



Kangaroo Care Transport versus Transport Incubator in Transporting Stable Preterm Neonates: A Randomized Controlled Trial

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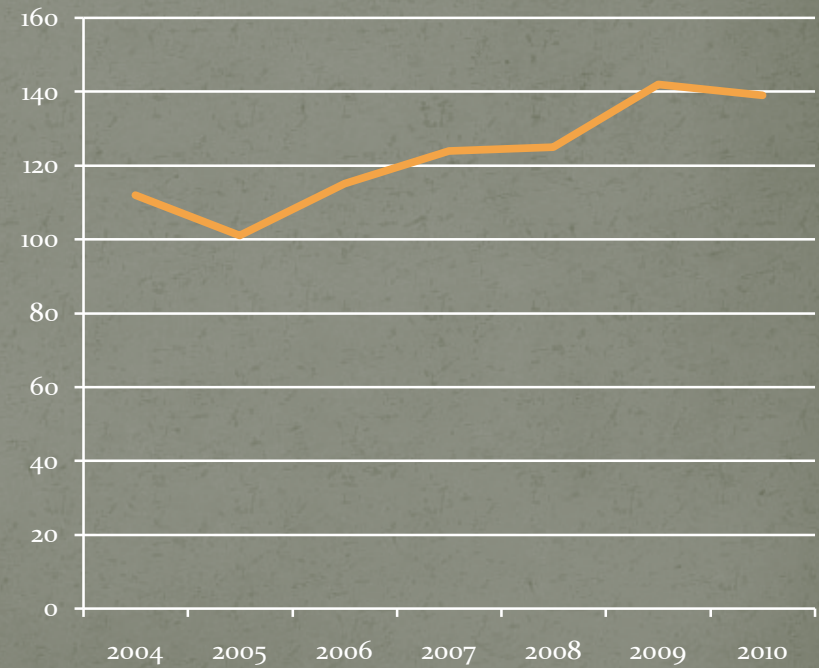
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BACKGROUND



PRETERM DELIVERIES/1000
DELIVERIES



BACKGROUND



- Kangaroo Mother Care
 - 1979
 - Instituto Materno Infantil in Bogota, Columbia
 - Dr. Edgar Rey Sahabria and Dr. Hector Martinez
- “KMC is defined as a form of parental caregiving where the newborn low birth weight infant is intermittently nursed skin to skin in a vertical position between the mother’s breast or against the father’s chest for a nonspecific period of time”

BACKGROUND



- Studies by Whitelaw et al, Fohe et al, Gale et al, and Ludington-Hoe et al
 - heart rate, respiratory rate, respiration, oxygenation, oxygen consumption, temperature, blood glucose, and behavior observed in preterm low birth weight neonates on KMC tend to be similar or better than those separated from their mothers

BACKGROUND



- Can KMC be used as a means of neonatal transport in the immediate newborn period and provide the same benefits?

BACKGROUND



- Initial postnatal period is characterized by high levels of stress
- Transition is accomplished in the first 4 to 6 hours after delivery but can take up to 12 hours
- Transportation of neonates from the delivery room to the neonatal intensive care unit (NICU) is added stress

BACKGROUND



- Kangaroo Care Transport Instead of Incubator Transport
 - Sontheimer, et al
 - heart rate, respiratory rate, oxygen saturation, and rectal temperature for both non-oxygen and oxygen- requiring neonates with ages of 1 hour to 79 days remained stable during kangaroo care transport lasting 10 to 300 minutes travelling to a distance of 2 to 400 km
 - Conclusion: kangaroo care transport might be considered as a safe, effective and inexpensive method of transport

MAIN OBJECTIVE



- To determine the efficacy and safety of kangaroo care transport for physiologically stable preterm neonate ≤ 36 weeks and weighing ≤ 2200 grams

SPECIFIC OBJECTIVES



- (1) to determine whether there is a significant change in heart rate (decrease by 5 beats/min, respiratory rate (decrease by 5 breaths/min), oxygen saturation (increase by 5%) and temperature (increase by 0.3 C) after kangaroo care transport compared to transport incubator
- (2) to determine whether kangaroo care transport would result to the occurrence of adverse events such as temperature instability, cardiorespiratory instability, oxygen desaturation, restlessness, and intraventricular hemorrhages (IVH)
- (3) to determine whether patients transported using the kangaroo care transport reduces the occurrence of sepsis as compared to use of transport incubator

