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<u>Essay 4</u>

Neonatal health in Tanzania – current situation and future outlook

by

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Abbreviations: ANC – antenatal care; EmOC – emergency/essential obstetric care; HIV – human immunodeficiency virus; IMCI – Integrated Management of Childhood Illness; IMR – infant mortality rate(s) (per 1000 live births); IPTp – intermittent preventive therapy in pregnancy (for malaria); LBW – low birth weight; MDG – Millenium Development Goal(s); NMR– neonatal mortality rate(s) (per 1000 live births); PMNCH – Partnership for Maternal, Neonatal and Child Health; PMR – perinatal mortality rate(s) (per 1000 live births); PMTCT – prevention of mother-to-child transmission (of HIV); U5MR – under five mortality rate(s) (per 1000 live births); WHO – World Health Organization

Table of Contents   *Page*

Introduction

Only recently adequate attention has been given to the state of neonatal health in developing countries.[1-7] Out of approximately 10.6 million children under five who die each year worldwide, close to 4 million are newborn infants.[1,7] Almost the same number of pregnancies (3.2 million) results in a stillbirth.[8] More than 98% of these deaths take place in developing countries.[1] The main reasons for neonatal deaths worldwide are infections (36%), prematurity/LBW[A] (28%) and birth asphyxia (23%).[1,6,7] The higher the NMR, the higher is the overall proportion of these three main causes within the number of neonatal deaths.[1] 50% occur on the first day, 75% during the first week of life.[1] Within the group of stillbirths, almost 1 million occur at the time of delivery, and about the same number of neonatal deaths is related to hypoxemic events during delivery.[9]

Black and colleagues showed that the relative proportion of neonatal deaths increases as U5MR decreases.[10] Over the last decades, neonatal mortality has not decreased to the same extent as infant or under-five mortality.[1,7] These findings indicate that current maternal and child health programs have not focussed enough on the neonate. This is a public and individual health tragedy as many effective interventions are known and available at low cost which could prevent up to 65 percent of neonatal deaths in developing countries.[2] Several authors convincingly argue that MDG 4, the reduction of U5MR by two thirds between 1990 and 2015, will not be achievable if NMR will not be reduced significantly worldwide.[1,4,5,7,11]

Tanzania is one of the severely affected countries. Due to its large number of births (among the 20 countries with the highest absolute numbers)[12] and a NMR of 32/1000,[13,14] it is among the 20 countries with the highest absolute numbers of neonatal deaths.[12] In addition, almost the same number of pregnancies leads to stillbirths, resulting in a PMR of 42/1000.[13] Thus there is enough reason to analyze the medical and structural causes, including risk factors, underlying cultural, socioeconomic issues and health systems aspects, of neonatal deaths and stillbirths, and to look at the strategies which Tanzania is about to implement as effective interventions on the population level to reduce perinatal and neonatal mortality significantly. This essay is an attempt to do so.

[A] Mainly LBW is analyzed in the literature as birth weight is more easily obtainable than a correct information on gestational age. But still many LBW infants may be premature as well, thus these two entities will be considered together, although they do not necessarily mean the same in the individual infant.

Current situation

For several years, NMR in Tanzania was reported to be around 42-43/1000.[15,16] In the last survey (2004/2005), much lower U5MR, IMR and NMR were reported.[13] The NMR fell by 21% from 42/1000 in 1999 to 32/1000 in 2004,[13,14] although the same level of NMR had been reported already in 1992.[17] In 2000, PMR was 69/1000,[18] whereas it was 42/1000 in 2004/2005.[13] If these data prove to be replicable in future surveys then MDG 4 could be achievable in Tanzania by 2015.[14] The reasons for this marked decline are not completely clear, but some ascribe these changes, among others, to the introduction of IMCI, a stronger focus on maternal and child health, and stronger political commitment.[13,14]

Apart from these surveys and a report on Africa's newborns,[13-17] there are no nationwide data on stillbirths, perinatal and neonatal mortality due to lack of a functioning vital registration.[11,14] Reports of hospital- and community-based studies provide a wide range of PMR and NMR, and cannot readily be generalized to the whole country. Still they do provide useful information about locally relevant levels of death. The most recent community-based studies date back into the late 1990's and give a PMR of 27-58/1000, and a NMR of 17-34/1000 in rural northern Tanzania,[19,20] whereas most other, older reports give a PMR of 58-125/1000,[21-25] and a NMR of 81/1000.[24] Thus it might be that indeed PMR and NMR levels are falling in Tanzania. A distinct pattern between rural and urban sites is not visible, even not in the last national survey: here rural mortality rates were lower than urban rates.[13] But it should be noted that in certain marginalized groups like pastoralists NMR can be > 100/1000, pointing to specific problems in these communities.[26,27]

