Outcome of Kangaroo Mother Care in Teaching Hospital in Rural India

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CREATION OF KMC

1978 - **Dr Edgar Ray Sanabria** & **Dr Hector Martinez** pediatricians from MCH, Colombia created **Kangaroo Mother Care** as a way to humanize high technology & also provide comprehensive low cost care for the LBW infants

KMC – MULTIMODAL STIMULATION

Satisfies all five senses of the baby

Touch: Baby feels warmth of the mother through skin to skin contact

Olfaction: smells mother's odour

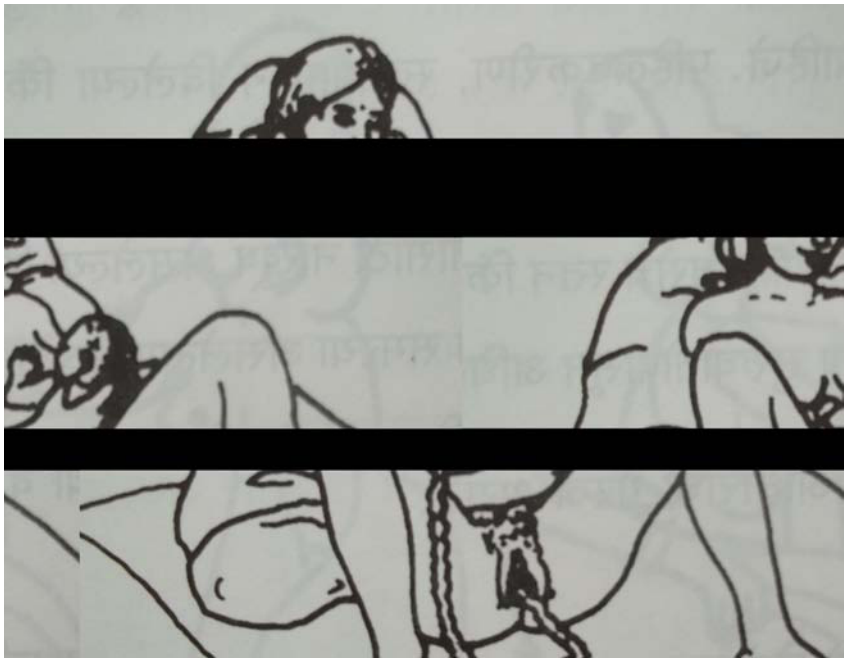
Taste: sucks on breast

Vision: has eye contact with mother

Hearing: listens to mother's voice

JOEY SUCKLING IN MOTHER'S POUCH

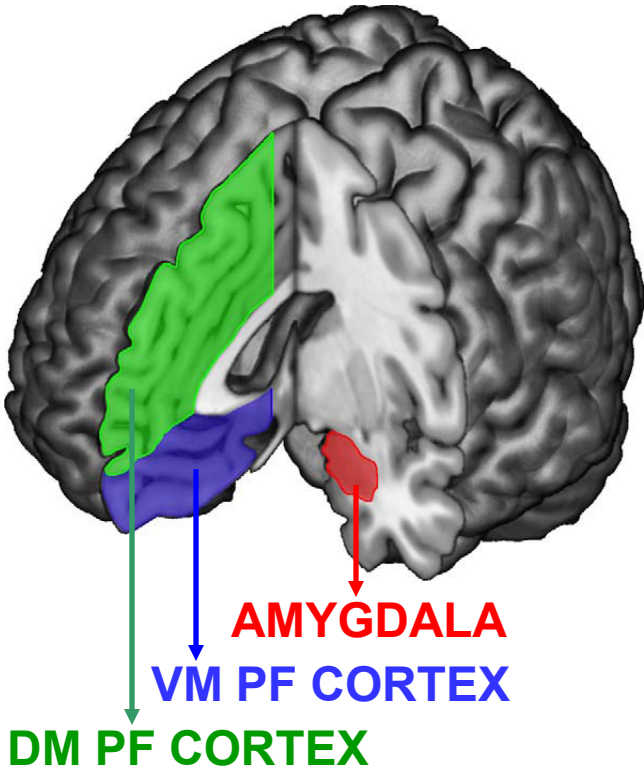
EARLY KMC: BREAST CRAWL i.e. NEONATE SUCKLING WITHIN MINUTES OF BIRTH



INTRODUCTION

SCIENTIFIC BASIS OF KMC

- ***Skin to skin contact*** and carry pattern of care, reflected in KMC
- Development of Amygdala – prefrontal - orbital tract
- Healthy right brain development
- Subsequent mental health
- Better perceptual – cognitive
- Better motor development in later infancy



Kirsten F G, Bergman NJ,Hann M F[4]: KMC in the nursery. Pediatr Clin North Am 2001;48:443 -452

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Ruiz Pelaez JG, Charpak N, Cuervo LG.[6]: KMC, an Example to follow from developing countries. BMJ 2004; 329(7475): 1179-1181