STUDY DESIGN



- Prospective
- Non-blinded
- Randomized controlled trial
- Conducted in a NICU of the Philippine General Hospital
- 7 month period

STUDY POPULATION



- Inclusion criteria:
 - physiologically stable neonates
 - APGAR score of ≥ 7 at the first and fifth minute of life
 - not requiring any ventilatory support, intravenous fluids or vasopressors
 - admitted at the neonatal intensive care unit
 - gestational age ≤ 36 weeks by pediatric aging
 - birth weight of ≤ 2200 grams

STUDY POPULATION



- Exclusion criteria:
 - preterm neonates needing any form of ventilatory support, intravenous fluids, vasopressors, chest tubes and umbilical lines
 - presence of major congenital abnormalities and fatal chromosomal anomalies
 - caregiver had any signs or symptoms of infection such as fever, conjunctivitis, cough, colds, oral sores and infected skin lesions

RANDOMIZATION



INTERVENTION

CONTROL



INTERVENTION GROUP



- Neonate wearing a cap and diaper was transferred gently and placed upright against the caregiver's bare chest
- Neonate's head was turned to one side and in a slightly extended position
- Neonate's hip was flexed and abducted
- The arms were also flexed
- Secured using the KMC tube blouse worn by the caregiver
- Caregiver was then instructed to place his/her hands to support the back and the neck of the neonate



WHO: Kangaroo Mother Care, A Practical Guide Handbook

CONTROL GROUP

- Neonates wore a cap and diaper
- Transported using a Medix TR-306 insulated double walled transport incubator
- The transport incubator preheated at a neutral thermal environmental temperature of 34C



MONITORING



- Measurement of respiratory rate, heart rate, oxygen saturation and temperature
 - prior to transfer to kangaroo care transport or transport incubator (baseline)
 - 15 minutes while on kangaroo care transport or transport incubator (pre-transport),
 - immediately on placing the infant on the pre- set 34 C radiant warmer upon arrival at NICU (on arrival)
 - and 15 minutes after arrival at NICU (post-transport)
- Capillary blood glucose was taken pre-transport and post-transport
- Morbidities during confinement

STATISTICAL ANALYSIS



- 46 subjects for each the control and treatment arm was calculated to achieve a power of 95% and an alpha error of 0.05 based on the study of Suman Rao et al on the secondary outcome of effect of KMC on morbidities (hypothermia)

STATISTICAL ANALYSIS



- Baseline characteristics of participants
 - categorical data were analyzed statistically by Chi-square test
 - T-test and the Fisher's exact test was used to compare quantitative measurements
- Mean change on the physiologic responses in heart rate and temperature of participants pre-transport and upon arrival at the NICU
 - independent T test
- Mean change on the physiologic responses in respiratory rate, oxygen saturation and capillary blood glucose
 - Wilcoxon-Mann-Whitney test.

STATISTICAL ANALYSIS



- adverse events
(hypothermia, hyperthermia, tachycardia, apnea, bradypnea, tachypnea, oxygen desaturation, hypoglycemia, hyperglycemia, sepsis, intraventricular hemorrhage and death)
- heart rate, respiratory rate, temperature and oxygen saturation measurements pre-transport, upon arrival at NICU and post-transport
 - exploratory analysis (descriptive measurements, graphs)

ETHICAL CONSIDERATION



- approval from the Expanded Hospital Research Office (EHRO)
- submitted to Bless Tetada KMC Foundation, Philippines, Inc. for funding of the study
 - a non-profit organization established in 2008 and is composed of recognized group of professionals committed to embrace every newborn's right to a healthy life through Kangaroo Mother Care

