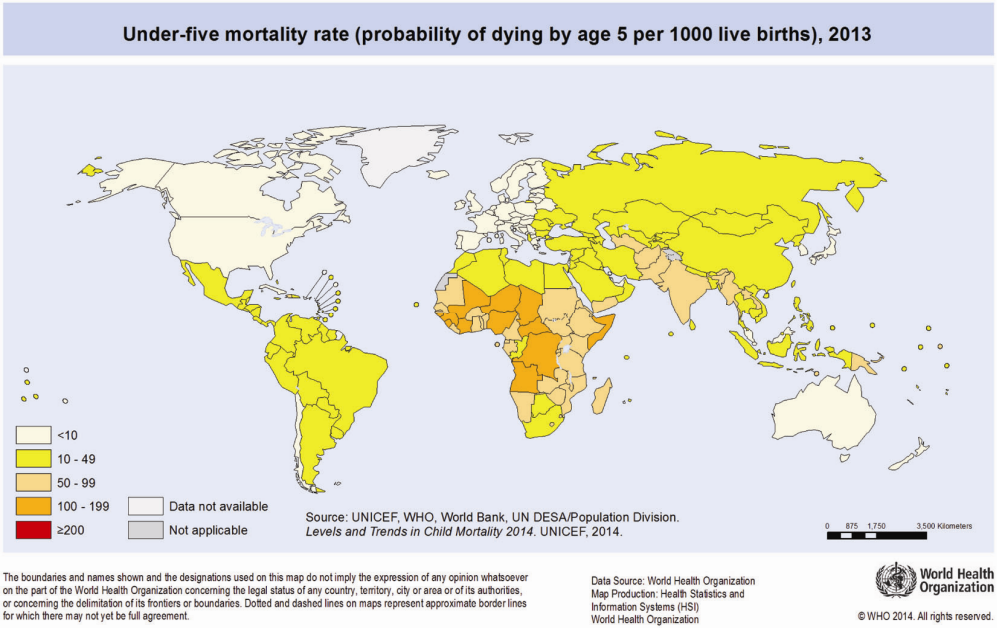

Figure 2. National Infant Mortality Map: Country-wise distribution of national mortality rate[40].

Infant mortality in Nigeria

One of the key indicators of the health status of a country is its infant mortality rate. In Nigeria, for example, the country loses about 2300 under five year olds and 145 women of child-bearing age everyday[38], making the country the second largest contributor to the under-five and maternal mortality rate in the world. According to the NDHS survey (2003), infant mortality and under 5 years mortality rates were 100 and 201 deaths out of 1000 live births respectively[12]. In 2008, it reported 75 for infant mortality and 157 for under-5 year mortality rates. The infant mortality rate is slow compared to the progress of other developing countries that had similar rates in 1990 (ref. 19).

Several studies have utilized analytical models to identify factors that correlate to childhood mortality in Nigeria[42–44]. These studies have assumed childhood deaths to be randomly and independently distributed across families, households and communities. Other studies[45–47] however have shown that childhood deaths can be clustered and concentrated at family, households and community levels, a direct consequence of mortality risks shared among children is due to mortality clustering risks – measurable and immeasurable.

The National Demographic and Health Survey (NDHS) which employed the pattern of clustering to describe the patterns and trends of risks of childhood mortality, found high levels of infant mortality clustering and a significant difference between levels in 1990 and 2008. In 2008, the proportion of mother's child loss of either two or more children slightly fell from 24% in 1990 to about 22.7% in 2008; the proportion of infant deaths per family had the same pattern[21]. However, an increase in terms of reduction was seen. In terms of geopolitical regions, infant mortality was found to be highest in the North Eastern and North Western regions compared to the South East, South West and South South regions. It was concluded that there was a decline in childhood mortality[21].

According to a study on determinants of neonatal mortality in Nigeria[48], infant mortality rates for singleton live births was 36.7 between the year 2003 and 2008 (95% CI: 34.4–39). But despite the decline in neonatal mortality rate, NDHS[49] reported 8% fall from 40 deaths per 1000 live births in 2008 to about 37 deaths per 1000 live births. Nigeria still lags behind in achieving the millennium development goal 4 devoted to the reduction of infant mortality of under 5 year children in 2015 (ref. 49). It was found that male infants significantly had higher risks of neonatal deaths compared to the female infants. This shows consistency in findings from a cross-sectional study conducted in Indonesia[50], where it was found that male infants were significantly more likely to die than females[51]. In Bangladesh, female infants were at negatively risk lower than male infants. This disparity in male/female infant deaths can be attributed to factors such as high vulnerability to infectious diseases, or because the foetal lung in female neonates develops and matures early, decreasing incidence of contracting respiratory diseases[52].