Hospital-based studies give a PMR of 35-124/1000.[11,21,25,28,29] NMR is not easy to determine from these studies because many neonates, who are born in hospital and are not sick, are discharged very early. Thus it is often not possible to calculate NMR accurately. Several authors argue that PMR in hospital is higher than in community studies because of risk selection,[11,21] but this argument is questioned by the fact that in some studies with high PMR the rate of fresh stillbirths occurring during delivery is very high (> 40%), indicating also a problem in the actual care in hospital.[11,19] In addition, others could demonstrate that after an intervention period it was possible to lower hospital PMR to levels which were equal to or lower than community-based PMR.[28,29]

The time of neonatal deaths reflects the need for appropriate perinatal and neonatal management: 36-65% of deaths occur on the first day of life,[30,31] 64-83% in the first week.[31,32] These figures are even somehow worse than the international estimates.[1] Several studies also document that not only more than half of the births take place at home,[13,19,20] but that also more than 40% of all neonatal deaths occur at home/in the community.[19,20,31]

Medical causes

The reports on hospital- and community-based PMR and NMR also provide information about locally relevant causes of death. In most studies, LBW and/or prematurity are associated with the highest neonatal mortality risk, resulting in relative risks/odds ratios ranging from 5 up to 45:1 compared to term infants or those with > 2500 g.[11,19,20,32,33] As LBW prevalence is in the range of 7.8-19%,[11,13,19-22,32,34-36] up to 68% of neonatal deaths are in LBW/ premature infants.[30,32] Infections (16-39%),[11,30-32,37] birth asphyxia (19-37%),[11,30-32,34,37] and prematurity (15-29%)[11,31] are the most common causes of deaths. In prematurity, respiratory distress syndrome seems to play a major role,[11,38] but also infections and asphyxia.[30,32,34] Contributing factors like hypothermia[32,37,39] and hypoglycemia[32,37] have been studied as well. Congenital malformations usually contribute less than 10% to the NMR.[31,34,37] The largely increased mortality risk of twins versus singletons was demonstrated in several studies.[11,22,40] It should be noted that in many of these studies PMR consists of > 50% of stillbirths.[11,19,29]

In the recent report on Africa's newborns, country-wide estimates of causes of neonatal mortality have been published.[14] These figures still carry a high degree of uncertainty as only 6-8% of all births are registered officially in Tanzania, more in the urban than in the rural areas where in turn more births take place.[13,14,41] Causes of deaths are not easy to establish and to ascertain. Further, many neonates die not only from one cause, but from several like infection and prematurity or hypothermia and low birth weight. Nevertheless, the leading causes are infections like pneumonia, sepsis and meningitis (28%; 32% if diarrhea (2%) and tetanus (2%) are included).[14] The other two important causes are prematurity/LBW (27%) and birth asphyxia (26%).[14] These data are in line with the international (infection 36%, prematurity/LBW 28%, asphyxia 23%)[1,6] and regional sub-Saharan (infection 37%, prematurity/LBW 25%, asphyxia 24%)[14] estimates. The total number of stillbirths is estimated at 42000/year, which almost equals the number of neonatal deaths.[14] Hence, in Tanzania the PMR contains a very high proportion of stillbirths (> 50%),[14,20,21,25] calling for substantial improvement of antenatal and obstetric care.

Structural causes

All factors which affect the well-being of the pregnant woman and mother after delivery are equally important to the well-being of the fetus and neonate. These have been examined already in detail in another essay, which therefore is referred to as a reference.[42] Here some additional, but due to space constraints only the most important aspects with regard to neonatal health are discussed.

a) Cultural and socioeconomic factors

Cultural traditions may impair the chance of neonatal survival. Unhygienic delivery and neonatal care can be one major obstacle, like applying cow dung to the umbilicus or using non-sterile instruments for cord-cutting.[26,43] Delayed initiation of breastfeeding or giving substitutes like water, tea, honey for colostrum may be especially harmful, resulting in non-exclusive breast-feeding and infection.[44] Seclusion practices for the mother and neonate after delivery may delay care-seeking in case of illness.[45] Recognition of symptoms of illness is often poor,[31,37] and frequently traditional healers are consulted before contact with the formal health system.[44,46-50]