RESULTS



92 participants



2 drop outs

45 Kangaroo Care
Transport



45 Transport Incubator

RESULTS

Baseline characteristics of participants



Characteristics	KC transport (n = 45)	Control (n = 45)	p-value
Maternal Risk Factors (%)			
Maternal Age (mean ± SD)	27.8 ± 7.5	28.0 ± 7.1	0.94 ^t
Gestational HPN	4.4	2.2	1.00 ^f
Chronic HPN	11.1	6.7	0.71 ^f
Pre-eclampsia	15.6	8.9	0.33 ^c
Eclampsia	2.2	6.7	0.62 ^f
Hepa B	0.0	4.4	0.49 ^f
Multiple gestation	17.8	35.6	0.06 ^c
HELLP syndrome	2.2	2.2	1.00 ^f
Gestational DM	6.7	2.2	0.62 ^f
PROM>12	11.1	6.7	0.71 ^f
Acquired pneumonia	0.0	6.7	0.24 ^f
Placenta previa	2.2	4.4	1.00 ^f
UTI	2.2	4.4	1.00 ^f
Oligohydramnios	4.4	2.2	1.00 ^f
Young Primigravida	6.7	4.4	1.00 ^f
Steroids use (%)	57.8	64.4	0.52 ^c
Age of Gestation (weeks) (mean ± SD)	34.9 ± 1.6	35.0 ± 1.2	0.82 ^t
Birthweight (grams) (mean ± SD)	1765.6 ± 327.1	1820.0 ± 253.3	0.38 ^t
Sex ; n (%)			
Male	20 (44.4)	24 (53.3)	0.40 ^c
Female	25 (55.6)	21 (46.7)	
Manner of delivery; n (%)			
SVD	24 (53.3)	24 (53.3)	1.00 ^c
LSCS	21 (46.7)	21 (46.7)	
Apgar score (1 st min) (mean ± SD)	8.8 ± 0.6	8.8 ± 0.5	0.56 ^t
Apgar score (5 th min) (mean ± SD)	9.0 ± 0.1	8.9 ± 0.3	0.41 ^t

T – t-test; c – Chi-square; f – Fisher's exact

RESULTS



Baseline characteristics of participants on transport

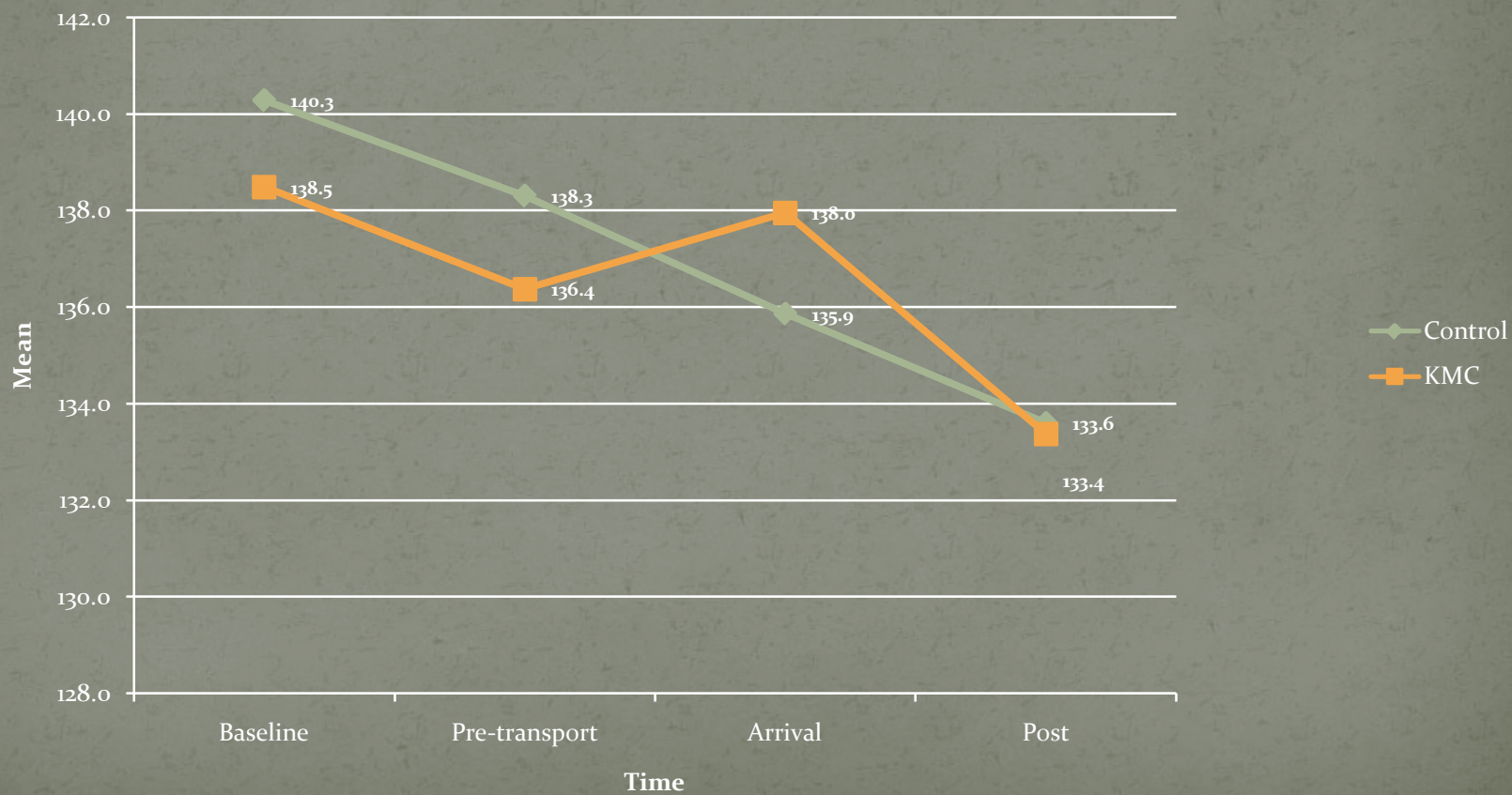
Characteristics	KC transport (n = 45)	Control (n = 45)	<i>p-value</i>
Age at transport (minutes) (mean ± SD)	167.3 ± 71.6	169.1 ± 75.2	0.91 ^t
Initial temperature (C) (mean ± SD)	36.3 ± 0.5	36.3 ± 0.6	1.00 ^t
Duration of Transport(minutes) (mean ± SD)	8.3 ± 2.8	7.4 ± 1.9	0.09 ^t