INTRODUCTION

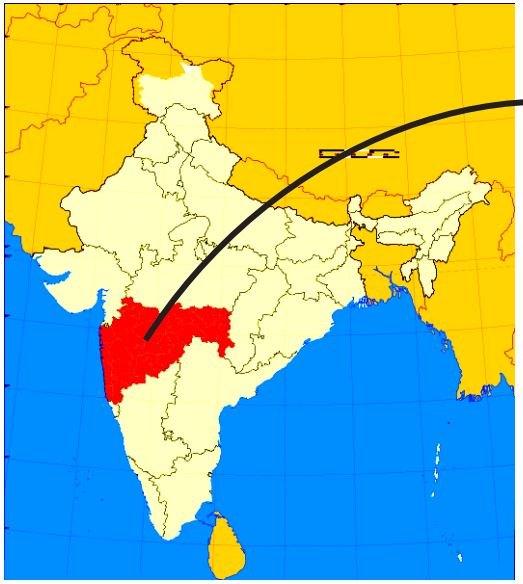
CONVENTIONAL CARE

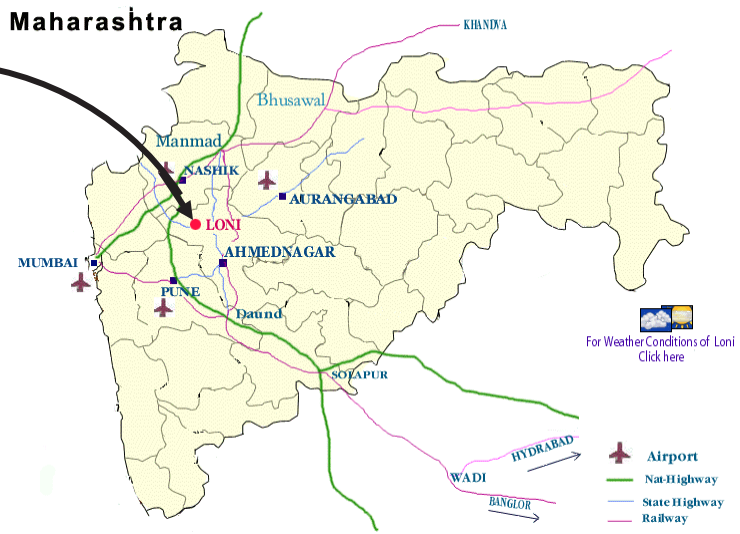
- ***INCUBATOR***
- ***PARENTERAL THERAPY***
- ***VENTILATOR THERAPY***
- ***CONTACT, REMOTE DELAYED, INTERMITTENT, UNATTENDED DISTRESSED***

KANGAROO MOTHER CARE

- **SKIN TO SKIN CONTACT – EARLY & PROLONGED**
- **EARLY EXCLUSIVE BREAST MILK**
- **APNEA PREVENTION**
- **MULTIMODAL STIMULATION**

GREETINGS





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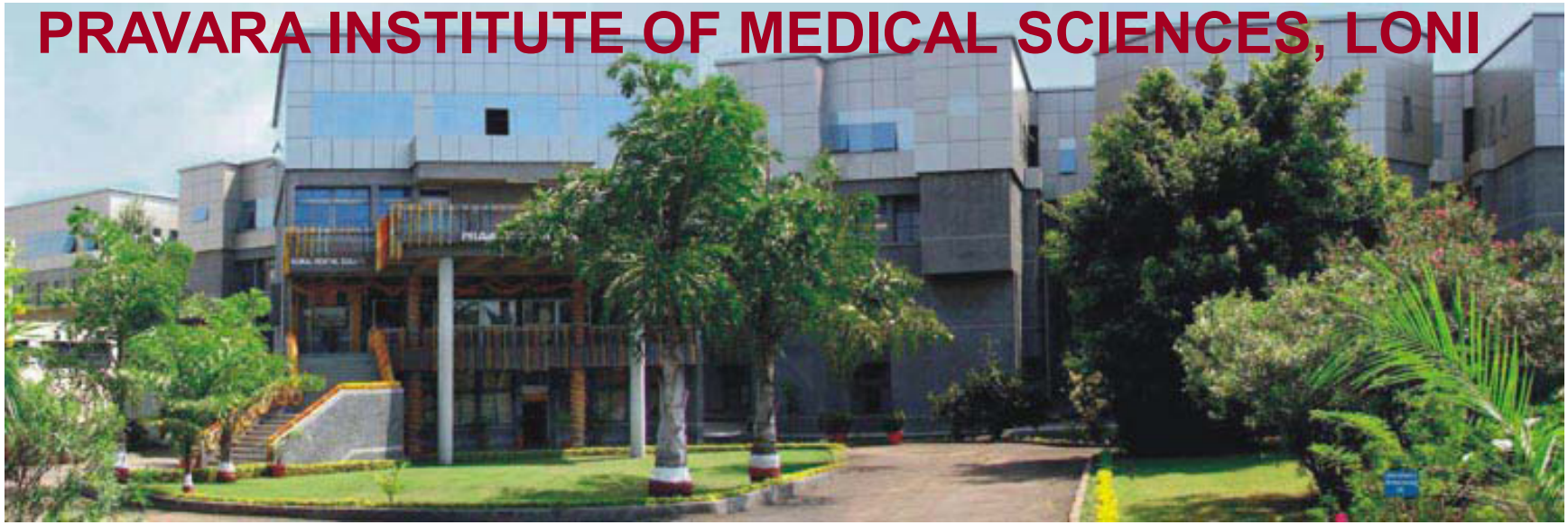
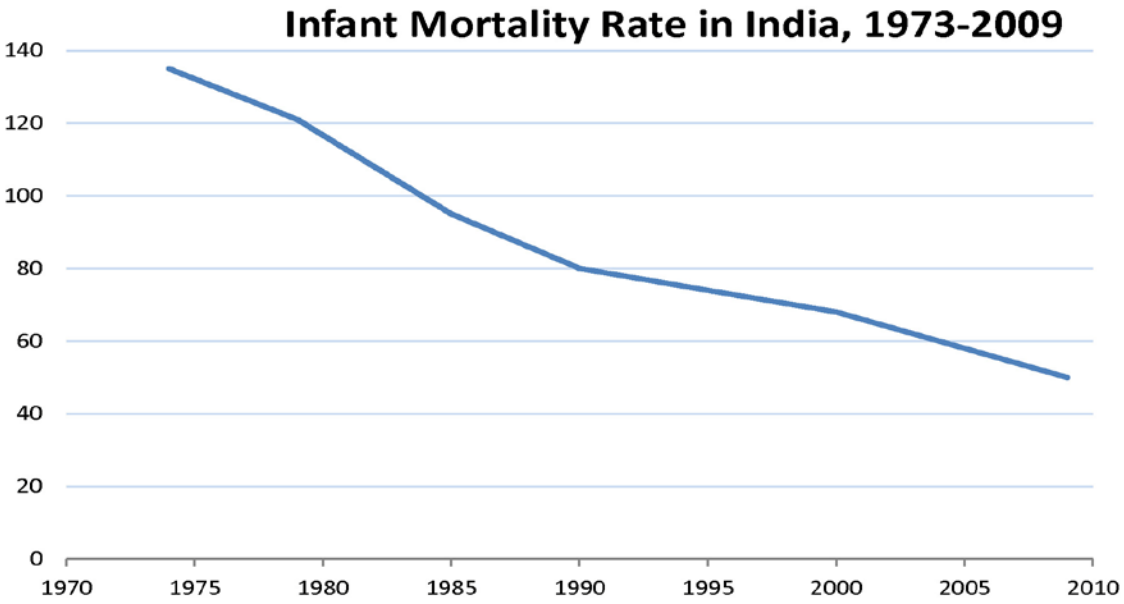
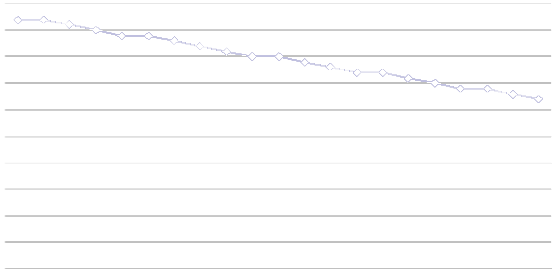