In many communities, the husband or mother-in-law decides when to seek care.[37,50] This explains why severe delays can result in the absence of decision-makers.[31] Perceived or real problems of accessibility (distance, means of transportation, cost) are equally important.[13,50] An older report argues that seasonal patterns influence NMR: during the wet, rainy season LBW and neonatal deaths are more frequent, which may be linked to food shortage and higher maternal work load during this time.[51]

Higher education (female literacy rate 62%, 16 points lower than male literacy rate)[12] is considered to be protective for neonatal health. But in the last survey, the highest NMR and PMR were found within the lowest and surprisingly highest educational level.[13] Possibly this can be explained by the fact that more educated women in general have their children later which may then increase the risk of neonatal death due to the age of mother.[13]

Despite the common notion of the link between poverty and poor health outcome, remarkably little differences of NMR and PMR are found in the different wealth quintiles (6%).[13,14] This finding deserves further investigation as one could possibly find out how to avoid increased NMR/PMR in poorer segments of societies elsewhere.

b) Health systems aspects

Poor quality of care (no or poorly performing staff, lack of equipment/medication) is definitely another impediment.[13,37] Less than 100 obstetricians, (C. Köbler, personal communication) too few midwives,[42,52] less than 50 pediatricians (C. Schmidt, W. Schimana, personal communications) and less than 200 pediatric nurses (unpublished results) try to supervise

and guide the work in this area of ANC, obstetrics, perinatal medicine and neonatology, far too few to improve the quality and quantity of outreach and hospital care significantly. Several studies demonstrate the great need for improvement as more than 50% of perinatal and neonatal deaths are considered to be preventable.[11,31,34,44] Obstetric and neonatal care in the community is not good either which is reflected by the high rate of deliveries and neonatal care without skilled attendance.[12,14,20,53] As in the field of maternal health, skilled health workers are urgently needed.[7,25,52]

c) Risk factors

Antenatal and obstetric risk factors like maternal anemia, HIV infection,[33,54,55] malaria,[56] syphilis,[20,44] pre-eclampsia, previous infant's death, multiple pregnancy, breech, obstructed labor, intrapartum hemorrhage and home delivery without skilled attendance greatly increase the mortality risk mainly due to intrauterine death, perinatal birth asphyxia and LBW/prematurity.[11,13,19,20,25,37] The increased mortality risk in LBW infants has been mentioned before; NMR can be up to 86/1000.[13] The high frequency of LBW (up to 19%) is most likely linked to maternal malnutrition.[20] In Tanzania, 10% of women of child-bearing age have malnutrition (BMI < 18.5 kg/m²), more in rural areas, in less educated and poorer women.[13]

Maternal age < 20 and > 40 years results in a NMR of 45/1000.[13] Primigravidae[20,34] and multigravidae (> 7 deliveries) have an increased NMR of 42/1000.[13] If the birth interval is < 24 months, then NMR rises to 63/1000.[13] Short birth intervals are more common if the previous child died.[20,27] Male sex is another risk factor for neonatal death (last national survey:[13] NMR 39/1000 vs. 29/1000 in females).[27] The risk factor analysis for PMR essentially reveals the same picture.[13]

Maternal deaths during and after delivery or during the first year of life pose an increased risk of neonatal or infant death.[57,58] Tanzanian data show a fourfold increased risk for this vulnerable group of neonates and infants, most likely due to lack of care and breast feeding.[58]

Interventions[B]

As maternal and neonatal health are closely interconnected, it is of no surprise that interventions to improve neonatal health must not only focus on the neonate, but also on the pre-pregnancy phase, the pregnant woman, the time of delivery and after delivery on the then mother. Likewise, the different levels of care need to be considered: care at home and in the community, including traditional healing systems; outpatient facilities and outreach activities; and hospital care. This approach, also known as the continuum of care and outlined in depth in the recent report on Africa's newborns,[14] will be followed when analyzing the interventions and their coverage rates to improve neonatal health in Tanzania.[C] It will also help to spot the gaps in interventions.

