



Kangaroo Mother Care and Neonatal Skin Microbiome

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Kangaroo Mother Care (KMC), a simple and low-cost intervention, is associated with a reduction in neonatal mortality and severe infection in low birth weight (LBW) neonates [1]. Initiating KMC within 24 h of birth, i.e., early KMC, is associated with even greater benefits including a lower risk of clinical sepsis than initiating KMC after 24 h of age. Reduced risk of sepsis has been noted not only with in-hospital KMC but also when KMC is initiated and practiced in the community [2]. The effect of KMC on the incidence of severe neonatal infection, especially nosocomial sepsis, may occur through multiple pathways - the increased use of breastmilk for feeding, lower incidence of hypothermia, greater time spent in care by the mother than a healthcare provider who takes care of multiple admitted neonates, and an earlier discharge from the hospital - all independently associated with reduced risk of neonatal sepsis. An additional mechanism of direct effect of KMC is through modulation of the maternal and neonatal immune system. While practicing KMC, both the mother and the baby are exposed to a common pool of microorganisms. The mature humoral and cellular immune systems of the mother respond to these micro-organisms and pass on the antibodies and leucocytes to the neonate through breast milk, thus not only providing passive immunity but also programming the neonatal immune system [3, 4]. One component of this programming is the promotion of a 'physiological' gut microbiome dominated by *Bifidobacterium* in the neonate, an interesting effect that includes the direct transfer of maternal gut bacteria to the neonatal gut through the entero-mammary route [3].

How does the close skin-to-skin contact between the mother and the baby during KMC influence the skin microbiome? In an article published in this issue of the journal, Govindarajan et al. report the change in skin microbiome before and after KMC among preterm neonates born before

32 wk of gestation [5]. Although the cause-and-effect relationship between KMC and skin microbiome is weakened due to a small sample size and lack of a control group, the study suggests that the practice of KMC for at least 6 h was followed by a reduction in colonization with pathogenic bacteria. These findings are supported by evidence from other studies. In a randomized controlled trial in Brazil, neonates colonized with methicillin-resistant *Staphylococcus aureus* were more likely to be decolonized if allocated to the skin-to-skin contact group [6]. In another study, family-integrated care that included the early introduction of mother's milk and skin-to-skin contact was associated with reduced incidence of colonization with hospital-acquired strains of bacteria [7]. Larger studies are needed to evaluate the effect of KMC on both maternal and neonatal microbiomes, though it will not be easy to separate the effect of breastmilk, maternal diet, and family-integrated care from the effect of skin-to-skin contact. How long does the effect of KMC on the skin, respiratory, and gut microbiome of the baby last? Does it affect the incidence of immune-related illnesses like atopic eczema, asthma, and celiac disease? Does it affect the emergence or colonization by anti-microbial resistance pathogens? These are exciting questions that await to be answered in future research.

Declarations

Conflict of Interest None.

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