T - t-test

RESULTS



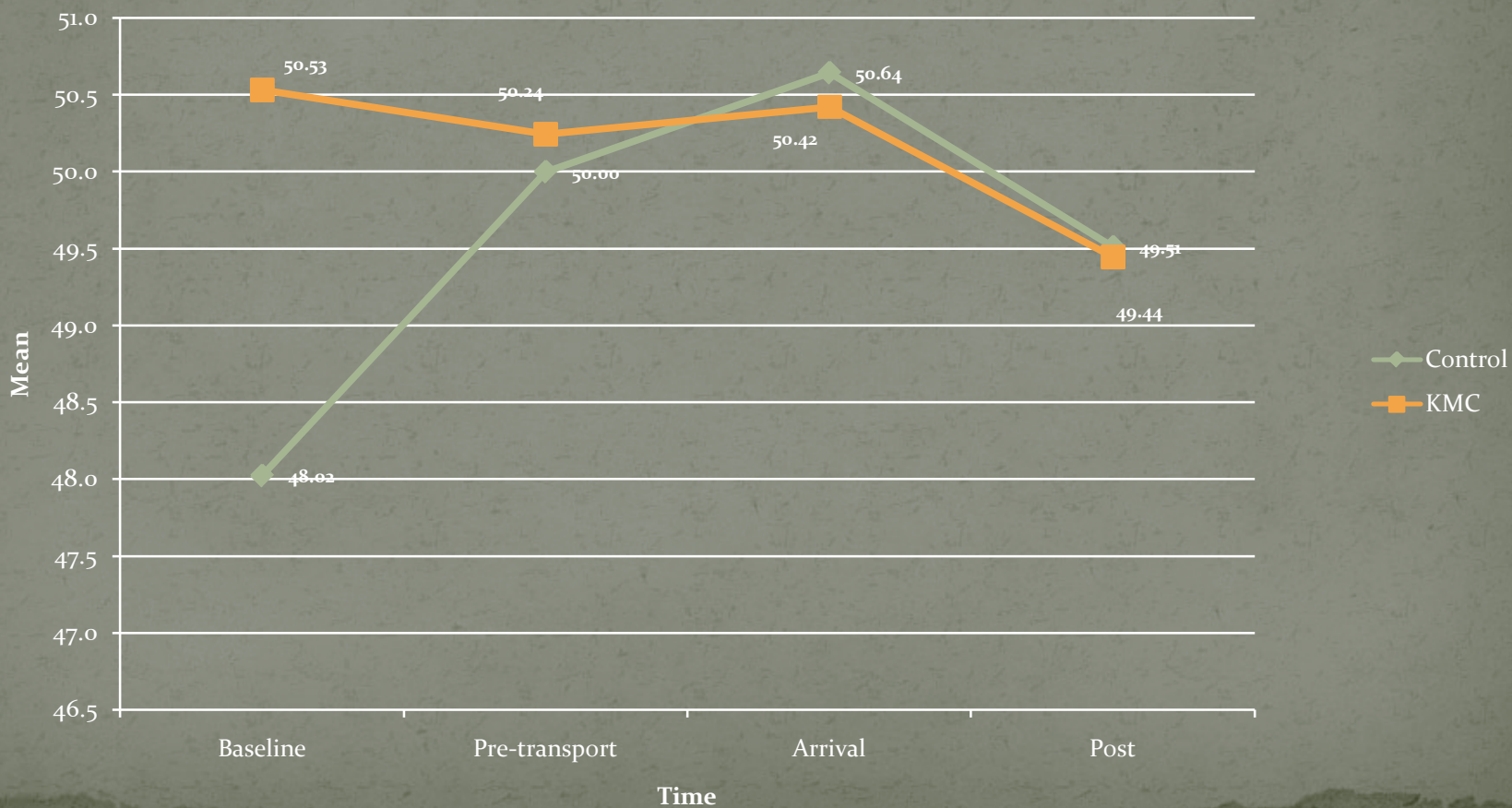
Mean Heart Rate of Participants According to Time and Group