Before pregnancy, the educational level and nutritional status of adolescent girls and women must be improved (for current levels see previous chapter). Education will not only help the women to raise their social status, but also to decide on contraception methods, birth spacing, healthy behavior during pregnancy, childbirth and postnatal period, place of delivery etc.[14] Nutrition must be improved as well, as a recent Tanzanian study with supplementation of multivitamins could show a positive outcome in the neonates.[35] If it is possible to introduce a pre-conceptional folic acid supplementation scheme remains to be seen in view of the high number of unintended/unplanned pregnancies.[20,37] Higher levels of family planning methods (currently 20%) would be helpful in delaying first pregnancies, in birth spacing and total fertility levels.[13,14] Prevention and treatment of HIV, sexually transmitted and other infections would improve women's health status.

During pregnancy ANC levels are very high in Tanzania (94%), but many women come quite late for the first visit during pregnancy, and quality of ANC is not always good.[12-14] The use of bednets (25%)[41] and of IPTp (53%)[14] is still too low, as well as PMTCT coverage (18%) (W. Schimana/, personal communication). The number of HIV infected pregnant women has not decreased substantially during recent years.[59] Tetanus immunization levels in pregnant women are already high, thus > 90% of neonates are protected against neonatal tetanus.[12] Still, the disease is not eliminated in Tanzania. Efforts have to increase to reach also the remaining, unprotected women and their newborn infants.

When it comes to delivery, the major obstacle will be to increase the number of deliveries with skilled attendance (currently 43%, significantly more in wealthier people)[12-14] and in EmOC facilities (no data available) in order to improve newborn care including resuscitation.[60] The linkage between deliveries starting at home (> 50%) and referral to EmOC facilities is still too weak. Although there are some examples of transportation for

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[B] Although it is acknowledged that social, educational, economic and political changes are equally important for the improvement of neonatal health, this essay is confined more to the medical interventions in order to cover this field in more detail.
[C] For more information on the continuum of care please refer to the figure in the appendix and to reference 14.

pregnant women, available data do not indicate clearly whether neonates benefit from this approach.[61-63] Interventions like steroids for preterm labor or prophylactic antibiotics in premature rupture of membranes are only possible in health institutions with good infrastructure.[14]

In the postnatal period, levels of early and exclusive breast feeding are far from optimal (41%) although levels of "any" breastfeeding are > 90%.[14] Here great efforts have to be made to improve the situation. A study from Ghana could show the marked effect of early and exclusive breast feeding on neonatal survival.[64] Routine newborn care and extra care for LBW/premature infants and sick neonates need to be implemented universally (at present only 47-54% of neonates, significantly more in wealthier families),[14] including topics like warmth, hygiene, nutrition, kangaroo mother care, and early recognition of disease. Neonates who are born at home need to be brought earlier to medical attention in case of illness. A study from northern Tanzania gives an interesting example how the provision of clean delivery kits reduced the incidence of neonatal infections (and puerperal sepsis) in the community even in the absence of skilled attendants.[43] Another study among the Maasai could show how culturally appropriate changes in cord care (water or milk instead of cow dung application) and the provision of sterile delivery kits dramatically reduced the mortality from neonatal tetanus (from > 80/1000 to 0.75/1000) and the NMR (from > 200/1000 to < 50/1000).[26]

If all interventions were introduced with 90% coverage along the continuum of care and at the different levels of care, it is estimated that the NMR could be reduced by 33-64%, saving up to 29000 newborn lives annually.[14]

In addition, Tanzania was one of the first countries which introduced IMCI in the country. According to recent data, IMCI is introduced in almost all districts in the country (90%).[14] In the meantime WHO has recognized that a neonatal IMCI component is essential for the future success of the program, and has developed and tested a neonatal IMCI module successfully. Therefore it can be expected that IMCI in Tanzania will be enlarged by the neonatal module soon.

Promises and obstacles

A positive sign is that the Tanzanian government seems to be committed to achieving a marked reduction in neonatal mortality, including the related areas of perinatal mortality and stillbirths. This is demonstrated by the fact that Tanzania is one of the leading founders of the Partnership for Maternal, Neonatal and Child Health (PMNCH) and that it has recently created a local Tanzanian group within PMNCH (www.who.int/pmnch/en). Another bilateral partnership with Norway is underway to give these efforts further support (www.norad.no/default.asp?V_ITEM_ID=7551).

