Utility of kangaroo mother care in preterm and low birthweight infants

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Abstract

Preterm birth (< 37 completed weeks of gestation) is the largest direct cause of neonatal mortality, accounting for an estimated 27% of the 4-million neonatal deaths every year. Kangaroo mother care (KMC) is a type of care for preterm and premature infants whereby the infant is placed in an upright position against the parent's chest, with early skin-to-skin contact between the parent and infant. Mothers who practise KMC exhibit less maternal stress and fewer symptoms of depression, and have a better sense of the parenting role and more confidence in meeting their babies' needs than those who don't. Despite the apparent feasibility of KMC, currently, only a few preterm babies in low-income countries have access to this intervention. Knowledge of the effectiveness and safety of KMC in the community and home setting, and its effects on growth, is still incomplete. Only one study has examined KMC initiation at home. There is an immense need for the promotion of research to improve the delivery of existing cost-effective interventions in low-resource settings and to address key gaps in knowledge. KMC improves growth in low birthweight and preterm infants, and has a significant role to play in protecting them from hypothermia and sepsis, as well as promoting exclusive breastfeeding. KMC helps to reduce neonatal mortality, and inculcates confidence and a better sense of parenting in mothers with regard to their babies' needs.

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Introduction

The United Nations Millennium Development Goal 4 states that childhood mortality should be reduced by two thirds between 1990 and 2015, but an assessment had indicated that the progress regarding mortality reduction has been disappointing in some countries.[1,2] The main proposed reason for the slow progress is insufficient knowledge of the implementation of existing cost-effective interventions and inadequate achievement regarding greater intervention coverage in low-resource settings.[3]

Preterm birth (< 37 completed weeks of gestation) is the largest direct cause of neonatal mortality, accounting for an estimated 27% of the 4-million neonatal deaths every year.[4-6] In high-income countries where tetanus, neonatal infection and intrapartum-related neonatal deaths are rare, preterm birth is the dominant cause of neonatal mortality and morbidity, and a major contributor to long-term impairment. In low-income countries, deaths that are directly due to preterm birth are a small proportion of overall deaths, but the cause-specific mortality rate is sixfold greater than that in high-income countries. This reflects a lack of even basic care.[4,6] Each year, 60-million babies are born outside of facilities. Of those born within facilities in low-income countries, few babies who need it receive basic care, let alone intensive care with ventilator support.[7] This challenge largely remains invisible in low-income countries, but is actually of great magnitude as preterm birth rates are higher, and the available resources, fewer. In addition, understaffed hospitals and ill-equipped or nonexistent neonatal care units ultimately result in higher neonatal mortality rates.[8]

Separation of mothers from their newborn infants at birth has become standard practice, despite mounting evidence that this may have harmful effects. The delivery room and postpartum hospital routines may disrupt early maternal-infant interaction and breastfeeding to a significant extent.[9,10] Also, a concurrent widespread decline in exclusive breastfeeding has been observed.[11]

The purpose of this review was to examine the available evidence of the effects of early skin-to-skin contact in kangaroo mother care (KMC) on the growth, development and survival of preterm and low birthweight infants, breastfeeding exclusivity and its impact on the health status of the mother, and the importance of its implementation as a cost-effective strategy in preventing neonatal mortality on a wider scale.

Kangaroo mother care: inception and components

Newborn care has greatly benefited from major technical advances in the last four decades, with substantial improvements in the mortality and morbidity of the high-risk neonate.[12] In addition, there has been heightened awareness of the psychological and emotional burden encountered by parents of the premature neonate. Moreover, the neonatal unit can constitute an environment of sensory overload and deprivation for the infant, which may have a negative impact on mother-infant interaction, on the infant's development and the psychological well-being of the parents and the infant.[13,14]

Dr Edgar Rey originally started KMC in 1978 in Bogota, Columbia, as an alternative to traditional incubator care for low birthweight infants, because of overcrowding and the scarcity of resources in his country's hospitals.[15,16] It has since been demonstrated that, from a physiological point of view, the KMC procedure does not increase the risk of mortality in premature infants.[17,18] KMC is a type of care for preterm and premature infants whereby the infant is placed in an upright position against the parent's chest, with early skin-to-skin contact between the parent and infant.[19,20] KMC has three main components: thermal care, support for exclusive breastfeeding, and early recognition and response to complications.[19] In addition, it is postulated that the baby is colonised by the mother's commensual organisms, reducing the risk of nosocomial infection, especially in a hospital environment. Acceptance of the KMC method is increasingly widespread and it is considered to be equivalent to conventional neonatal care.[15,19]