RESULTS



Mean RR of Participants According to Time and Group



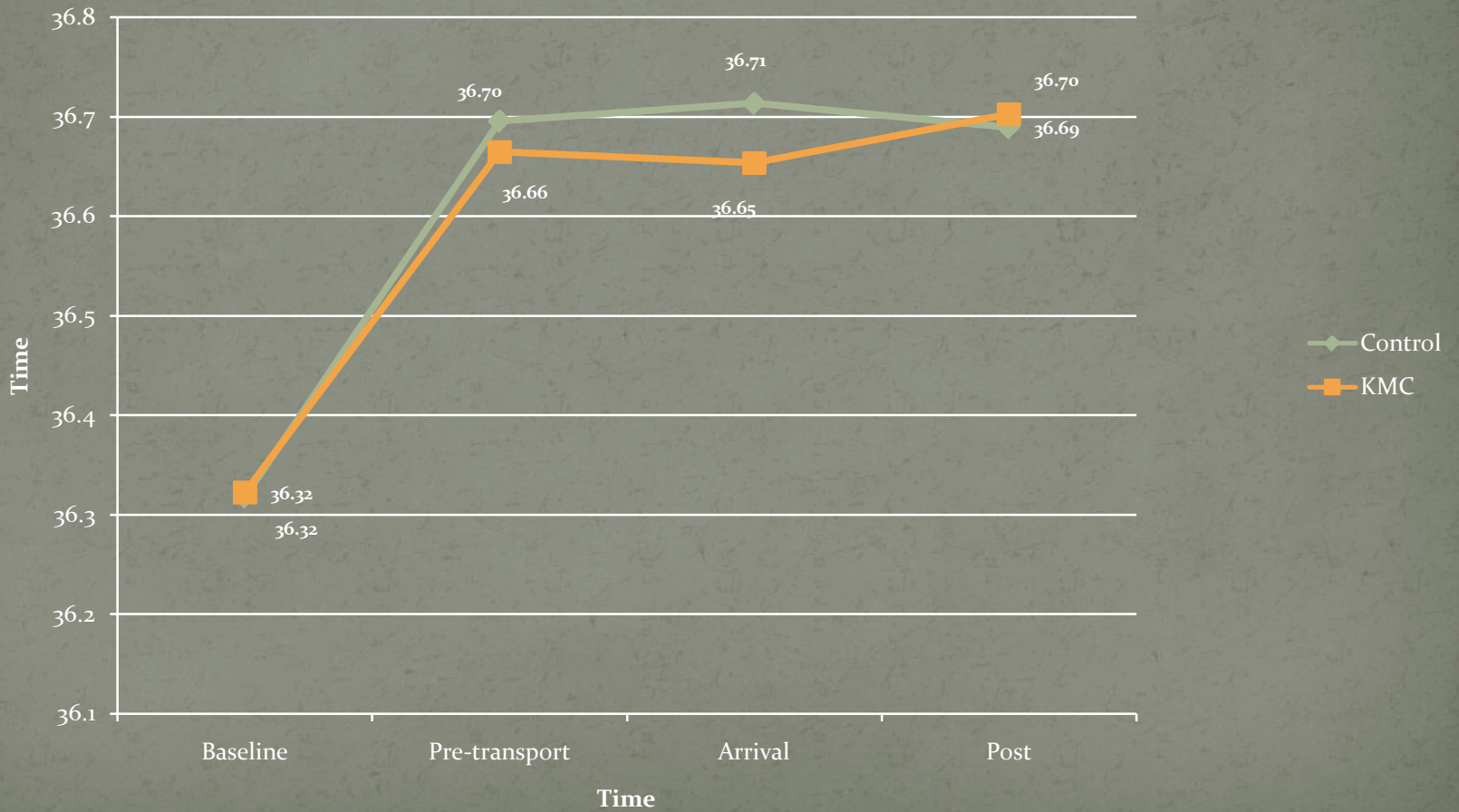
RESULTS



- **SIGNIFICANT REDUCTION IN RESPIRATORY RATE**
- Oxygenation, Heart Rate, and Temperature in Very Low Birth Weight Infants during Skin to Skin Contact with their Mothers
 - Acholet, et al
- Body Temperatures and Oxygen Consumption during Kangaroo Care in Stable Preterm Infants Weighing ≤ 1500 grams
 - Bauer, et al
- Skin to Skin Contact Improves Gas Exchange in Premature Infants
 - Fohe, et al

