



# Performance of high impact interventions for neonatal care, and applicability to kenya

## Key messages

- Neonatal health care policy and planning for pre-term and underweight babies should consider the upscaling of interventions with the highest impact on outcomes.
- Kangaroo Mother Care (KMC) is an effective evidence-based intervention to reduce neonatal morbidity and mortality, and the health system plays an essential role in the scale-up and adoption of KMC.
- Although KMC has been identified as one of the high impact interventions for the management of low birth weight and premature babies, the coverage of this intervention is extremely low.
- Recommended immediate newborn care practices include thermal care, hygienic cord care and early initiation of breastfeeding.
- Thermal care of newborns (immediate drying and wrapping, skin-to-skin contact after delivery, and delayed bathing), as one of the recommended strategies to reduce hypothermia, contributes to neonatal morbidity and mortality.
- Early initiation of breastfeeding, which is defined as breastfeeding of the baby within the first hours of birth, decreases the risk of mortality in neonates of low birth weight. This intervention needs to be promoted to improve its coverage in the community.

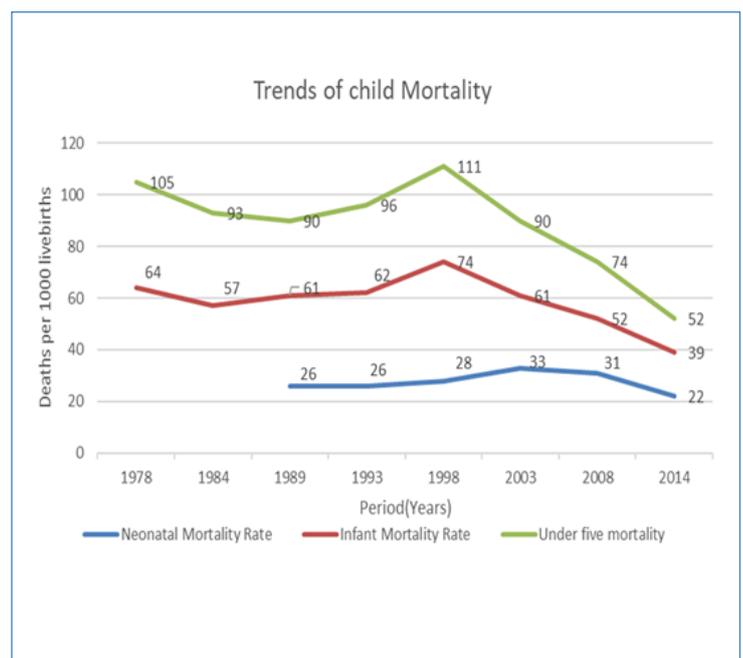
## Background

Globally, 2.8 million newborns die each year, with low and middle-income countries (LMICs) contributing to 98% of this burden. Most of these deaths occur in South-East Asia and sub-Saharan Africa (Lawn et al., 2014). Accelerating the scale-up of high impact interventions that address the major causes of neonatal death is critical for countries to achieve the health targets for SDG 3 of reducing neonatal mortality to at least as low as 12 per 1000 live births.

In Kenya, neonatal mortality has continued to be a major health challenge for the past decade. According to Kenya Demographic Health Survey, while under five mortality decreased by 50% since 1990, neonatal mortality (death in the first 28 days of life) has remained relatively stagnant decreasing at a slower rate and currently stands at 22/1,000 per live births (KDHS, 2014).

Estimates show newborn deaths account for 45% of all deaths of children under five years and 56% of infant (less than one year) deaths. The main causes of neonatal death are birth asphyxia (31.6%), prematurity (24.6%), and neonatal sepsis (15.8%).

Figure 1: Trends of child mortality



There is need to determine why the rates have remained high despite the high impact interventions already put in place. Some of the low-cost high impact interventions put in place for neonatal care include; neonatal infection management, kangaroo mother care, early initiation of breastfeeding, thermal care for all newborns, and cord care immediately after delivery.