Neonatal Mortality Rate in India, 1990-2010



Source: Level & Trends in Child Mortality. Report 2011. Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA, UNPD).

MATERIALS

PERIOD: June 2007 to May 2009

INCLUSION CRITERIA

Intramural singleton neonates (<2000gms) were enrolled in KMC after

- **stabilization i.e. Apgar score of 7 at 5 minutes**
- **with stable cardiopulmonary status and on EBM(NGT) or Breast feed**

at Birth / 24-72 hrs of age / after 72 hrs of age and studied till discharge with advice to continue at home till follow up at CDOB.

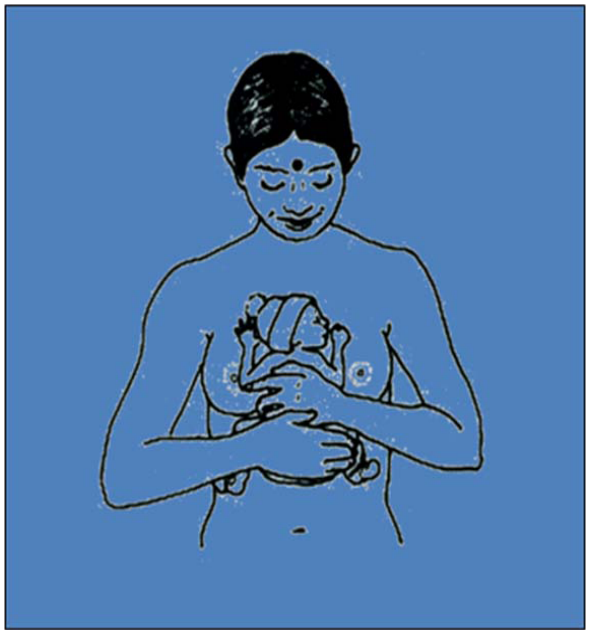
EXCLUSION CRITERIA

- **Neonates > 2000 gms**
- **Neonates with life threatening congenital anomalies**
- **Neonates with Apgar < 7 at 5 minutes**
- **Neonates of multiple gestation**

A TOTAL OF 287 NEONATES SELECTED FOR STUDY WERE ENROLLED FOR KMC, OF WHICH THOSE WHO SHOWED DISCOMFORT WERE GIVEN CMC FORMED THE CONTROL GROUP.

METHODS

- A printed questionnaire to elicit maternal history in detail while sensitizing the mother for KMC
- Printed pro forma for recording thorough clinical examination of the newborn.
- Components of KMC
- Kangaroo feeding policy
- Daily weight monitoring
- Kangaroo discharge and follow up policies
- KMC Ward
- Follow up as surrogate for morbidity / mortality



KANGAROO POSITION

INADEQUATE WEIGHT GAIN (<15-20 gm/kg/d)

Well baby

Calculate fluid and calorie intake

Adequate calorie intake

Ensure 24 hours KMC

Recheck weight

No weight gain

Provide **hind milk**

No weight gain

Add MCT oil or **coconut oil***

No weight gain

Add **human milk fortifier****

No weight gain

Add **preterm formula*****

If inadequate provide the deficit

Continue **KMC**

Support mother

Re-evaluate

Sick baby

Look for acute illness

Minor illness
- Anemia
- ARI

Out patient treatment /observe & SOS hospitalize

Severe illness
- Sepsis
  Pneumonia
  Bronchiolitis

Hospitalize

Omit once adequate weight gain of 15 -20gm/kg/d

RESULTS

Live born babies birth weight ≤ 2500gms

Total no. of live births N = 5036		Total No. of LBW N =1780 (35.34%)	
Male	Female	Male	Female
2678 (53.18%)	2358 (46.82%)	922 (51.80%)	858 (48.20%)

Sex distribution of babies having birth weight ≤ 2000gms:

