REVIEW ARTICLE

Community-Based Antenatal and Perinatal Interventions and Newborn Survival

***S. S. Sule** MCommH, MWACP, FMCPH, ****A. A. Onayade** MPH, FWACP, FMCPH.

Department of *Community Health, Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife,
** Community Health, Consultant and Senior Lecturer, Obafemi Awolowo University, Ile-Ife, Nigeria.

ABSTRACT

Background: *As part of the millennium development goal (MDG) 4 to reduce by two-thirds the mortality rate among children under five, neonatal mortality rate (NMR) needs to be reduced by half. This is a selective review of the literature of the morbidity and mortality patterns among newborns as well as cost-effective interventions and community aspects of newborn care.*

Methods: *Documented causes of morbidity and mortality among newborns were examined in the overall context of developing and developed countries. Cost-effective interventions that have been proven to be inexpensive with evidence or potential to save newborns' lives by international agencies concerned with health, journals and other publications were reviewed. Community aspects of newborn care and what is required at the individual, household and community levels to reduce neonatal morbidity and mortality were also reviewed.*

Results: *A score of recent publications by the World Health Organization (WHO), Save-the-Children, United Nations Children's Fund (UNICEF), journals, and other scientific publications reported consistently that neonatal mortality constitute 40-70% of deaths in infancy and that 99% of these deaths occurred in developing countries, with highest neonatal mortality rates (NMRs) in sub-Saharan Africa. The global burden of newborn illness shows that a disparity of up to 30-folds exists between countries with highest and lowest NMRs. Four million babies die in developing countries and about 42% of these deaths are due to infections. Other major causes include perinatal asphyxia (21%), birth injuries (11%), prematurity and low birth weight (10%) and congenital abnormalities (11%). It was also observed that two-thirds of the deaths in the neonatal period occur in the first week; among these deaths, two-thirds occurred within the first 24 hours. Review findings also revealed that an integrated, proven and cost-effective intervention such as the mother-baby packages incorporated into a functional and sustainable healthcare delivery system and improved household practices will save newborns' lives. Reports showed that to achieve meaningful development, neonatal mortality will need to be reduced in developing countries.*

Conclusion: *Programmes that are necessary for the reduction in neonatal morbidity and mortality rates are for countries to employ rational mix of quality clinical services, effective public health measures and inexpensive community-based interventions in public and private sectors and to scale-up known cost-effective interventions.*

KEYWORDS: *Pattern; Cost-effective intervention; Community; Newborn health; Development.*

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INTRODUCTION

Over 4 million newborn die each year[1] and 99 percent of these deaths occur in developing countries[2,3]. For every baby who dies in the first week after birth, another is born dead[1]. In the first month of life, a child's risk of death is nearly 15 times greater than any other time before his or her first birthday.[1] Child survival efforts of recent decades have helped reduce the death rate among children under-five years, the biggest impact has been in reducing mortality from diseases that affect infants and children more than one month old. Perinatal and neonatal mortalities are increasingly becoming important public health issues in many developing countries, as post-neonatal mortality rates fall[4].

Perinatal and neonatal deaths are not recognized as a problem in many societies, largely because they are so common. Even some communities in developing countries have adapted to this situation by not recognizing the birth as complete and by not naming the child until the newborn has survived an initial period.[5] In developing countries, priority has been given to the reduction of post-neonatal and early childhood mortalities in the erroneous belief that perinatal mortality cannot be influenced by public health measures[5].

Some of the factors that lead to perinatal and neonatal deaths result from inadequate care of mothers and babies, while other factors like nutrition and women's status are socio-economic and cultural in nature. These two kinds of factors interact in ways that are not always well understood and are often ignored. The causes of perinatal and neonatal deaths are often presented as maternal, obstetric and fetal. The ways, in which these different types of causes affect the risk of death, include poor maternal health, inadequate care during pregnancy, and inappropriate management of complications during pregnancy and delivery, poor hygiene during delivery and the first critical hours after birth, and lack of immediate

Correspondence to: **Dr. S. S. Sule**

newborn care[6].