The newborn underweight babies are at the risk of dying one month after birth compared to the newborn with normal weight[48]. This study also found that infants born by caesarean section (c-section) had a relative risk of higher infant mortality than those born by normal deliveries. However, this finding does not corroborate with the available literature that there is no statistically significant relationship between neonatal mortality and the mode of delivery[53]. Mortality rate of neonatals born by c-section is attributed to misconceptions, negative

perceptions, an aversion to c-section and possibly fear among Nigerian mothers[42,43,48]. The study also reported mother's age as a risk factor. It was observed that children born to mothers aged between 20 and 40 years had a significantly lower risk of mortality compared to younger mothers less than 20 years[48]. Another factor contributing to mortality was the birth order of children. It was found that children born with intervals shorter of about 2 to 4 years were at higher risk of mortality than those with longer intervals. The birth place was also seen as an important factor; neonates born in rural areas were at a higher risk of mortality compared to those in urban areas.

A prospective study in Southwest Nigeria[15] found the infant mortality rates to be 68.2 per 1000 live births. In the study, 55.1% of all infant deaths were neonatal deaths with infant mortality rate of 37.6 per 1000 live births and 44.9% of infant deaths were post-neonatal deaths. Also, 44% of neonatal deaths were recorded within 24 h of delivery and 74.1% of neonatal deaths were in the first week of life and perinatal deaths.

Factors such as age of mother (older than 34 years) and order of first births were significantly associated with mortality risk ($P = 0.004$)[17]. The gender of the infant was another factor, as females were 2 times likely to die compared to males in infancy ($P = 0.011$), contrary to previous studies. The environmental factors also play a role in neonatal deaths, as more neonatal deaths were recorded in the dry season ($P = 0.018$), besides other causes like asphyxia (3.8%), congenital (3.8%), sepsis (7.7%), neonatal tetanus (7.7%), maternal death and neglect (7.7%), low weight and premature babies (23.11%) and other unknown causes. 46.2% of deaths occurred in the postnatal period due to fever infection (39.3%), congenital abnormality (4.3%), diarrhoea (4.3%), acute respiratory infections (8.7%), measles (8.7%) and malnutrition (13%) as well as unknown factors lead to post neonatal deaths[15].

Infant mortality rates were found to be 65.8 out of 1000 live births in south west Nigeria[44]. The most common cause of infant mortality is low birth weight, which accounted for about 25% of infant deaths while maternal deaths and sepsis accounted for 9.4% and 12.5% mortality respectively. Other causes included neonatal tetanus (3.1%), diarrhoea (3.1%), asphyxia (9.4%) and congenital abnormality (3.1%). significant predictors of childhood mortality were seen to be low birth weight (RR = 4.7, $P = 0.03$), lack of delivery attendant (RR = 5.01, $P = 0.018$), delivery out of health facility (RR = 3.6, $P = 0.05$) and traditional birth attendants (RR = 2.7, $P = 0.03$)[44].

Conclusion

In this article, we have reviewed breastfeeding and infant mortality. Review of literature suggests feeding is an optimal method to feed infants from birth to 6 months which should be continued with appropriate complementary feeding for two years and beyond. This feeding method has also been highly recommended by WHO and UNICEF. Other international bodies too have strongly identified breastfeeding with child survival and reduction of childhood mortality. It is also known that breastfeeding protects infants from several infections such as diarrhoea, pneumonia, gastrointestinal infections, urinary tract infections, sudden infant death syndrome and others, all cause infant deaths. As breastfeeding provides adequate nutrition to infants, protects them from diseases and infections, it is a cost-effective method/intervention to reduce infant mortality. The Federal Government baby-friendly hospital initiative along with other agencies should create awareness on the benefits of breastfeeding as well as appropriate complementary feeding and weaning foods.

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