Total no. of live births N = 5036	
No. of babies having birth weight ≤ 2000gms, n = 1182 (23.47%)	
No. of babies studied n = 287 (24.28%)	
Male	Female
146 (50.87%)	141 (49.13%)

Weight distribution of KMC / CMC babies under study:

Weight in gms	No. of babies		
	KMC	CMC	Total
≤ 1000	3 (1.63%)	0	3 (1.04%)
1001-1500	68 (37.15%)	8 (7.69%)	76 (26.48%)
1501-2000	112 (61.2%)	96 (92.3%)	208 (72.48%)
Total	183 (63.76%)	104 (36.24%)	287 (100%)

RESULTS

Gestational Age Distribution of neonates in KMC and CMC

GESTATIONAL AGE (wks)	KMC			CMC			TOTAL
	M	F	Total	M	F	Total	
≥ 28 - **30**	5	13	**18**	1	1	**2**	**20**
≥ 30 - **32**	22	17	**39**	8	5	**13**	**52**
≥ 32 - **34**	30	24	**54**	14	10	**24**	**78**
≥ 34 - **36**	15	14	**29**	16	17	**33**	**62**
≥ 36 - **38**	19	24	**43**	16	16	**32**	**75**
Total	**91**	**92**	**183 (63.76%)**	**55**	**49**	**104 (36.24%)**	**287**

Gestational Age Distribution of neonates in KMC and CMC

GESTATION	KMC	CMC
Preterm	**140**	**72**
Full term	**43**	**32**

RESULTS

Average weight gain (gms/kg/day)

CATEGORY	KMC	CMC
Minimum Avg. wt gain (gms/kg/day)	6	5
Maximum Avg. wt gain (gms/kg/day)	30	18
Mean ± SD	17.64 ± 2.31	10.81± 1.02
Median	18.0	11.5

CATEGORY	≤ 1000	1001 -1500	1501-2000
Minimum Avg. wt gain (gms/kg/day)	10	5	5
Maximum Avg. wt gain (gms/kg/day)	26	30	30
Mean ± SD	17.75 ± 2.27	16.53 ± 1.85	16.43 ± 1.73
Median	18.0	17.5	17.5

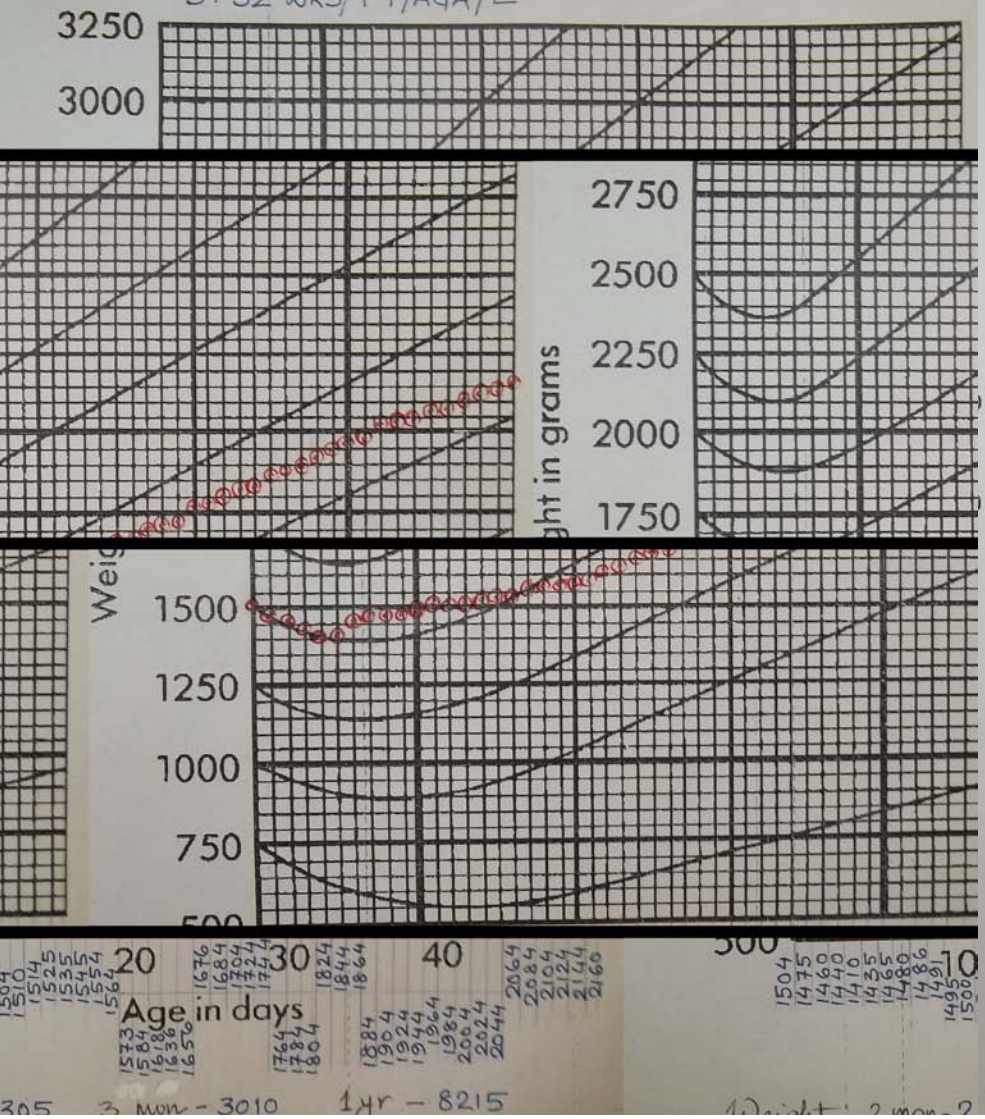
Mean Avg. weight gain in KMC: 17.64 ± 2.31 gms/kg/day
Mean Avg. weight gain in CMC: 10.81 ± 1.02 gms/kg/day
Applying Z test for difference between two sample means shows highly significant difference between mean values of Avg. weight gain in KMC and CMC ($p < 0.01$)