The global burden of newborn illness shows that a disparity of up to 30-folds exists between countries with highest and lowest NMRs. Reports of neonatal mortality suggest that there are differences between developed and developing nations, and within developing nations in both the NMR and the causes of neonatal deaths [5,7-10]. Even in the same country, NMR differs from place to place. For example, NMR in Nigeria was recently estimated to be 53 deaths per thousand live births,[11] and there are more neonatal deaths in the northern part of the country compared to the South. The highest rate of 61 deaths per thousand live births was reported in the North-East region of the country, while the lowest value of 39 deaths per thousand live births was reported in the South-West region[11].

In most developing countries, people living in rural communities and resource poor settings in urban communities bear the greatest burden of perinatal and neonatal morbidity and mortality.[12] In Nigeria, NMR in urban areas was estimated to be 37 deaths per one thousand live births, while in rural areas it was estimated to be 60 deaths per one thousand live births [11]. This difference may be attributable to certain determinants that are directly or indirectly linked to poor neonatal health outcome. For instance, lack of amenities and poor infrastructures, ignorance of the population, and patronage of traditional birth attendants (TBAs). Some of these are major causes of delay in seeking health care services. Poverty and certain traditional and cultural experience of the population are also very important determinants. Others would include physical barriers presented by difficult geographical terrain and other social and organizational as well as economic barrier to seeking health care services.

Perinatal mortality is the probability of a fetus dying in the uterus after 28 weeks' gestation (in Nigeria) and in the first 7 days of life and is a measure of the quality of obstetric care in a country. Neonatal mortality rate is used to measure the probability of dying within the first 28 days of life, while infant mortality and under-five mortality are measures of probability of dying before the first birthday and between birth and the fifth birthday respectively[11,13]. A reduction in infant mortality rate (IMR) is accepted as an indication of improvement in socio-economic status and provision of health care services in a community.[5,6] Efforts to reduce infant mortality, however, must focus on the patterns and causes of neonatal deaths since neonatal mortality accounts for about 50%-70% of deaths in infancy[14] and about 40% of deaths among children under five years of age world wide[3,15]. Under-five mortality rate (U5MR) is used world-wide as measure of critical indicator of the well-being of children[13]. Nigeria currently ranks 13th position amongst the U5MR ranking world-wide[13].

Commission on Macroeconomic and Health set up as part of the process of developing and implementing the MDGs by the WHO provide a broad review of health importance in the development process and specifically mention perinatal morbidity, noting that perinatal diseases are associated with lifetime consequences[14]. For example, about one-quarter of newborn in developing countries start life with impaired growth in the uterus. Impaired growth predisposes infants to low birth weight and to consequences ranging from increased risk of infections[16] and death, to developmental problems, like poor attention span and a much higher burden of disease throughout life. Low birth weight infants remain undernourished while developing as children and adolescent and will easily grow into undernourished women of childbearing age who themselves often deliver low birth weight infants[17].

Effective public health actions and inexpensive clinical interventions can reduce perinatal and neonatal deaths. This is particularly evident in resource poor communities where access to modern medical technologies is limited. This makes it imperative to embark on cost-effective and proven community based interventions. The objectives of this review therefore is to highlight the morbidity and mortality patterns among newborns, cost-effective interventions and community aspects of newborn care.

Global Burden and Determinants of Newborn Illness and Death

The global burden of newborn illness and death in the developing countries as shown in figures 1 and 2 revealed that about 42% of deaths during the neonatal period are due to infections [pneumonia (19%), neonatal tetanus (14%), sepsis and meningitis (7%) and diarrhoea (1%)]. While other causes include, birth asphyxia (21%), birth injuries (11%), low birth weight (10%), and congenital abnormalities (11%)[18].