Kangaroo mother care: a blessing for mother and infant

Advantages for the infant

KMC has been associated with a reduction in several clinically important adverse infant outcomes, including mortality and nosocomial infection on hospital discharge and severe infection or sepsis at the most up-to-date follow-up.[18,21]

Compared to infants who are not offered KMC, those who receive it were found to:[18,37]

- Have improved growth and development.[22,23]
- Have a higher daily weight gain. [18,22,24]
- Have higher weekly increments in head circumference and length.[22]
- Have more time in quiet sleep.[25]
- Have a lower and more stable heart rate.[25]
- Suffer less from apnoea and bradycardia.[26-28]
- Have a better ability to maintain body temperature.[18,27,29,30]
- Have better oxygen saturation.[26]
- Have more physiological stability.[23,31]
- Experience an analgesic effect during painful medical procedures.[23,32-34]
- Have good stress regulatory capacity.[35,36]
- Be discharged from hospital earlier.

The literature has also shown that the impact of KMC is not only limited to the period of hospitalisation. KMC also has a positive long-term impact on breastfeeding,[18,23,24,28,30,38] crying,[28,39] being alert and responsive,[39] the sleep-wake cycle and arousal,[39] as well as the infant's overall development during the first two years of life.

KMC is considered to be equivalent to conventional care in terms of safety, thermal protection, morbidity, mortality and development. It appears to promote the humanisation of infant care and facilitates mother-child bonding in very low birthweight and preterm infants.[40-42] It was found that infants who were held using skin-to-skin contact were more likely to breastfeed successfully during their first feeding post-birth than those who were held while being swaddled in blankets by their mothers.[43-45] Different studies have established the safety of KMC in intubated neonates under 1500 g and in extremely preterm infants.[46-48]

Advantages for the mother

All mothers can provide KMC, irrespective of age, parity, education, culture and religion.[49] Studies have demonstrated the impact of KMC on the mother-infant relationship, as well as on the mother's psychological well-being.

Compared to mothers who do not utilise KMC, those who practise it:

- Report more positive feelings towards their infant.[39]
- Perceive their infant to be less abnormal.[50]
- Have increased parental sensitivity to infant cues.[23]
- Experience the positive effects of infant-parent interaction.[23]
- Exhibit less maternal stress.[50]
- Have fewer symptoms of depression.[23,50,51]
- Have a better sense of the parenting role.
- Feel more confident and competent in meeting their babies' needs.[29,52]
- Have a more cohesive family.[53]

Oxytocin antagonises the flight-fight effect, decreasing maternal anxiety and increasing calmness and social responsiveness.[54,55] It was found that mothers who experience skin-to-skin contact have reduced chances of bleeding and more rapid delivery of the placenta.[56,57] Even in Caesarean births, mothers in the skin-to-skin contact group reported less postoperative pain than those who were separated from their infants.[58] KMC was also found to be acceptable to most mothers and families at home.[22,24,37,59]

Expansion of kangaroo mother care

Based on increasing evidence of the positive effects and outcomes of KMC, and the emerging understanding of

the complexity of the physiology involved, KMC practice has been rapidly accepted worldwide, in both high- and low-resource countries. KMC has also been introduced in countries such as Ethiopia,[60] Ghana,[61] Madagascar,[62] Malawi,[63,63] Nigeria[65] and South Africa.[31] The safety, feasibility, acceptability and cost-effectiveness of KMC has been demonstrated in all these countries.

Despite the high impact and apparent feasibility of KMC, currently only a few preterm babies in low-income countries have access to this intervention. No systematic data on global coverage are available. South Africa has multiple KMC sites in almost every province, and has employed a low-cost KMC model for lower levels in the health system.[42,66] In most African countries, there are few KMC units, if any, and these are mainly in capital cities. A few countries, notably Malawi, Tanzania and Ghana, now have plans in place to expand KMC to district hospital, or even health centre, level.[67]

Some countries have no guidelines to support the implementation of KMC. On the other hand, a strong, committed national team of dedicated persons, working in union with professional trainers, facilitates the expansion of KMC. It has been recommended that a multidisciplinary team should be established to develop the implementation, education and training committees or task forces at different levels to extend KMC.