KMC

PRAVARA RURAL HOSPITAL : Pediatrics
OPD No. IPD No. 22108
UNIT : Neonatology WARD : KMC

Dancis Chart

NAME : B/o Mrs. Aruna Dabhade DOB: 5/01/08 Wt: 1504 Sex: M
D : 32 WKS/PT/AGA/L



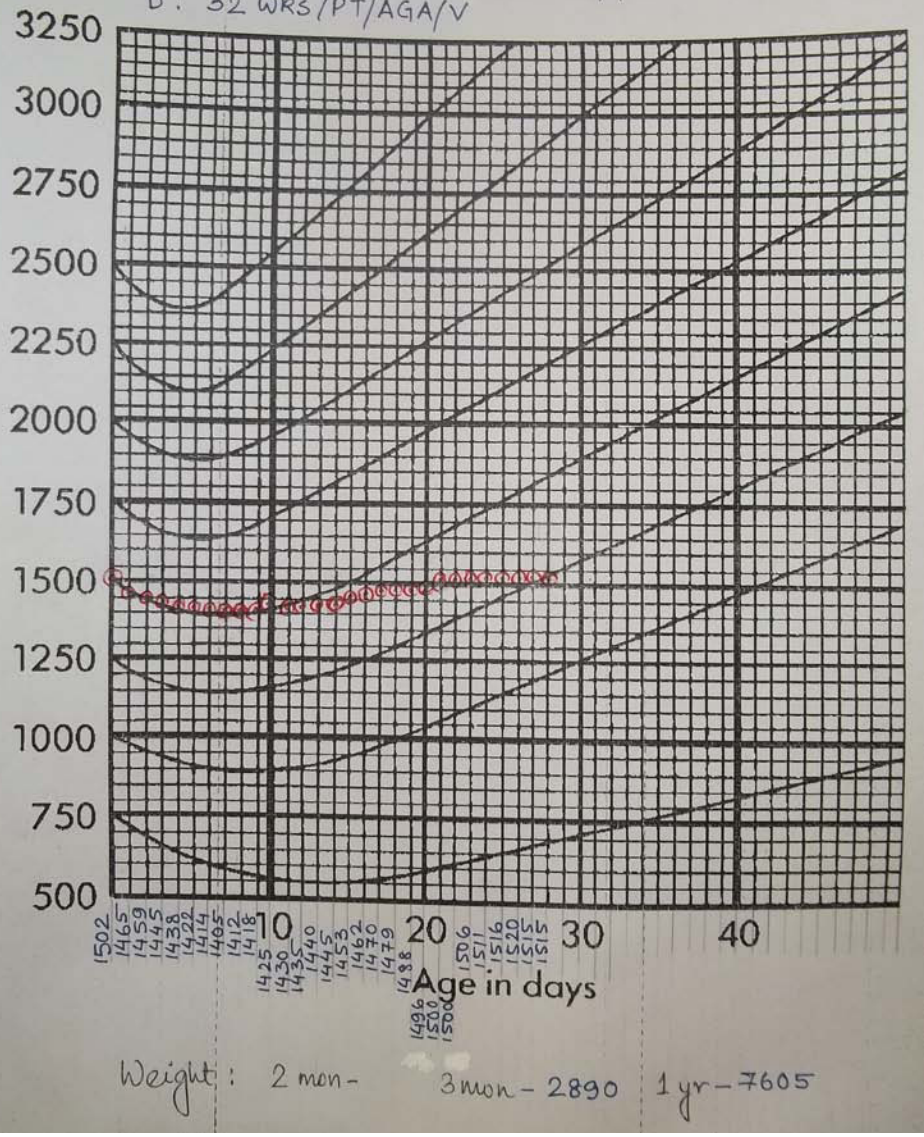
3 mon - 3010 1 yr - 8215

CMC

PRAVARA RURAL HOSPITAL : Pediatrics
OPD No. IPD No. 193308
UNIT : Neonatology WARD : CMC