Many maternal factors, such as hypertensive disorders and infections, as well as some obstetric complications like abruptio placentae and multiple pregnancies often result in neonatal mortality[5]. The degree to which neonatal deaths are associated with maternal complications and maternal deaths is demonstrated by data that showed that if a mother dies after delivery, this often leads to death of the newborn infant as well. Preterm birth, one of the commonest causes of neonatal death, demonstrates how different factors combine to result in death. For example, abnormal presentations of many preterm fetuses may contribute to birth asphyxia and trauma. Additionally,

preterm newborns do not adapt well to extra-uterine life. They often have difficulties with initiation of breathing and are very susceptible to cold injury that can easily be fatal. Infections, which have also been implicated to cause preterm birth, can also cause death in preterm infants.

Fortunately, most fetuses are carried to term in good health and are well equipped for extra-uterine life. If they die or are permanently damaged, it is because of obstetric complications like poor management of delivery that causes asphyxia and/or trauma, or inappropriate care after birth. In many parts of developing countries health care services are not always available, and quality of care may be poor. Birth attendants are not adequately trained to deal with the basic needs of newborns and in the management of other problems or diseases that may occur.[6] This situation is evident in urban/rural dichotomies in the level of provision of orthodox medical care and its effects on perception of health intervention packages such as the rates of births attended by trained health professionals, exclusive breast-feeding rates, the acceptance of vaccination and the utilization of maternal and child health care services.

Other important determinants in developing countries that are common to the poor outcome of most disease condition in neonatal periods is that, most babies are born at home, and a small proportion of these births take place with the assistance of a trained birth attendant[19]. Secondly, most babies born in institutions are discharged within 24 hours of birth. Therefore, most diseases such as birth asphyxia, neonatal tetanus, omphalitis, other neonatal infections, neonatal jaundice, hypothermia and neonatal hypoglycaemia manifest when the newborn is at home and must therefore be recognized at home. Family members, especially mothers, need to be able to recognize signs of newborn disease promptly in order to take the decision to seek care[20]. Thirdly, when these conditions are recognized, such neonates must be able to reach quality care that are appropriate in time to save their lives or reduce serious morbidity and complications and consequently to reduce mortality.