Six implementation phases have been identified in South Africa to implement the expansion of KMC at hospital level: increasing awareness, adopting the concept, mobilising resources and delivering evidence of practice, including evidence of routine, integration and sustainable practice.[66] This scale was used to compare different implementation strategies, including provision of a standard implementation package with, and without, visits, from a facilitator[68] and on-site, versus off-site, facilitation.[69]

Community-based kangaroo mother care

Knowledge on the effectiveness and safety of KMC in the community and home setting, and its effects on growth, is still incomplete.[70] Only one study has examined KMC initiation at home, in a challenging setting in rural Bangladesh. This study demonstrated a substantial mortality benefit for babies < 2 000 g, but not for normal birthweight babies.[71] At this stage, community initiation of KMC cannot be recommended based on evidence from this one trial, and larger trials in different settings are required.

Barriers and facilitators in kangaroo mother care

In a study that assessed the perception of parents about supportive factors and barriers to KMC, it was concluded that interventions to enhance parents' ability to perform KMC should address the attitudes and practices of staff in the hospitals and the neonatal intensive care environment.[72] Important barriers regarding the implementation of KMC were identified at follow-up with the trainees at a KMC centre in Colombia.[73]

Experience with KMC implementation at community level is much more restricted than that using hospital-level initiatives.[74] A randomised controlled trial that was carried out in Bangladesh was inconclusive in terms of KMC impact. Thus, a recommendation was given for the need for "additional experimental research" to determine whether or not community KMC benefits newborn and infant survival".[71] In another study, mothers reported that the infants' feeding process was the main obstacle to KMC.[72] In an Indian trial, the main barrier to the expansion of KMC was identified in the establishment phase, which meant that doctors and nurses needed to change their practices to allow mothers access to neonates throughout the day.[75]

Need for future research

Unfortunately, research interest and investment in preventing neonatal deaths resulting from preterm births and low birthweight have not been commensurate with the importance of low birthweight as the leading child killer.[76,77] Investment in global health research today would benefit from consensus on context, appropriate investment strategies and co-ordination in achieving a significant reduction of the disease burden in the foreseeable future. Simultaneously, research to improve the delivery of existing cost-effective interventions in low-resource settings, as well as epidemiological research to address key gaps in knowledge, should be considered as significant priorities. The ultimate aim of health research should be to improve efficiency, effectiveness and equity in the implementation of child survival interventions in low- and middle-income countries.

Conclusion

Preterm and low birthweight infants should be regarded as extero-gestational foetuses who need skin-to-skin contact to promote maturation. Intranatal and postnatal care in all settings should adhere to a paradigm of non-separation of infants and their mothers, and families. We conclude that KMC improves growth in low birthweight and preterm infants, has a significant role to play in protecting them from hypothermia and sepsis, as well as in promoting exclusive breastfeeding. KMC helps to reduce neonatal mortality, and also inculcates more confidence and a better sense of parenting in mothers with regard to their babies' needs.

References

1. Bryce J, Terreri N, Victora CG, et al. Countdown to 2015: tracking intervention coverage for child survival. Lancet. 2006;368(9541):1067-1076.

