

# Prognostic factors for success in the Kangaroo Mother Care method for low birth weight babies

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## Abstract

**Background** Low birth weight (LBW) is closely related to neonatal morbidity and mortality. Management of LBW infants in developing countries remains limited, due to the low availability of incubators. The Kangaroo Mother Care (KMC) method has been shown to be effective for newborns, especially LBW infants, in which skin-to-skin contact may be conducive for infants' weight gain, thermoregulation, and heart rate stability.

**Objective** To determine the prognostic factors for KMC success in LBW babies.

**Methods** This cohort study included LBW infants at Dr. Kariadi General Government Hospital, Semarang, by a consecutive sampling method. Success of KMC was assessed by infant weight gain, as well as stabilization of temperature, heart rate, and respiration. Prognostic factors for KMC success that we assessed were birth weight, gestational age, KMC duration, age at KMC onset and maternal education level. Statistical analyses used were Chi-square and relative risk (RR) tests.

**Results** Of 40 LBW infants, 24 were successful in KMC. Birth weight  $\geq$  1500 grams (RR 0.4; 95%CI 0.23 to 0.73;  $P=0.001$ ), gestational age  $\geq$  34 weeks (RR 0.94; 95%CI 0.46 to 1.89;  $P=1.00$ ), KMC duration  $\geq$  65 minutes (RR 1.44; 95%CI 0.76 to 2.75;  $P=0.215$ ), high maternal education level (RR 1.25; 95%CI 0.76 to 2.04;  $P=0.408$ ), and age at KMC onset  $>10$  days (RR 2.69; 95%CI 1.14 to 6.32;  $P=0.003$ ), were factors that related to the successful of KMC.

**Conclusion** Age at KMC onset  $>10$  days was a prognostic factor for KMC success in low birth weight babies. [Paediatr Indones. 2015;55:142-6.].

**Keywords:** kangaroo mother care, prognostic factor for success, low birth weight

The World Health Organization (WHO) reported that 20 million LBW babies are born yearly, mainly caused by prematurity or intrauterine growth retardation.<sup>1</sup> Low birth weight is closely related to neonatal morbidity and mortality, and it influences growth, cognitive development, and even chronic disease in later life. Many factors influence this problem, such as gestational age, intrauterine growth, and birth weight. As these factors are interconnected with the fetal, maternal, and physical environment, they have an important role in determining an infant's birth weight and future health.<sup>2</sup> The LBW infants may experience feeding problems, poor thermoregulation, and comorbid diseases. Hypothermia may cause death in LBW infants, as it can lead to infection, renal failure, apnea, or massive hemorrhage.<sup>3</sup> Low birth weight morbidity and mortality is influenced by gestational age. Infants of younger gestational age have higher mortality rates and higher incidence of complications due to prematurity or neurological impairment.<sup>4</sup>

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The care of LBW infants in developing countries remains limited, due to the low availability of incubators compared to the number of LBW babies, costs, geography, transportation and communication limitations. Incubators also require maintenance to properly adjust temperature and humidity, and prevent infection.<sup>5</sup> An alternative and effective substitute for incubators is the Kangaroo Mother Care (KMC) method, or skin-to-skin contact. The KMC provides the baby with care, warmth, breastfeeding, stimulation, and safety.<sup>6</sup> Kangaroo mother care is known to be effective for newborns, especially those with LBW, as skin-to-skin contact can improve weight gain, thermoregulation and heart rate stabilization. The KMC decreases the risk of nosocomial infection, improves growth and development, and leads to good survival and physiological outcomes.<sup>7,8</sup>

The aim of this study was to determine factors related to the success of KMC method in LBW babies.

## Methods

An observational, prognostic study with a cohort design was done in the Neonatology Ward at Kariadi Hospital from July to October 2013. Subjects were LBW infants who fulfilled the inclusion criteria. Inclusion criteria were birth weight <2,500 grams and no congenital anomalies. Unstable infants with shock, respiratory distress, or severe hypothermia were excluded. We included subjects consecutively

from their time of admission. Informed consent was obtained from all parents.

We collected the following data: infant gender, birth weight, KMC duration, gestational age, age at KMC onset, as well as parental data on occupation, education, and age. We evaluated subjects' temperature, heart rate, and respiratory rate every 8 hours and birth weight daily, until the time of hospital discharge. The KMC success was defined as fulfilled all criteria of weight gain, and stabilization of heart rate, temperature, and respiratory rate.