As Tanzania was one of the first countries which introduced IMCI in the national health system, probably it will soon adopt the neonatal IMCI module, recently developed by WHO. The government is equally committed to improving maternal health status which gives some reason to hope that the number of maternal deaths, stillbirths and perinatal deaths will decrease.[14]

On the other hand, some words of caution are necessary. At present, the existence of PMNCH is not well known in the country (W. Schimana, C. Schmidt, personal communications), thus it will take some time to present and introduce the objectives of PMNCH into the daily work of the health system. Previous experience from the introduction of IMCI in Tanzania should also give some reason for caution. Although IMCI training has taken place in > 90% of districts in Tanzania,[14] this is not equivalent to the actual provision and utilization of IMCI in all districts (T. John, personal communication). Hence it may be over-optimistic to expect that the neonatal IMCI module will be introduced soon and will produce significant improvements quickly. The latter concern is further based on the fact that even with a huge effort in the pilot districts, the original IMCI intervention only produced a reduction of U5MR by 13% instead of the expected 50-70%.[65]

Another concern is the low number of deliveries with skilled attendance.[12-14] So far it does not seem that the country can introduce any effective measures to increase the number of deliveries with skilled attendance and in health institutions. Even if the latter were true, the quality and quantity of care provided by the health institutions is quite low, so that improvements in obstetrics and neonatology are badly needed, but difficult to achieve.[11,31,34] Reportedly, obstetric and neonatal departments are overwhelmed by the workload, and working conditions are poor in every aspect (C. Köbler, C. Schmidt, personal communications; personal experience).[11] The two largest hospitals, being at the same time university faculties of medicine, have a PMR of around 100/1000 (Bugando Medical Centre Mwanza: C. Köbler, personal communication) and 120/1000 (Muhimbili Medical Centre Daressalaam: reference 11). Roughly half of the deaths are stillbirths, again half of these fresh stillbirths. These very high PMRs indicate, besides some risk selection, a low level of quality of care in these major centers of the country. Thus it is hard to imagine that in other

hospitals much better results are achievable with even fewer staff. Still, there are reports from rural areas which showed much lower PMR and early NMR in hospitals.[28,29]

As in maternal health, the need for skilled health workers is immense. In this context, an initiative by the US-based Touch Foundation is most welcome which tries to increase the quantity and quality of health workers through a cooperation with a Tanzanian medical university (www.touchfoundation.org).

At present, it is not clear if Tanzania will also try to introduce a nation-wide program in community-based neonatology as it is planned in India.[66] Because of the low percentage of deliveries with skilled attendants, this could be a possibility to reduce the number of neonatal deaths in the community as it has been demonstrated by the work of A. Bang and colleagues from India.[67] But at the same time, Tanzania must work on improving the number of deliveries with skilled attendants and in health institutions. Community-based neonatology programs are no substitute for improvement in institutional health care, they are only an additional strategy.