RESULTS

Mean Temperature of Participants According to Time and Group



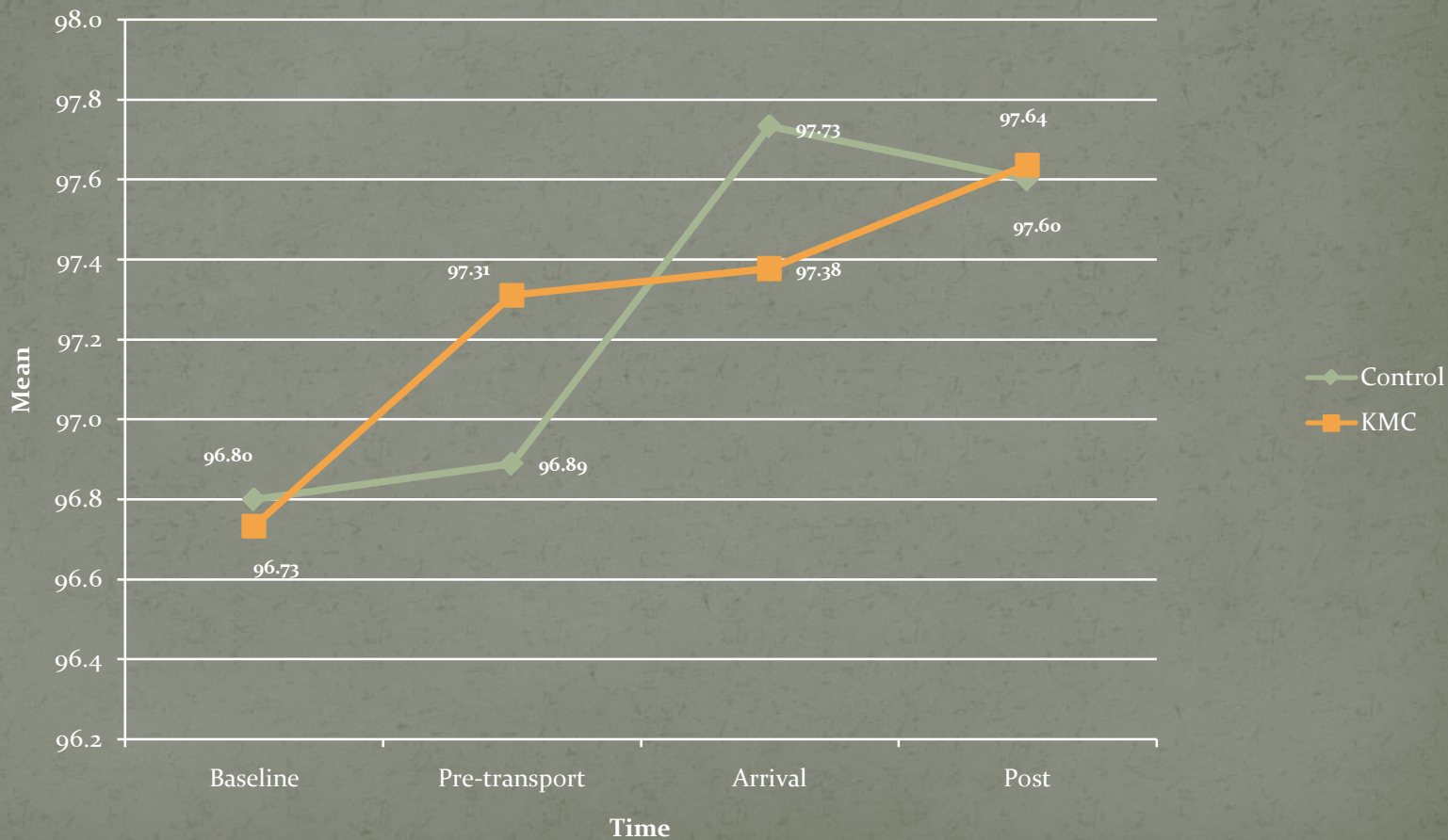
RESULTS



- **INCREASE IN BODY TEMPERATURE**
- Meta-analysis of Physiological Effects of Skin-to-Skin Contact for Newborns and Mothers
 - Mori, et al
- Body Temperatures and Oxygen Consumption during Kangaroo Care in Stable Preterm Infants Weighing <1500 grams
 - Bauer, et al
- Physiological Response to Skin to Skin Contact in Hospitalized Premature Infants
 - Ludington-Hoe, et al

RESULTS

Mean O₂ sat of Participants According to Time and Group



RESULTS



- **INCREASE IN OXYGEN SATURATION**
- Skin to Skin Contact Improves Gas Exchange in Premature Infants
 - Fohe, et al
- Oxygenation, Heart Rate, and Temperature in Very Low Birth Weight Infants during Skin to Skin Contact with their Mothers
 - Acholet, et al
- Meta-Analysis of Kangaroo Care Effects
 - Ludington-Hoe, et al

RESULTS

Mean Change on the Physiologic Responses of Participants (Pre-transport and Upon Arrival) According to Group

Characteristics	KC transport (n = 45)	Control (n = 45)	<i>p-value</i>
Heart rate (mean ± SD)	-1.6 ± 9.6	2.4 ± 11.5	0.07
Respiration			
(mean ± SD)	-0.18 ± 5.7	-0.64 ± 4.3	
Median	0.0	-1.0	0.44
Minimum	-26.0	-10.0	
Maximum	11.0	8.0	
Temperature			
(mean ± SD)	0.01 ± 0.22	-0.02 ± 0.21	0.53
O2 sat			
(mean ± SD)	-0.07 ± 2.6	-0.84 ± 2.6	
Median	0.0	0.0	0.19
Minimum	-5.0	-8.0	