2. Murray CJ, Laakso T, Shibuya K, et al. Can we achieve Millennium Development Goal 4? New analysis of country trends and forecasts of under-5 mortality to 2015. Lancet. 2007;370(9592):1040-1054.
3. Bryce J, El Arifeen S, Pariyo G, et al. Reducing child mortality: Can public health deliver? Lancet. 2003;362(9378):159-164.
4. Lawn JE, Cousens S, Zupan J. Four million neonatal deaths: when? where? why? Lancet. 2005;365(9462):891-900.
5. Black RE, Cousens S, Johnson HL, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. Lancet. 2010;375(9370):1969-1987.
6. Lawn JE, Ketende WK, Cousens SN. Estimating the causes of 4 million neonatal deaths in the year 2000. Int J Epidemiol. 2006;35(3):706-718.
7. Darmstadt GL, Bhutta ZA, Cousens S, et al. Evidence-based, cost-effective interventions: how many newborn babies can we save? Lancet. 2005;365(9463):977-988.
8. Ruiz-Pela ez JG, Charpak N, Cuervo LG. Kangaroo mother care, an example to follow from developing countries. BMJ. 2004;329(7475):1179-1181.
9. Anderson GC, Chiu SH, Morrison B, et al. Skin-to-skin care for breast feeding difficulties post birth. In: Field T, editor. Touch and massage therapy in early development. New Brunswick: Johnson & Johnson Pediatric Institute, 2004; p. 115-136.
10. Odent M. New reasons and new ways to study birth physiology. Int J Gynecol Obstet. 2001;75(Suppl 1):S39-S45.
11. Grummer-Strawn LM, Scanlon KS, Fein SB. Infant feeding and feeding transitions during the first year of life. Pediatrics. 2008;122(Suppl 1):S36-S42.
12. De Kleine MJK, den Ouden AL, Kollée LAA, et al. Lower mortality but higher neonatal morbidity over a decade in very preterm. Paediatr Perinat Epidemiol. 2007;21(1):15-25.
13. Muller-Nix C, Forcada-Guex M, Pierrehumbert B, et al. Prematurity, maternal stress and mother-child interactions. Early Hum Dev. 2004;79(2):145-158.
14. Carter JD, Mulder RT, Bartram AF, Darlow BA. Infants in a neonatal intensive care unit: parental response. Arch Dis Child Fetal Neonatal Ed. 2005;90(2):F109-F113.
15. Charpark N, Ruiz-Pelaez JG, Figueroa de CZ, Charpark Y. Kangaroo mother versus traditional care for newborn infants < 2000 grams: a randomized, controlled trial. Pediatrics. 1996;100(4):682-688.
16. Doyle LW. Kangaroo mother care. Lancet. 1997;350(9093):1721-1722.
17. Charpak N, Ruiz-Pelaez JG, Figueroa de CZ, Charpak Y. A randomized, controlled trial of kangaroo mother care: results of follow-up at 1 year of corrected age. Pediatrics. 2001;108(5):1072-1079.
18. Conde-Agudelo A, Diaz-Rossello JL, Belizan JM. Kangaroo mother care to reduce morbidity and mortality in low birth weight infants. [Cochrane review]. In: The Cochrane Library, Issue 4, 2000. Oxford: Update Software.
19. Charpak N, Ruiz JG, Zupan J, et al. Kangaroo mother care: 25 years after. Acta Paediatr. 2005;94(5):514-522.
20. World Health Organization. Kangaroo mother care: a practical guide. Geneva: WHO Publications; 2003.
21. Simmons LE, Rubens CE, Darmstadt GL, Gravett MG. Preventing preterm birth and neonatal mortality: exploring the epidemiology, causes, and interventions. Semin Perinatol. 2010;34(6):408-415.
22. Suman RP, Udani R, Nanavati R. Kangaroo mother care for low birth weight infants: a randomized controlled trial. Indian Pediatr. 2008;45(1):17-23.
23. Nyqvist KH, Anderson GC, Bergman N, et al. Towards universal kangaroo mother care: recommendations and report from the first European conference and seventh international workshop on kangaroo mother care. Acta Paediatr. 2010;99(6):820-826.
24. Ramanathan K, Paul VK, Deorari AK, et al. Kangaroo mother care in very low birth weight infants. Indian J Pediatr. 2001;68(11):1019-1023.
25. Ludington-Hoe SM, Smith JY. Developmental aspects of kangaroo care. J Obstet Gynecol Neonatal Nurs. 1996;25(8):691-703.
26. Fohe K, Dropf S, Avenarius S. Skin-to-skin contact improves gas exchange in premature infant. J Perinatol. 2000;20(5):311-315.
27. Mori R, Khanna R, Pledge D, Nakayama T. Meta-analysis of physiological effects of skin-to-skin contact for newborns and mothers. Pediatr Int. 2010;52(2):161-170.
28. Moore ER, Anderson GC, Bergman N, Dowswell T. Early skin-to-skin contact for mothers and their healthy newborn infants. [Cochrane review]. In: The Cochrane Library, Issue 5, 2012. Oxford: Update Software.