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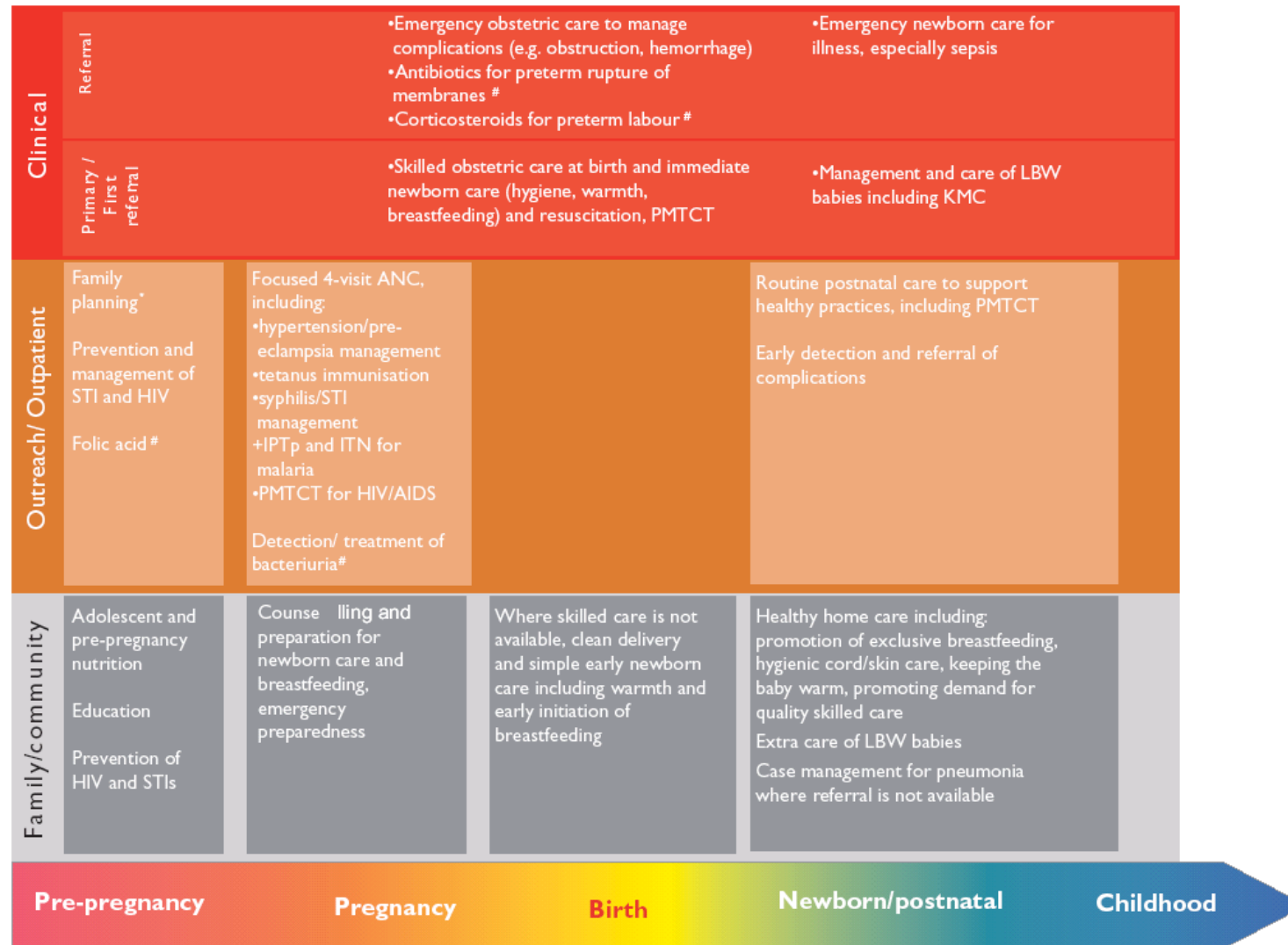
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FIGURE II.3 **Interventions that reduce newborn deaths within the continuum of care**

Source: Adapted from references[11;14;18;19]

		Pre-pregnancy	Pregnancy	Birth	Newborn/postnatal	Childhood
Clinical	Referral		•Emergency obstetric care to manage complications (e.g. obstruction, hemorrhage) •Antibiotics for preterm rupture of membranes # •Corticosteroids for preterm labour #		•Emergency newborn care for illness, especially sepsis	
Clinical	Primary / First referral		•Skilled obstetric care at birth and immediate newborn care (hygiene, warmth, breastfeeding) and resuscitation, PMTCT		•Management and care of LBW babies including KMC	
Outreach/ Outpatient		Family planning* Prevention and management of STI and HIV Folic acid #	Focused 4-visit ANC, including: •hypertension/pre-eclampsia management •tetanus immunisation •syphilis/STI management +IPTp and ITN for malaria •PMTCT for HIV/AIDS Detection/ treatment of bacteriuria#		Routine postnatal care to support healthy practices, including PMTCT Early detection and referral of complications	
Family/community		Adolescent and pre-pregnancy nutrition Education Prevention of HIV and STIs	Counselling and preparation for newborn care and breastfeeding, emergency preparedness	Where skilled care is not available, clean delivery and simple early newborn care including warmth and early initiation of breastfeeding	Healthy home care including: promotion of exclusive breastfeeding, hygienic cord/skin care, keeping the baby warm, promoting demand for quality skilled care Extra care of LBW babies Case management for pneumonia where referral is not available	

*. Evidence published since the Lancet newborn survival series shows a mortality and morbidity reduction from birth spacing[15;16]

+. A new Cochrane review shows significant benefit of insecticide treated materials for neonatal outcomes[17]

#. Additional interventions which are more complex to implement and become more cost-effective with a stronger health system and lower neonatal mortality rate

Acronyms: KMC=Kangaroo Mother Care, ANC=antenatal care, IPTp=intermittent preventive treatment in pregnancy for malaria, ITN=insecticide treated bednets, LBW=low birthweight

For more information please refer to reference 14.