## Interventions

1. Kangaroo Mother Care (KMC): Widely acknowledged as a critical evidence-based, low-cost intervention for improving the health and survival chances of premature and low-birthweight infants. It promotes exclusive breastfeeding of the infant and allows for early discharge of the mother from a facility. KMC be practiced both in the hospital and within the community. In low-birthweight infants, KMC reduces neonatal mortality by 40%, hypothermia by 66%, and nosocomial infection by 55% (Conde-Agudelo, Belizán, and Diaz-Rossello, 2014).
2. Exclusive Breastfeeding: The World Health Organization (WHO) recommends exclusive breastfeeding of infants until the age of six months. Infants who are exclusively breastfed for six months experience less gastro-intestinal morbidity, less respiratory morbidity, and less infection-related neonatal mortality than partially breastfed neonates (WHO, 2014c).
3. Neonatal Infection Management: Sources of infection among neonates include the mother's birth canal, the environment in which the neonate is delivered, hands of the person assisting with the delivery, and through the umbilical cord. These factors suggest that most of the infections can be prevented through observing clean practices during delivery and in the post-partum period, in addition to proper clinical care for newborns. For cord care, WHO recommends daily chlorhexidine (CHX) application to the umbilical cord stump during the first week of life for newborns (WHO 2014c). CHX cleansing of the umbilical cord stump is an evidence-based intervention that reduces newborn infections.
4. Neonatal Thermal Care: Thermal care for all newborns at the time of delivery and immediately after include immediate drying and wrapping, skin-to-skin contact after delivery and delayed bathing.

## Objective

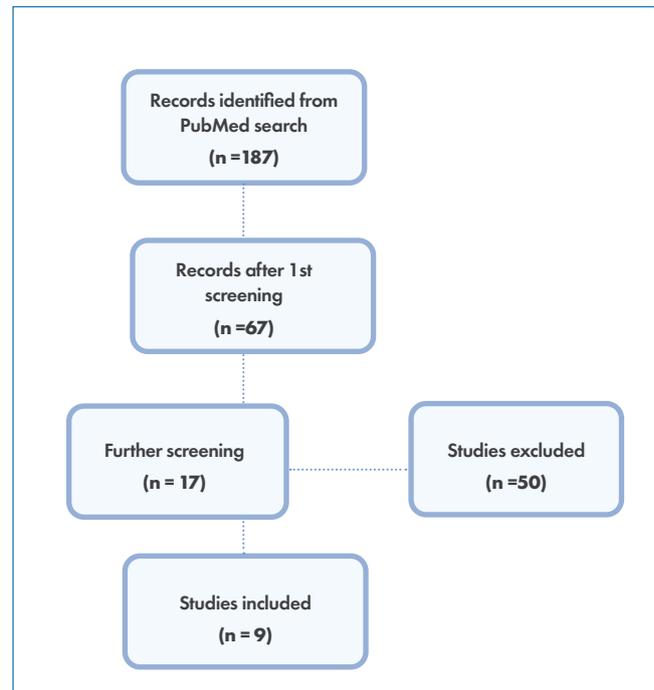
To evaluate the performance of high impact interventions for neonatal care and applicability to Kenya.

## Methods

Rapid evidence synthesis of published literature. We searched the PubMed database using specific search terms as shown in figure 2. The search generated a total of 187 peer reviewed

publications. A title screening of the publications gave us 67 relevant publications, while further screening of the abstracts resulted in 17 publications, 5 which were relevant to Africa and the rest global.

**Figure 2: Study inclusion/exclusion criteria**



### Search terms:

“Neonatal care” OR “neonatal management” OR “neonatal intervention”) AND (“High impact interventions” OR Effectiveness OR mitigation OR solutions OR strategies OR approaches) AND (“Neonatal Infection Management” OR “Kangaroo Mother Care” OR “Neonatal Thermal Care” OR “early initiation of breastfeeding”)

## Results

Seventeen publications were included in the review (table 1). Most studies looked at the impact of the interventions of neonatal care and its applicability. Among the interventions mentioned included the KMC, exclusive breastfeeding, neonatal infection management and thermal neonatal care.