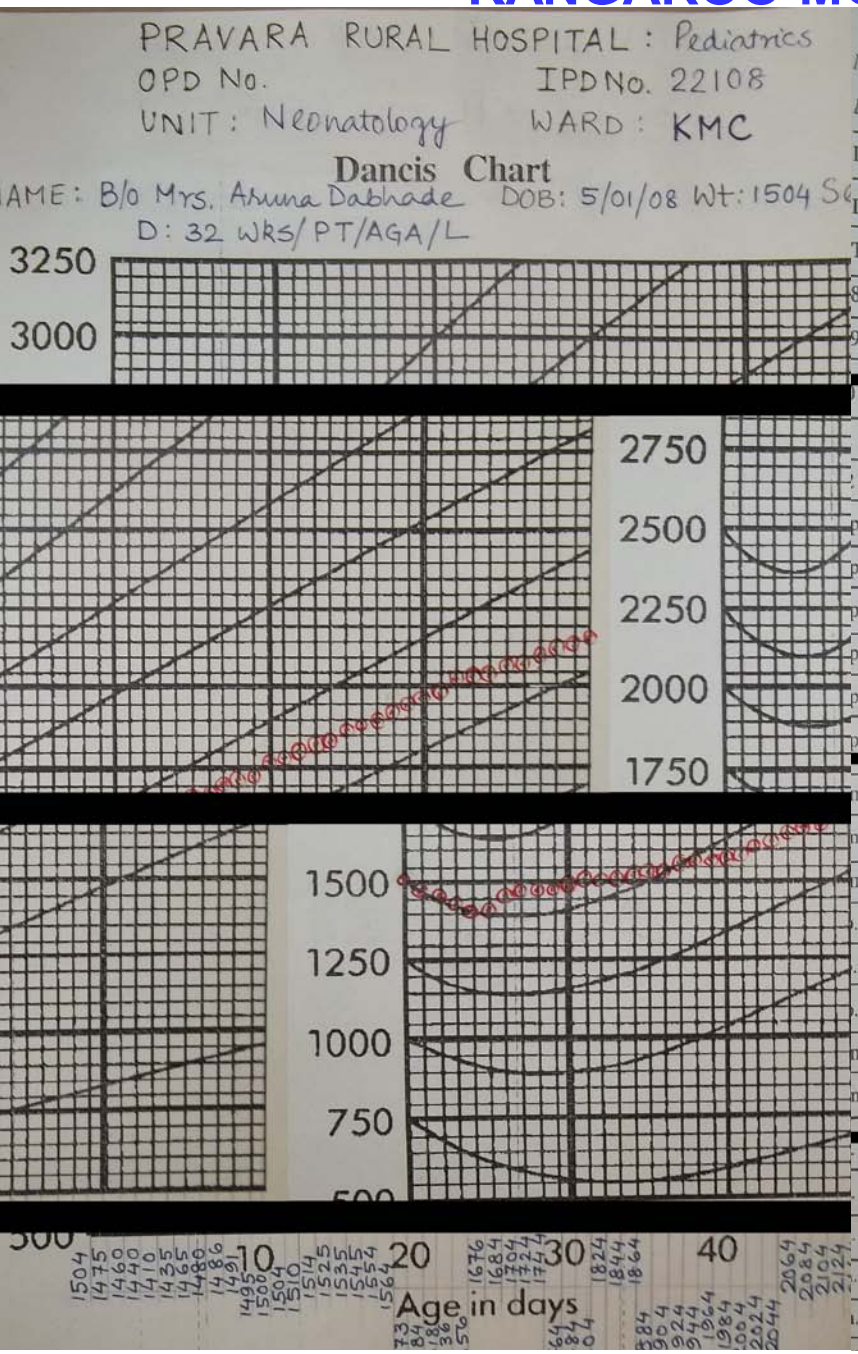
Dancis Chart

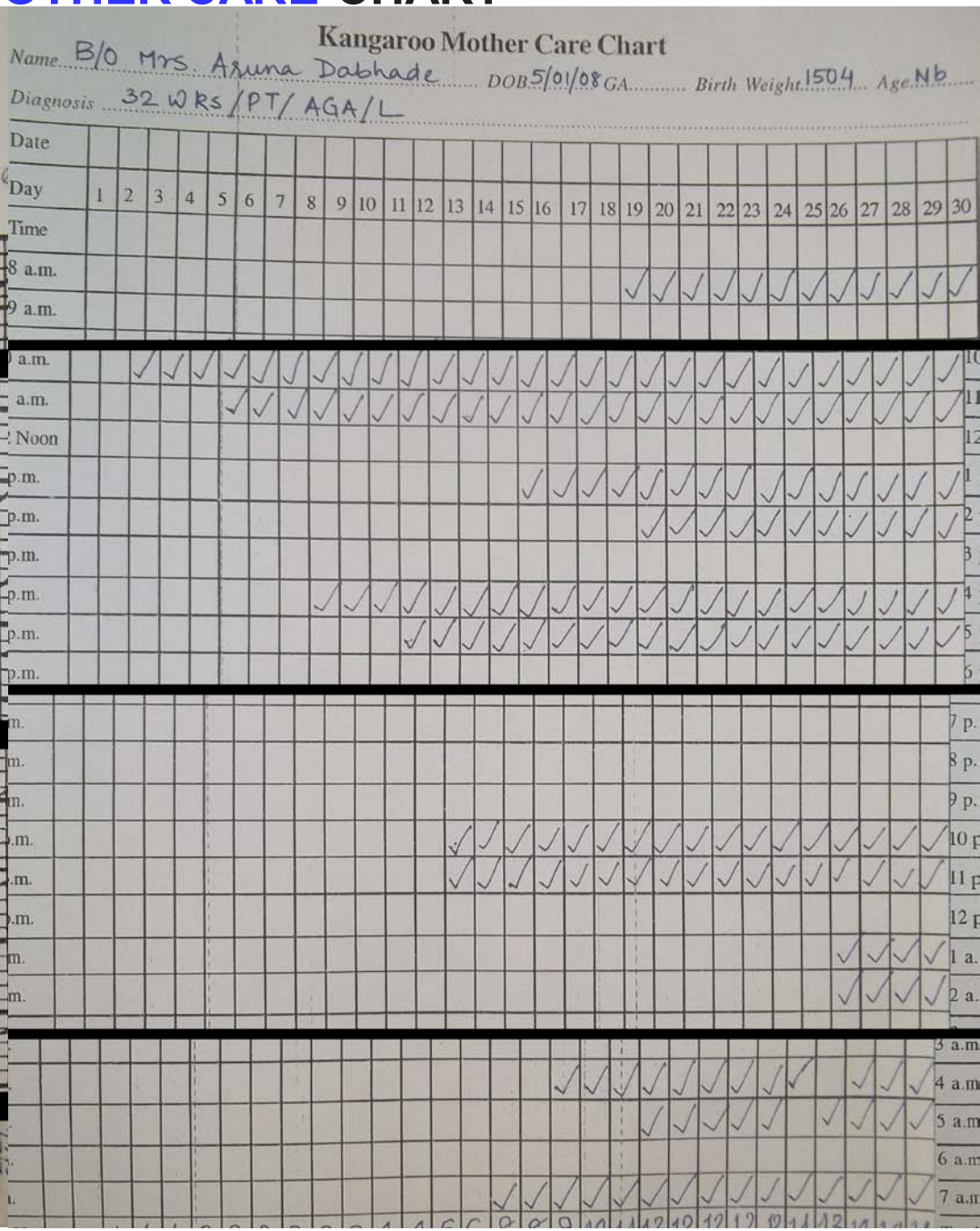
NAME : B/o Mrs. Manisha Shinde DOB: 30/1/08 Wt. 1502 Sex: M
D : 32 WKS/PT/AGA/V