Data were analyzed to assess for prognostic factors of KMC success, and relative risks (RR) were calculated. This study was approved by the Ethics Committee for Health Research at Diponegoro University Medical School.

## Results

This cohort study included 40 LBW babies admitted to Kariadi Hospital from July to October 2013. Subjects' characteristics are shown in **Table 1**. There were 20 males and 20 females, with 24 babies in the successful group and 16 babies in the unsuccessful group. The mean maternal ages were 28.71 (SD 5.93) years in the successful group and 27.25 (SD 5.78) years in the unsuccessful group. Mean gestational ages were 31.75 (SD 2.58) weeks in the successful group and 32.63 (SD 3.16) weeks in the unsuccessful group.

The KMC success was evaluated by the following variables: weight gain, temperature, heart rate, and

Table 1. Demographic characteristics of subjects

Characteristics	KMC		P value
	Successful (n = 24)	Unsuccessful (n=16)	
Gender, n			
Male	13	7	0.519*
Female	11	9	
Mean parity (SD), n	1.63(0.97)	1.94(1.06)	0.604***
Mean maternal age (SD), years	28.71(5.93)	27.25(5.78)	0.446**
Mean birth weight (SD), gr	1,384.17(271.72)	1,773.13(264.06)	0.000**
Mean gestational age (SD), weeks	31.75(2.58)	32.63(3.16)	0.154***
Maternal employment, n			
Employed	15	10	1.000*
Unemployed	9	6	

\* Pearson's Chi-square test; \*\* Independent T-test; \*\*\* Mann-Whitney test

**Table 2.** KMC success indicators

Variables	KMC	
	Successful (N=24)	Unsuccessful (N=16)
Weight gain		
Yes	23	1
No	1	15
Temperature stabilization		
Normothermy	23	15
Hypothermia/hyperthermia	1	1
Respiratory stabilization		
No apnea	23	11
Apnea	1	5
Heart rate stabilization		
Normal	23	15
Bradycardia/tachycardia	1	1

respiratory rate stabilization, as shown in **Table 2**. Twenty-three infants had weight gain in the successful group. Two infants had hypothermia, 6 infants had apnea and 2 infants had bradycardia during KMC.

**Table 3** shows that infants with birth weight  $\geq 1,500$  grams had 0.4 times KMC success than infants with lower birth weight. Four infants with gestational age  $\geq 34$  weeks had KMC success with RR 0.94 (95%CI 0.46 to 1.89). Eighteen infants with KMC duration  $\geq 65$  minutes had KMC success with RR 1.44 (95%CI 0.76 to 2.75). Nine infants whose mothers had a high education level had KMC success with RR 1.25 (95%CI 0.76 to 2.04). There were 20

infants  $> 10$  days of age at the time of KMC onset who were successful, with RR 2.69 (95%CI 1.14 to 6.32), which means those infants had 2.69 times better chance of KMC success.

From the study, length of stay for the successful group was 21.67 (SD 10.19) days, and for the unsuccessful group was 11.19 (SD 7.10) days.

## Discussion

Kangaroo mother care was first founded by Rey and Martinez in Bogota, Colombia as an alternative method to care for stable low birth weight babies.<sup>9</sup> The KMC is simple, as mothers use their own body temperature to maintain their baby's warmth, especially in areas of limited neonatal care.<sup>10,11</sup>

In our study, 40 LBW infants fulfilled the inclusion criteria, with 50% males and mean gestational age of 31.75 (SD 2.58) weeks and mean birth weight of 1,384.17 (SD 271.72) grams in the successful group. More than half of the subjects' mothers received junior high school formal education. Mean maternal age of the successful group was 28.71 (SD 5.93) years. All subjects in this study had intermittent KMC while hospitalized with level II neonatal care, where the baby was in an incubator. Similarly, a Brazilian study on KMC found mean maternal age to be 24.6 years, with mothers receiving a mean of 7 years of formal educa-