The evidence search revealed that infants who are exclusively breastfed for six months experienced less gastro-intestinal morbidity, less respiratory morbidity, and less infection-related neonatal mortality than partially breastfed neonates. KMC reduced neonatal mortality significantly. Clear and consistent communication between Health Care Workers (HCWs) and health facility leadership is an important enabler of successful implementation of high impact interventions.

**Table 1: Summary of related publications**

Intervention	Study	Outcomes	Effect of intervention	Recommendation
Neonatal Infection Management	Alejandro MM, Lansang MA, Dans LF, Mantaring JB 3rd. Intravenous immunoglobulin for treating sepsis, severe sepsis and septic shock. Cochrane Database Syst Rev. 2013 Sep 16;2013(9):CD001090. doi: 10.1002/14651858.CD001090. pub2. PMID: 24043371; PMCID: PMC6516813.	Intravenous immunoglobulin (IVIG), as adjunctive therapy, does not reduce mortality. For Immunoglobulin gamma M (Ig-M) enriched IVIG, the trials on neonates and adults were small and the totality of the evidence is still insufficient to support a robust conclusion of benefit.	IVIG showed no significant reduction in mortality for;  - Standard IVIG (RR 1.00; 95% CI 0.92 to 1.08; five trials, n = 3667)  - IgM-enriched polyclonal IVIG (RR 0.57; 95% CI 0.31 to 1.04; three trials, n = 164)	Adjunctive therapy with monoclonal IVIGs remains experimental.
	Blencowe H, Cousens S, Mullany LC, Lee AC, Kerber K, Wall S, Darmstadt GL, Lawn JE. Clean birth and postnatal care practices to reduce neonatal deaths from sepsis and tetanus: a systematic review and Delphi estimation of mortality effect.  BMC Public Health. 2011 Apr 13;11 Suppl 3(Suppl 3):S11. doi: 10.1186/1471-2458-11-S3-S11. PMID: 21501428; PMCID: PMC3231884.	According to expert opinion, clean birth and particularly postnatal care practices are effective in reducing neonatal mortality from sepsis and tetanus.	Thirty experts reached consensus regarding reduction of neonatal sepsis deaths by clean birth practices at home (15% (IQR 10-20)) or in a facility (27% IQR 24-36)), and by clean postnatal care practices (40% (IQR 25-50)).  The panel estimated that neonatal tetanus mortality was reduced by clean birth practices at home (30% (IQR 20-30)), or in a facility (38% (IQR 34-40)), and by clean postnatal care practices (40% (IQR 30-50)).	Further research is required regarding optimal implementation strategies.
Kangaroo Mother Care (KMC)	Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database Syst Rev. 2016 Aug 23;2016(8):CD002771. doi: 10.1002/14651858.CD002771. pub4. PMID: 27552521; PMCID: PMC6464509.	Buy-in of KMC at health facilities, staff shortages and turnover inhibit implementation in health facilities.	KMC was associated with a reduction in the risk of mortality (typical risk ratio (RR) 0.60, 95% confidence interval (CI) 0.39 to 0.92; eight trials, 1736 infants), nosocomial infection/sepsis (typical RR 0.45, 95% CI 0.27 to 0.76), hypothermia (typical RR 0.34, 95% CI 0.17 to 0.67), and length of hospital stay (typical mean difference 2.2 days, 95% CI 0.6 to 3.7).  At latest follow-up, KMC was associated with a decreased risk of mortality (typical RR 0.67, 95% CI 0.48 to 0.95; 11 trials, 2167 infants) and severe infection/sepsis (typical RR 0.56, 95% CI 0.40 to 0.78).	Evidence from this updated review supports the use of KMC in Low Birth Weight (LBW) infants as an alternative to conventional neonatal care, mainly in resource-limited settings.  Further information is required concerning the effectiveness and safety of early-onset continuous KMC in unstabilized or relatively stabilized LBW infants, as well as long-term neuro-developmental outcomes and costs of care.
	Ghojzadeh M, Hajebrahimi S, Pournaghi-Azar F, Mohseni M, Derakhshani N, Azami-Aghdash S. Effect of Kangaroo Mother Care on Successful Breastfeeding: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Rev Recent Clin Trials. 2019; 14(1):31-40. doi:10.2174/1574887113666180924165844. PMID: 30251612.	KMC was found to increase some measures of infant growth, breastfeeding, and mother-infant attachment.  KMC reduced risk of severe infection/sepsis.  Infants on KMC gained more weight.  KMC contributed to better bonding between mother and baby in both low and high-income countries; and also increased father involvement.	Compared with Conventional Neonatal Care, KMC was found to reduce mortality at discharge or at 40 to 41 weeks' post-menstrual age; increased weight, length, and head circumference gain; and breastfeeding.  KMC decreased the length of hospital stay by 1.6 days.	Findings indicated a superiority of KMC over Conventional Neonatal Care (CNC) in terms of breastfeeding success.  Assessment of the complications and costs of KMC implementation is recommended.