29. Winberg J. Mother and newborn baby: mutual regulation of physiology and behavior: a selective review. Dev Psychobiol. 2005;47(3):217-229.
30. Gartner LM, Morton J, Lawrence RA, et al. Breastfeeding and the use of human milk. Pediatrics. 2005;115(2):496-506.
31. Bergman NJ, Linley LL, Fawcus RR. Randomized controlled trial of skin to skin contact from birth vs. conventional incubator for physiological stabilization in 1200to 2199 gram newborns. Acta Pediatr. 2004;93(6):779-885.
32. Gray L, Watt L, Blass E. Skin-to-skin contact is analgesic in healthy newborn. Pediatrics. 2000;10(1):e14.
33. Anand KJ, Aranda JV, Berde CB, et al. Summary proceedings from the neonatal pain control group. Pediatrics. 2006;117(3 Pt 2): S9-S22.
34. Warnock FF, Castral TC, Brant R, et al. Brief report: maternal kangaroo care for neonatal pain relief: a systematic narrative review. J Pediatr Psychol. 2010;35(9):975-984.
35. Vandenberg K A. Individualized developmental care for high risk newborns in the NICU: a practice guideline. Early Hum Dev. 2007;83(7):433-442.
36. Collados-Gómez L, Aragonés-Corral B, Contreras-Olivares I, et al. Assessing the impact of kangaroo care on preterm infant stress. Enferm Clin. 2011;21(2):69-74.
37. Kambarami RA, Chicledo O, Kowo DT. Kangaroo care versus incubator care in the management of well preterm infants: a pilot study. Ann Trop Paediatr. 1998;18(2):81-86.
38. Flacking R, Ewald U, Wallin L. Positive effect of kangaroo mother care on long-term breastfeeding in very preterm infants. J Obstet Gynecol Neonatal Nurs. 2011;40(2):190-197.
39. Feldman R, Eidelman AI, Sirota L, Weller A. Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development. Pediatrics. 2002;110(1):16-26.
40. Tuoni C, Scaramuzzo RT, Ghirri P, et al. Kangaroo mother care: four years of experience in very low birth weight and preterm infants. Minerva Pediatr. 2012;64(4):377-383.
41. Gupta M, Jora R, Bhatia R. Kangaroo mother care (KMC) in LBW infants: a western Rajasthan experience. Indian J Pediatr. 2007;74(8):747-749.
42. Pattinson RC, Bergh AM, Malan AF, Prinsloo R. Does kangaroo mother care save lives? J Trop Pediatr. 2006;52(6):438-441.
43. Carfoot S, Williamson PR, Dickson R. The value of a pilot study in breast-feeding research. Midwifery. 2004;20(2):188-193.
44. Carfoot S, Williamson P, Dickson R. A randomized controlled trial in the north of England examining the effects of skin-to-skin care on breast feeding. Midwifery. 2005;21(1):71-79.
45. Khadivzadeh T, Karimi A. Randomized controlled trial of very early maternal infant skin-to-skin contact and successful breastfeeding. BJOG. 2008;115(Suppl 1):248.
46. Azevedo VM, Xavier CC, Gontijo Fde O. Safety of kangaroo mother care in intubated neonates under 1500 g. J Trop Pediatr. 2012;58(1):38-42.
47. Véras RM, Traverso-Yépez M. The Kangaroo program at a Brazilian maternity hospital: the preterm/low-weight babies' health-care under examination. Nurs Inq. 2011;18(1):84-91.
48. Karlsson V, Heinemann AB, Sjörs G, et al. Early skin-to-skin care in extremely preterm infants: thermal balance and care environment. J Pediatr. 2012;161(3):422-426.
49. Udani RH, Nanavati RN. Training manual on kangaroo mother care. Mumbai: Department of Neonatology, Seth GS Medical College and King Edward Memorial Hospital; 2004.
50. Ruiz-Peláez JG, Charpak N, Cuervo LG. Kangaroo mother care, an example to follow from developing countries. BMJ. 2004;329(7475):1179-1181.
51. De Alencar AE, Arraes LC, de Albuquerque EC, Alves JG. Effect of kangaroo mother care on postpartum depression. J Trop Pediatr. 2009;55(1):36-38.
52. Feldman R, Weller A, Sirota L. Testing a family intervention hypothesis: the contribution of mother-infant skin-to-skin contact (kangaroo care) to family interaction, proximity and touch. J Family Psychol. 2003;17(1):94-107.
53. Miles R, Cowan F, Glover V, et al. A controlled trial of skin-to-skin contact in extremely preterm infants. Early Hum Dev. 2006;82(7):447-455.
54. Uvnas-Moberg K, Arn I, Magnusson D. The psychobiology of emotion: the role of the oxytocinergic system. Int J Behav Med. 2005;12(2):59-65.
55. Lee SB, Shin HS. Effects of kangaroo care on anxiety, maternal role confidence,