Weight : 2 mon - 3 mon - 2890 1 yr - 7605

KANGAROO MOTHER CARE CHART





CONSTANT TEMPERATURE IN KMC

Table 3(a): Incidence of Hypothermia, Hypoglycemia, Sepsis, Hypoxia and Apnea in KMC and CMC cases

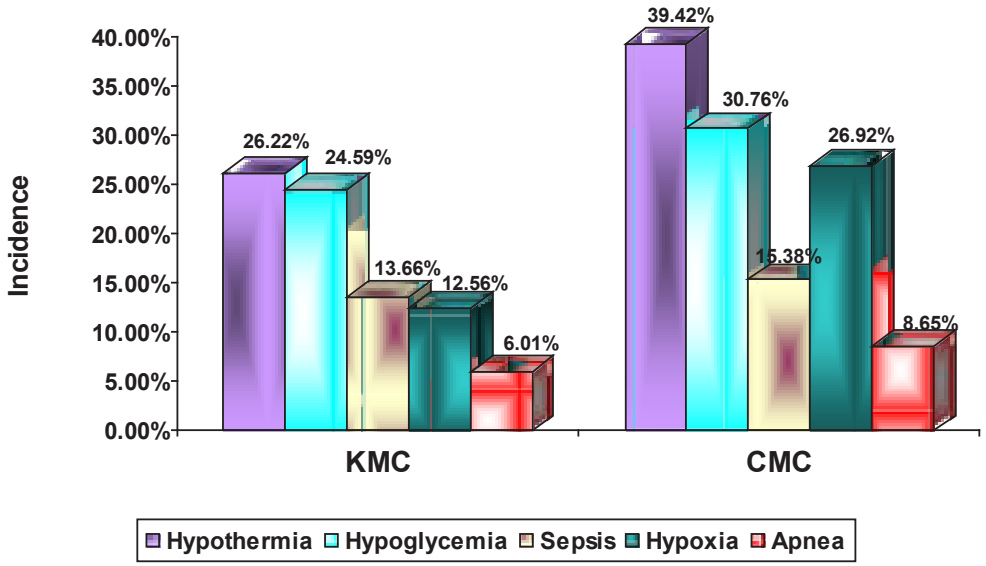
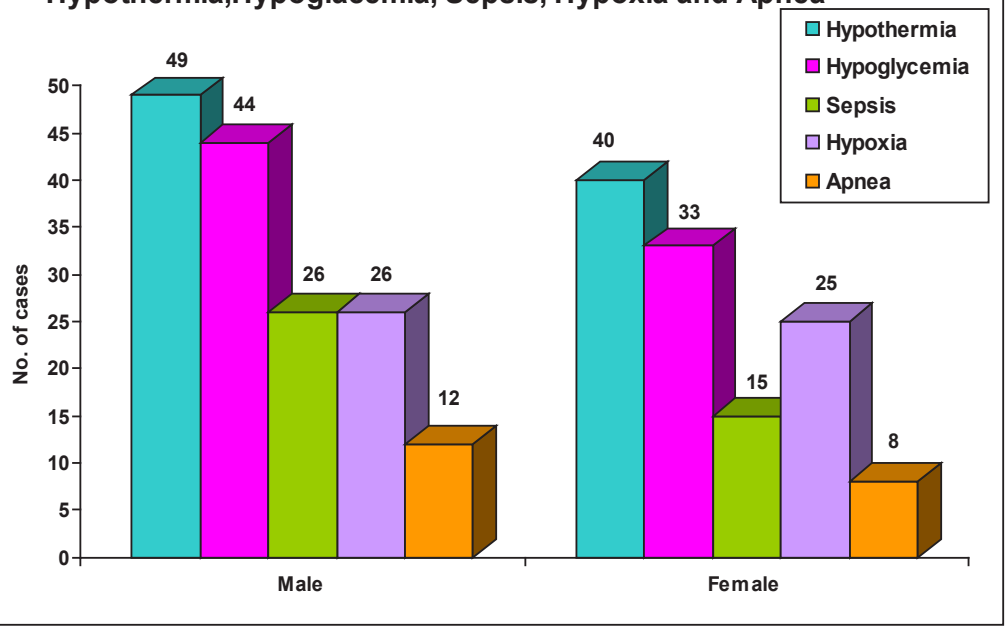


Table 3(b): Sex wise distribution in Hypothermia,Hypoglacemia, Sepsis, Hypoxia and Apnea



DISCUSSION

WEIGHT GAIN

Average weight gain

Study group KMC:
17.64 ± 2.31 g/kg/day

Control group CMC:
10.81 ± 1.02 g/kg/day

highly significant ($p<0.01$)

Cattaneo et al 1998[12]: ***study group: 21.3 g/day; control group:17.7 g/day***
Lincetto et al 2000[13]: ***15.6 g/day***
Colonna et al 1990[14]: ***12.8 g/day***
Aloke, Vani et al[15]: ***KMC 101.67 vs. CMC 36.6 g***
Ramnathan et al[3]: ***15.9 ± 4.5 vs. 10.6 ± 4.5 g/day***