Intervention	Study ID	Outcomes	Effect of intervention	Recommendation
	Jafari M, Farajzadeh F, Asgharlu Z, Derakhshani N, Asl YP. Effect of Kangaroo Mother Care on hospital management indicators: A systematic review and meta-analysis of randomized controlled trials. <i>J Educ Health Promot.</i> 2019 May 14;8:96. doi: 10.4103/jehp.jehp_310_18. PMID: 31143813; PMCID: PMC6532364.	KMC improves hospital management indicators (HMI) but not significantly.	The overall late onset sepsis (LOS) standard different between groups (KMC vs. CNC) was - 0.91 days (95% confidence interval [CI], -2.14-0.32, Q = 25.6, df = 10, P = 0.004, I <sup>2</sup> = 60.98).	According to the current study result and other studies that report a positive effect of KMC on the health status of the newborns and parents, the implementation of KMC in LMICs is recommended.
	Sharma D, Farahbakhsh N, Sharma S, Sharma P, Sharma A. Role of kangaroo mother care in growth and breastfeeding rates in very low birth weight (VLBW) neonates: a systematic review. <i>J Matern Fetal Neonatal Med.</i> 2019 Jan;32(1):129-142. DOI: 10.1080/14767058.2017.1304535. Epub 2017 Mar 27. PMID: 28274153.	KMC has a positive effect on the growth of the VLBW infants and also leads to an increase in breastfeeding rates.	All included studies except one either showed positive effect or no effect on growth and breastfeeding rates.	KMC should be an integral part of neonatal care and should be promoted as an essential newborn care component.
	Pados BF, Hess F. Systematic Review of the effects of skin-to-skin care on short-term physiologic stress outcomes in pre-term infants in the neonatal intensive care unit. <i>Adv neonatal care.</i> 2020 Feb;20(1):48-58. DOI: 10.1097/ANC.0000000000000596. PMID: 30893092.	Skin-to-skin care (SSC) is safe and has stress-reducing benefits. SSC should be considered an essential component to providing optimal care in the newborn intensive care unit (NICU).	Although there have been some mixed findings, the research supports that SSC improves short-term cardio-respiratory stress outcomes compared with incubator care.  The evidence is clearer for studies reporting stress hormone outcomes, with strong evidence on SSC reducing cortisol and increases oxytocin levels in preterm infants.	More research is needed to determine the timing of initiation, duration, and frequency of SSC to optimize the stress-reducing benefits.  Future research should include the most fragile infants, who are most likely to benefit from SSC, utilize power analyses to ensure adequate sample sizes, and use sophisticated data collection and analysis techniques to more accurately evaluate the effect of SSC on infants in the NICU.
Neonatal Thermal Care	Hill Z, Tawiah-Agyemang C, Manu A, Okyere E, Kirkwood BR. Keeping newborns warm: beliefs, practices and potential for behavior change in rural Ghana. <i>Trop Med Int Health.</i> 2010 Oct;15(10):1118-24. doi: 10.1111/j.1365-3156.2010.02593.x. PMID: 20667049.	Many sub-optimal practices had cultural and symbolic origins. Drying the baby on birth was least symbolically imbued, although resisted by prioritizing of the mothers.  Hypothermia contributes to neonatal morbidity and mortality in low-income countries, yet little is known about thermal care practices in rural African settings.	42% of babies were dried and 27% wrapped within five minutes of birth mainly due to an awareness that this reduced cold. Results found variation in the prevalence of immediate newborn care practices between countries was universally low.  The importance of keeping newborn babies warm was well recognized, although thermal care practices were sub-optimal.	Newborns delivered by a skilled provider tended to have better thermal care than those delivered by unskilled providers.  Most thermal care behaviors needed improving.