and maternal infant attachment of mothers who delivered preterm infants. Taehan Kanho Hakhoe Chi. 2007;37(6):949-956.

56. Dordevic G, Jovanovic B, Dordevic M. An early contact with the baby: benefit for the mother. Medicina Preglio. 2008;61(11-12):576-579.
57. Marin GMA, Martin LI, Lopez EA, et al. Randomized controlled trial of early skin-to-skin contact: effects on the mother and the newborn. Acta Paediatrica. 2010;99(11):1630-1634.
58. Nolan A, Lawrence C. A pilot study of a nursing intervention protocol to minimize maternal-infant separation after cesarean birth. J Obstet Gynecol Neonatal Nurs. 2009;38(4):430-442.
59. Kadam S, Binoy S, Kanbur W, et al. Feasibility of kangaroo mother care in Mumbai. Indian J Pediatr. 2005;72(1):35-38.
60. Worku B, Kassie A. Kangaroo mother care: a randomized controlled trial on effectiveness of early kangaroo mother care for the low birth weight infants in Addis Ababa, Ethiopia. J Trop Pediatr. 2005;51(2):93-97.
61. Nguah SB, Wobil PNL, Obeng R, et al. Perception and practice of kangaroo mother care after discharge from hospital in Kumasi, Ghana: a longitudinal study. BMC Pregnancy Childbirth. 2011;11:99.
62. Nagai SS, Andrianarimanana D, Rabesandratana NH, et al. Earlier versus later continuous kangaroo mother care (KMC) for stable low-birth-weight infants: a randomized controlled trial. Acta Paediatr. 2010;99(6):827-835.
63. Blencowe H, Molyneux E. Setting up kangaroo mother care at Queen Elizabeth central hospital, Blantyre: a practical approach. Malawi Med J. 2005;17(2):39-42.
64. Blencowe H, Kerac M, Molyneux E. Safety, effectiveness and barriers to follow-up using an 'early discharge' kangaroo care policy in a resource poor setting. J Trop Pediatr. 2009;55(4):244-248.
65. Ibe OE, Austin T, Sullivan K, et al. A comparison of kangaroo mother care and conventional incubator care for thermal regulation of infants < 2000 g in Nigeria using continuous ambulatory temperature monitoring. Ann Trop Paediatr. 2004;24(3):245-251.
66. Bergh AM, Arsalo I, Malan AF, et al. Measuring the implementation progress in kangaroo mother care. Acta Paediatr. 2005; 94(8):1102-1108.
67. Bergh AM, van Rooyen E, Lawn J, et al. Retrospective Evaluation of KMC in Malawi. Blanytre: Malawi Save the Children, Medical Research Council South Africa and University of Pretoria; 2007.
68. Pattinson RC, Arsalo I, Bergh AM, et al. Implementation of kangaroo mother care: a randomized trial of two outreach strategies. Acta Paediatr. 2005;94(7):924-927.
69. Bergh AM, van Rooyen E, Pattinson RC. Scaling up kangaroo mother care in South Africa: 'on-site' versus 'off -site' educational facilitation. Hum Resour Health. 2008;6:13.
70. Dodd VL. Implications of kangaroo care for growth and development in preterm infants. J Obstet Gynecol Neonatal Nurs. 2005;34(2):218-232.
71. Sloan NL, Ahmed S, Mitra SN, et al. Community-based kangaroo mother care to prevent neonatal and infant mortality: a randomized, controlled cluster trial. Pediatrics. 2008;121(5):e1047-e1059.
72. Blomqvist YT, Frölund L, Rubertsson C, Nyqvist KH. Provision of kangaroo mother care: supportive factors and barriers perceived by parents. Scand J Caring Sci. 2013;27(2):345-353.
73. Charpak N, Ruiz-Pelaez JG. Resistance to implementing kangaroo mother care in developing countries, and proposed solutions. Acta Paediatr. 2006;95(5):529-534.
74. Quasem I, Sloan NL, Chowdhury A, et al. Adaptation of kangaroo mother care for community-based application. J Perinatol. 2003;23(8):646-651.
75. Kumar V, Mohanty S, Kumar A, et al. Effect of community-based behavior change management on neonatal mortality in Shivgarh, Uttar Pradesh, India: a cluster-randomised controlled trial. Lancet. 2008;372(9644):1151-1162.
76. Moran M, Guzman J, Ropars AL, et al. Neglected disease research and development: how much are we really spending? PLoS Med. 2009;6(2):e30.
77. De Francisco A, Matlin S, editors. Monitoring financial flows for health research. Geneva: Global Forum for Health Research; 2006.