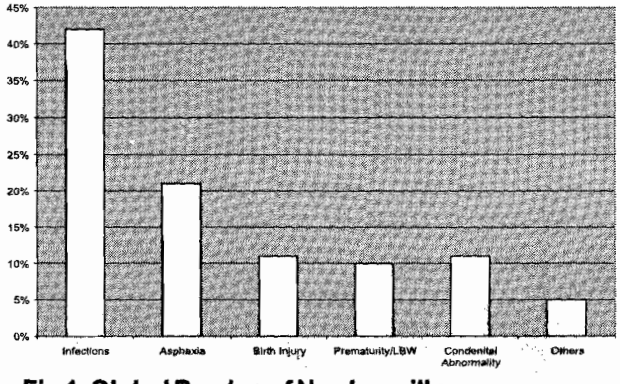

Fig 1. Global Burden of Newborn illness

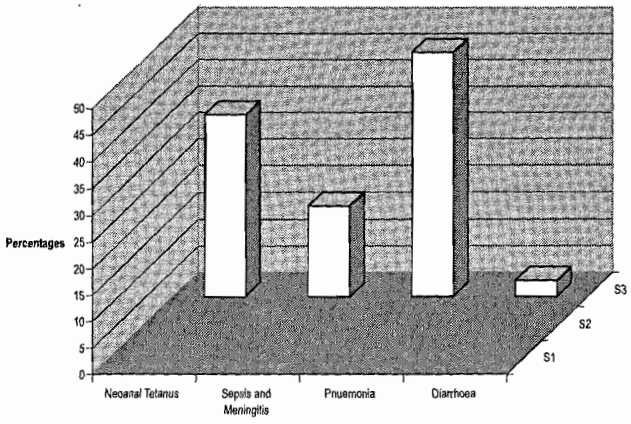

Fig 2. Burden of Infections among newborn in developing countries

It is important to emphasize the point that in the newborn period, particularly during the first week of life, most diseases present with non-specific signs. It may therefore be difficult to determine the exact cause of illness because of the overlap of these signs. There are specific factors that have been found to influence some disease conditions in neonatal period, for example neonatal hypoglycaemia occur in conditions where infants become cold, or where initiation of feeding is delayed[21]. Small and premature babies are at a greater risk of hypothermia[22]. Neonatal tetanus and omphalitis have been linked to mothers not vaccinated with the recommended tetanus vaccines and the use of non-sterilized instruments during delivery[20]. Asphyxia kills or damages preterm fetuses during or immediately after birth more frequently than term fetuses[23]. Asphyxia kills about 900,000 newborn each year according to WHO estimate and the 3% of the 120 million babies born each year in developing countries who develop birth asphyxia require resuscitation that may reduce the mortality from it, which is not often available[23].able to respond quickly and correctly when needed. Adequate ventilation is more important than additional oxygen; quick action

In summary, the major determinants of perinatal and neonatal mortality are centred on three types of delay. Type one delay is the delay to seek appropriate health care by the mother and these can be addressed by improving girl-child education, restoring decision-making power of the mother; creating awareness and the provision of information on warning signs of danger signals during perinatal and neonatal period, and birth preparedness. The second type of delay is the delay to access health care facility and this can be addressed by good road network, siting of first level health care facilities within five kilometres to where people live or work, efficient communication network and the provision of transportation by the community and other stakeholders. These first two types of delay occur at the community

level. The third type of delay is delay in receiving care at the health facility and this can be addressed by investment in strengthening health systems, from community to the referral level.

Cost-Effective Interventions to Save Newborn Lives

Most mortality and morbidity in the perinatal and neonatal periods are caused by conditions that can be prevented and treated. Interventions that benefit mothers by reducing maternal deaths and complications in pregnancy, during labour and after delivery coupled with special attention to such needs of the newborn may help ensure the survival and improved health of newborn infants. Conceptual frameworks to advance newborn health and survival in developing countries as part of saving the newborn initiative have been advocated. The framework identifies that, and if implemented well, would generally improve newborn outcome (i) use of routine maternal and newborn care and good-quality services, (ii) response to maternal danger signs, (iii) response to non-breathing newborn, (iv) care for the low-birth baby, (v) response to newborn danger signs, particularly, those of infections[24].

Simple and cost-effective interventions like resuscitation, immediate breast-feeding, warmth, cleanliness, hygienic conditions for delivery and cord care, and the prevention, early detection and management of major newborn disease should be available at the community level. Packages in the Safe Motherhood Initiative (SMI) or Make Pregnancy Safer (MPS) that target pregnant women and newborn that are currently being promoted globally should be strengthened at the primary health care (PHC) level. These intervention packages, when integrated into the existing PHC system should be attainable, sustainable and provided in a cost-effective manner to all communities in developing countries, particularly in rural areas and resource poor settings in urban areas where access is limited and poverty is prevalent.

These interventions have an immediate beneficial impact on the mother and the newborn. In fact, Interventions that prevent morbidity during the neonatal period have the potential to be highly cost effective and affect health far beyond the neonatal period[25]. Other packaged intervention strategies at the community level that can save newborns' lives include, the current concept of maternal and newborn health initiative; the concept of school health programme as an agent for positive change in the community which can be done by promoting sustainable actions that will help individuals at the formative stage of their life to adopt healthy lifestyle and create condition conducive to health; the retraining of birth attendants in the use of delivery kits and life saving skills; and the role of Non-Governmental Organizations (NGOs) and Community Based Organizations (CBO) should also be emphasized.

Specific interventions such as good maternal nutrition, the prevention and management of anaemia, and improvement in the quality of antenatal care (ANC) may reduce the incidence of complications during pregnancies and delivery and thereby improve the chances of survival of the mother, the fetus and the newborn. Other specific interventions such as community mobilization and health education through mass media campaign and direct counselling by community health workers to effect attitudinal changes among people in the community that will promote newborn health and survival should be promoted.