Intervention	Study ID	Outcomes	Effect of intervention	Recommendation
Exclusive Breastfeeding	Lucas RF, Smith RL. When is it safe to initiate breastfeeding for pre-term infants? <i>Adv Neonatal Care</i> . 2015 Apr; 15(2): 134-41. doi: 10.1097/ANC.0000000000000167. PMID: 25822518.	<p>The risk of mortality was decreased for those neonates who accepted breast milk within the first hour after birth - prevented necrotizing enterocolitis in very-low-birth-weight infants.</p> <p>Neonates who were not breastfed within the first hour after birth had around 3 times greater risk of death compared to neonates who were breastfed within the first hour (OR 2.9; CI 95%: 1.7–4.8).</p> <p>Neonates who obtain not only breast milk during neonatal period (or before death) as the feeding had 8.5 times greater risk of death than neonates who obtained only breast milk (OR 8.5; CI 95%: 2.89–10.76).</p>	<p>Early Initiation of Breastfeeding (EIB) ensures the neonate receives colostrum which has immune factors and growth factors that are beneficial to the neonate.</p> <p>EIB ensures skin-to-skin contact is made early, an important factor in preventing hypothermia and establishing the bond between mother and child.</p> <p>EIB reduces a mother's risk of postpartum hemorrhage, one of the leading causes of maternal mortality.</p>	There is need of continuous sensitization on EIB to mothers and to the community as a whole to promote this practice.

## Discussion

### Neonatal infection management

Marissa M Alejandria et al., (2013) noted that among neonates with sepsis, there is sufficient evidence that standard polyclonal IVIG, as adjunctive therapy, does not reduce mortality based on the inclusion of the large polyclonal IVIG trial on neonates. Adjunctive therapy with monoclonal IVIGs remains experimental.

### Kangaroo mother care

Agustin Conde-Agudelo et al., (2016) reported use of KMC in LBW infants as an alternative to conventional neonatal care, mainly in resource-limited settings.

### Neonatal thermal care

Zelee Hill et al., (2010) states that thermal care is a key component of community newborn interventions, the design of which should be based on an understanding of current behaviors and beliefs.

### Exclusive breastfeeding

Lucas RF et al., (2015) states that the transition from enteral feedings to direct, exclusive breastfeeding should involve frequent mother-

infant skin-to-skin contact requiring support and guidance from the NICU staff. Satrinawati Berkat et al., (2014) demonstrated that breast milk and the early initiation of breastfeeding were determinant factor of neonatal mortality for the LBW in Aceh Province, Indonesia. A new strategy to promote and improve the number of LBW that accept initiation of breastfeeding and exclusive breastfeeding is however needed.

## Conclusion

Clear and consistent communication between HCWs and health facility leadership is an important enabler of successful implementation of high impact interventions. The implementation of kangaroo mother care in both low and high-income countries is extremely low and requires scaling up. Breast milk and the early initiation of breastfeeding are determinant factors of neonatal mortality. Infants who are exclusively breastfed for six months experience less gastro-intestinal morbidity, less respiratory morbidity, and less infection-related neonatal mortality than partially breastfed neonates. According to expert opinion, clean birth and particularly postnatal care practices are effective in reducing neonatal mortality from sepsis and tetanus.

## Recommendations

1. Scale-up of high impact interventions that address the major causes of neonatal death.
2. Evaluate kangaroo mother care services in the country.
3. Conduct an assessment on quality of care for newborns in the health facilities.
4. Improve immediate newborn care practices including drying and wrapping, skin-to-skin contact after delivery, hygienic cord care (use of Chlorhexidine and early initiation of breastfeeding).

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