**Table 3.** Potential prognostic factors for KMC success

Variables	KMC		RR (95% CI)	P value
	Successful (N=24)	Unsuccessful (N=16)		
Birth weight				
$\geq 1,500$ gr	8	14	0.4 (0.23 to 0.73)	0.0001
$< 1,500$ gr	16	2		
Gestational age				
$\geq 34$ weeks	4	3	0.94 (0.46 to 1.89)	1.0
$< 34$ weeks	20	13		
KMC duration				
$\geq 65$ minutes	18	9	1.44 (0.76 to 2.75)	0.215
$< 65$ minutes	6	7		
Maternal education				
High	9	4	1.25 (0.76 to 2.04)	0.408
Low	15	12		
Age at KMC onset				
$> 10$ days	20	6	2.69 (1.14 to 6.32)	0.003
$\leq 10$ days	4	10		

tion. Mean birth weight was 1,560 (SD 269) grams and mean gestational age was 32.5 (SD 1.4) weeks.<sup>12</sup> Birth weight in unsuccessful group was significantly higher than in the successful group, this can also affect the result that babies who could reach standard weight, which in our center is 1800 grams, and were stable can continue in outpatient care.

In our study, weight gain occurred in 24/40 subjects. For the remaining 16 babies, weight gain may not have occurred because they received KMC during the period of physiological weight loss, 10-14 days after birth. The Brazilian study found that LBW infants who received KMC had a mean birth weight of 1,560 (SD 269) grams over a period of 5-33 days [mean 16.7 (SD 5.9) days].<sup>12</sup>

Age at KMC onset was a prognostic factor for KMC success. We found that babies at > 10 days of age at KMC onset had greater success. In addition, the Brazilian study found that age at KMC onset was associated with increased breastfeeding frequency, which may explain the increased weight gain.<sup>12</sup> Also, a study in Madagascar compared early and late KMC and found no significance differences in mortality, morbidity, severe infection, readmission, hypothermia, weight gain, or breastfeeding at 4 weeks of age.<sup>13</sup> Furthermore, an Indian study with subjects who started KMC at a mean age of 3.7 (SD 2.8) days found decreased morbidity and increased growth in LBW infants.<sup>14</sup> In our study we found that those at > 10 days of age at KMC onset had greater success could be caused by some babies were still unstable before their ages reached 10 days in level II neonatal care.

We found that higher maternal education was not a prognostic factor for KMC success. An Indian study on KMC educational intervention given to mothers who visited an antenatal clinic without looking at their formal educational status, found that mothers had a good understanding about KMC and how to practice it.<sup>15</sup>

Kangaroo Mother Care duration  $\geq$  65 minutes was not a prognostic factor for KMC success. Indian studies found that KMC durations were 11.45 hours, Rao *et al.* for 13.5 hours and Kadam *et al.* for 9.8 hours.<sup>16-18</sup> A Cochrane review shows that severe infection risk or sepsis occurred in the intermittent KMC group but not in the continuous KMC group, but sepsis risk at 40-41 weeks significantly decreased in both the intermittent KMC and continuous KMC groups.<sup>17</sup>

Our study differed in design, with KMC duration  $\geq$  65 minutes, done intermittently not continuously, due to facility limitations. In our study, each baby done KMC for unless 65 minutes per session per day, each baby had different duration and total length of KMC due to different status of the baby and the hospital length of stay. Nevertheless, in our study the intermittent KMC method was advantageous for LBW babies, they can get the advantage from breastfeeding such as bonding and nutrition, less incidence of heart rate and respiratory instability during the KMC.

In our study, mean gestational age in the successful group was 31.75 (2.58) weeks, and older gestational age was not a prognostic factor for KMC success. In contrast, an Indian study with subjects of 35.3 (SD 2.3) weeks gestational age in the KMC group found that their growth increased and morbidity decreased.<sup>14</sup> Similarly, Sunil *et al.* found that in the KMC group with mean gestational age of 30.8 (SD 2.1) weeks there was no incidence of apnea and only 1 subject with hypothermia, but there were no significant differences.<sup>18</sup>

Our study limitations included the period of research being only until the time of hospital discharge, in order to avoid subjects being lost to follow-up. Also, subjects only experienced intermittent KMC, as continuous KMC was not possible due to facility limitations.

In conclusion, older age at KMC onset is a prognostic factor for KMC success. Other factors such as KMC duration, gestational age, and maternal educational level are found not to be prognostic factors for KMC success. To increase the success of KMC, it should be started when infants are in a stable condition, performed continuously. Support of mothers is needed to improve their self-confidence for consistency in KMC practice.

## Conflict of interest

None declared.

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