At birth, resuscitation should always be anticipated. Thus, every health worker involved in maternity and delivery services and trained traditional birth attendant should be skilled in newborn resuscitation, (including anticipation, preparation, timely recognition and quick and correct action) and should have the necessary equipment and supplies clean and functioning to be able to respond quickly and correctly when needed. Adequate ventilation is more important than additional oxygen; quick action with the bag and mask is more important than intubation. Therefore resuscitation can and should be initiated virtually anywhere, including those places where oxygen is not readily available. The choice of device for ventilation is not as important as how effectively it is used. The most common causes of failed resuscitation are failure to recognize the problem promptly, not reacting quickly enough and not ventilating effectively. Correct technique and assessment of the effectiveness of ventilation are critical.

Advanced procedures (chest compression, intubations, administration of oxygen, and use of drugs) are needed only in a small proportion of cases. These procedures have strict indications and are beneficial only in specific circumstances and if carried out by an experienced person in referral centres[23]. Basic resuscitation will not help all newborns but, done correctly, it will help most, even where only few resources and simple training are available. The probability of sequelae is low if a newborn infant is resuscitated promptly and correctly and starts breathing spontaneously within 20 minutes. Whether resuscitation succeeds or fails will depend on anticipation, preparation, availability of skilled attendants and functioning equipment, timely initiation and correct procedures. Delayed or ineffective action makes resuscitation more difficult and increases the risk of brain damage[23].

At birth newborn babies should be properly kept warm and breastfed immediately. Those that need

antibiotics should be identified and given promptly. A comprehensive report in the "State of the World's Newborns"[25] indicates that improving the health of newborns is largely a matter of applying sound health care practices appropriately. It should be recognized that, in order for strategies aimed at improving neonatal outcome to be effective, affordable and sustainable, they must take place within a broader context of improving maternal and child health, and be integrated within safe motherhood and child health programmes. One other possible way of ensuring sustainability is to promote intersectoral collaboration among several organizations including those with origins at the community level. For instance, there should be synergism amongst the health sector, the education sector, social services sector, professional organizations like the Paediatric Association of Nigeria, Society of Gynaecologist and Obstetricians of Nigeria, Association of Community Health physicians, NGOs, etc.

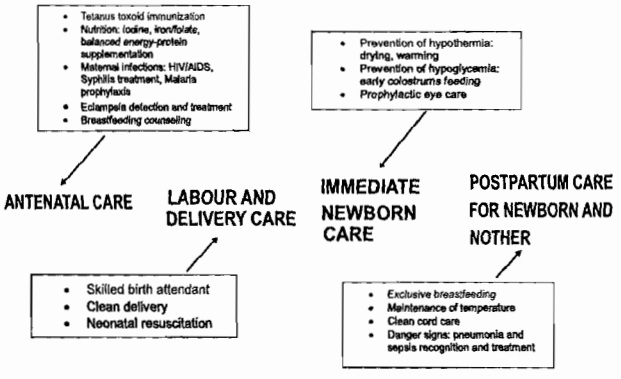

Fig 3. Priority interventions for improving perinatal and newborn care[2]

Community Aspect of Newborn Care

Clearly, advances in medical treatment alone are not enough to reach nearly 11 million children who die every year before their first birthday. Child survival and health depends on a complex combination of factors. Present evidence support the fact that the care children receive at home, in their families and in their communities are first and are as important as the treatment available in health facilities. This is why improving the way children are treated and cared for in the community is now recognized as a vital weapon in the struggle to protect children at risk of dying from common, largely preventable diseases[26]. Promotion of increased neonatal survival and health in the community, particularly in resource limited settings requires interventions that address the main causes of mortality in the first 28-days of life: infections; delivery associated problems; low birth weight and congenital malformations. Although some of the necessary interventions will best be delivered during pregnancy and childbirth, interventions will also have to ensure the provision of improved care for the neonate at the health care facility and the household level[27].