Maximum	9.0	5.0	
CBG			
(mean ± SD)	-5.07 ± 21.4	-4.6 ± 21.5	
Median	-7.0	-6.0	0.63
Minimum	-51.0	-80.0	
Maximum	64.0	45.0	

Wilcoxon-Mann-Whitney test (RR, O2sat, CBG)

RESULTS



	Kangaroo Care Transport Group	Transport Incubator Group
Hypothermia	5 (11.11%)	11 (24.44%)
Hypoglycemia	3 (6.67%)	5 (11.11%)
Tachypnea	1 (2.2%)	4 (8.89%)
Tachycardia	1 (2.2%)	3 (6.67%)
Hyperglycemia	1 (2.2%)	1 (2.2%)
Bradypnea	1 (2.2%)	0

RESULTS



	Kangaroo Care Transport Group	Transport Incubator Group
Culture proven early onset sepsis	4 (8.89%) <i>Pseudomonas aeruginosa</i> <i>Alcaligenes faecalis</i>	2 (4.44%) <i>Staphylococcus epidermidis</i> <i>Alcaligenes faecalis</i>
Neonatal Pneumonia	2 (4.44%)	2 (4.44%)
Intraventricular hemorrhage	1 (2.2%)	0

CONCLUSION



- preterm physiologically stable neonates on kangaroo care transport maintained their cardiorespiratory and temperature stability clinically within acceptable ranges with occurrence of some adverse events
- there is no significant difference in the heart rate, respiratory rate, temperature, oxygen saturation and blood glucose levels
- findings of this study do not confirm that kangaroo care transport is superior or inferior to transport incubator in transporting physiologically stable preterm neonates

RECOMMENDATION

- a similar study with a larger population is recommended





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