In those places where neonatal mortality is the highest, home-care is often inadequate and the neonates are not taken to health facilities, or are taken only when it is already too late for effective treatment to be instituted. Services required at the community level include the early detection of danger signals by the healthcare worker at the PHC level. Such signals may include: refusal of feeds, vomiting, seizures, fever, colour changes, etc and referral of complicated cases such as neonate at risk of birth asphyxia, prematurity and low birth weight, and infections. This further necessitates the call for the strengthening of PHC services, the referral system and improvement in the quality of health care service delivery at the referral centre

Because the majority of infants in developing countries are born at home (60%), improvement in facility-based health services will address only part of the problem and must be complemented by intervention at the home and community level. These bring to fore the need to develop and promote minimal components of community-based interventions to improve perinatal and neonatal outcomes[19]. Various cadres of community health workers can provide these interventions through the PHC system. These interventions include:

1. **Antenatal Care:** Birth preparedness, promotion of ANC, counselling on breastfeeding, voluntary counselling and testing (VCT) of mothers for HIV infection, improved nutrition, recognition of danger signs and seeking emergency care; iron-folate and iodine (in deficient areas) supplementation, treatment of malaria in endemic area, treatment of syphilis, and measures to prevent MTCT of HIV. This can further be strengthened by providing free ANC services to mothers in the community.
2. **Intra-Partum and Immediate Post-Partum Care:** Training of birth attendants and families to recognize birth complications, clean delivery, drying and warming of baby, placing baby on mother's abdomen or breast, clean cord cutting, basic resuscitation, avoidance of inappropriate oxytocic use and immediate initiation of breastfeeding.
3. **Postnatal Care:** keeping baby warm, early and exclusively breastfeeding, cup-spoon feeding of low birth weight infants who cannot suck directly from breast, hygienic eye/skin care, education of families and caregiver on recognition of illness, early care-seeking from appropriate providers, treatment and referral, if necessary.

The Save Newborns Live initiative and other researchers recommend that a set of proven, cost-effective interventions should be integrated into existing health care services[28,29]. Millions of newborn deaths could be avoided and child health experts predict that the MDG to reduce under 5 mortality by two-third cannot be met unless neonatal mortality is at least halved, which will require greater emphasis and the need for more resources to be invested in proven, low cost intervention designed to address newborns' needs[30], most of which have been highlighted in this paper.

Interventions need not be expensive; even in more developed countries, neonatal and perinatal mortality rates fell long before intensive-care neonatal units were developed, thanks to simple low-cost interventions like the use of antibiotics and better routine maternal and newborn care.

The interventions that save newborns' lives depend on three items (i) a functional and sustainable health system, (ii) planning at the local level and (iii) improved household practices. Since most births in less developed countries occur at home, there is a need for parents to be educated about what they can do to save the newborns' lives[31]. Families need to adopt better nutritional practices, including breastfeeding; learn how to dry and warm their newborns; and better understand the danger signs of maternal and neonatal complications. The Mother-Baby package[18], introduced by WHO's Maternal Health and Safe Motherhood Programme (SMP) in 1995, comprises a cluster of interventions designed to support countries in striving to attain the goals of the Safe Motherhood Initiative. These goals include improved newborn health. The overall aim is a substantial reduction in maternal, perinatal and neonatal mortality and morbidity.

Reducing neonatal mortality rate is also an important component of the demographic transition from high to low fertility and mortality ratio and to sustainable rates of population growth. Neonatal morbidity and mortality have important socio-economic consequences, and many conditions that contribute to neonatal mortality can also cause severe disability. For example, for every newborn that dies from asphyxia, another suffers lifelong impairment such as cerebral palsy or developmental delay[32]. The costs associated with such disabilities strain the health systems, while caring for disabled or such children burdens families[28].

CONCLUSION

Reducing perinatal and neonatal mortality is the key to achieving the target set by the MDG 4 in reducing mortality among under-five children, particularly in developing countries. From the literature reviewed, programmes that are necessary for the reduction in neonatal morbidity and mortality rates are for countries to employ rational mix of quality clinical services, effective public health measures and inexpensive community-based interventions in public and private sectors and to scale-up known cost-effective interventions. Even in resource limited settings, these interventions are attainable, sustainable and affordable at the family and at the community level. Health of the newborn child is important in the development process and can never be over-emphasized.

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