INCIDENCE OF HYPOTHERMIA

Study group KMC:

48 of 183

Control group CMC:

41 of 104

study group < control group

(p<0.05)

Cattaneo et al 1998[12]: ***KMC 10.8 vs. CMC 14.65 episodes/100 infants/day***
Priya et al 2004[17]: ***KMC 98.8°F was higher than CMC 98.3°F***
Kadam et al 2005[19]: ***KMC 10 of 44 ; CMC 21 of 45 hypothermia incidence***
K. Christensson et al[18]: ***skin temperature of full terms increases significantly in just 5 minutes KMC***

INCIDENCE OF HYPOGLYCEMIA

Study group KMC: 45 of 183

Control group CMC: 32 of 104

study group < control group ($p<0.05$)

Aloke, Vani et al[15]: ***showed no incidence of symptomatic hypoglycemia in both the KMC and CMC groups.***

INCIDENCE OF SEPSIS

Study group KMC:
25 of 183

Control group CMC:
16 of 104

study group < control group ($p<0.01$)

Charpak et al[7]: *rate of infection similar in both groups but severity of septicemia differed, favoring the KMC group*

Dr. Susan Ludington[16]: *immunity improved among LBW infants in KMC (especially preterms) thereby protecting them from infection*

Sloan et al[20]: *during 6 months follow up KMC group had significantly low rate of infection compared to CMC group*

INCIDENCE OF HYPOXIA

Study group KMC:

23 of 183

Control group CMC:

28 of 104

study group < control group

(p<0.05)

Priya JJ et al 2004[17]: ***KMC 5.4 vs. CMC 9.5 frequency of episodes (p<0.05)***

INCIDENCE OF APNEA

Study group KMC:

11 of 183

Control group CMC:

9 of 104

study group < control group

(p<0.05)

Priya JJ 2004[17]: ***KMC 0.43 vs. CMC 0.73 mean apneic spells, clinically significant***

Sloan et al [20]: ***similar results at Isidro Ayora Maternity Hospital in Quito, Ecuador***

BLOOD PRODUCT UTILIZATION

Blood Product Utilization

study group **KMC:** 46 of 183

control group **CMC**: 28 of 104

Rate of wt. gain less in Preterms due to anemia requiring blood transfusion & later put on oral iron therapy at 8 wks age

Weight in gms	KMC (n=183)		CMC (n=104)		Total (n=287)	
	Male	Female	Male	Female	Male	Female
≤ 1000	1	1	0	0	1	1
1001-1500	13	9	1	3	14	12
1501-2000	9	13	11	13	20	26
Total	23	23	12	16	35	39
Grand Total	46 (25.13%)		28 (26.92%)		74 (25.78%)	

G.Kirsten Et H. Weyers2006[21]: KMC < CMC

MORBIDITY / MORTALITY PROFILE

Follow up at ≥ 3 months is a surrogate marker of overall mortality/morbidity which is an evidence of effectiveness & safety of KMC over CMC

199 of total 287 babies (69.33%)

KMC: 145 of 183 (79.23%) **CMC:** 54 of 104 (51.9%)

Babies had adequate weight gain & neurodevelopment was normal.

Sex / Birth weight	≤ 1000		1001 - 1500		1501 - 2000		Total (n = 287)
	KMC (3)	CMC (0)	KMC (68)	CMC (8)	KMC (112)	CMC (96)	
Male	1	0	26	2	46	27	102
Female	1	0	25	4	46	21	97
Total	2	0	51	6	92	48	199 (69%)
Grand Total	2		57		140		

Conde-Agudelo A et al[22]: *involving 1362 infants, showed no difference in infant mortality, KMC associated with reduced risk of nosocomial infection at 41 weeks CGA, OR 0.49, CI 0.25 – 0.93; wt. gain: KMC > CMC*

Sloan et al[20]: *mortality same in KMC & CMC most deaths occurred during the stabilization period before randomization*

Priya JJ[7]: *involving 30 LBW babies showed a marked reduction of morbidity and mortality in KMC as* **compared to CMC**

BREAST MILK FEEDING RATES

All the babies (100%) were on breast feeding at discharge

Follow up at ≥3 months:

199 of total 287 babies (69.33%)

KMC: 145 of 183 (79.23%)

CMC: 54 of 104 (51.9%)

***Sloan et al 1994[20]:* similar observation**

***Charpak et al 1994[23], 1997[7] :* KMC more than CMC 1 month 93% vs. 78%**

3 months 82% vs. 75%

6 months 70% vs. 37%

1 year 41% vs. 23%

BREAST MILK FEEDING RATES

Cattaneo et al 1998[12]: ***study group KMC 88%; control group CMC 70%,***
Hurst et al[24]: ***KMC increases milk production,***
Ramanathan et al 2001[3]: ***KMC doubles breast feeding rates.***

HEAD GROWTH (OFC)

Follow up at ≥ 3 months:

199 of total 287 babies(69.33%)

KMC: 145 of 183 (79.23%)

CMC: 54 of 104 (51.9%)

Head growth i.e. reflection of brain growth monitored by measuring OFC at birth (3 days age) and on follow up at 3 months, values within normal range

OFC in different weight categories

Wt. (Grams)	At Birth (3 days)	At 3 months
≤1000	**26.2 cm**	**33.7 cm**
1001 - 1500	**28.5 cm**	**34.4 cm**
1501 - 2000	**31.6 cm**	**37.3 cm**

NEURODEVELOPMENT

INFANIB Scale was used for neurodevelopment evaluation of babies on follow up at 3 months of age. Following signs were assessed and found overall normal

1) *Hands open / close*
2) *Scarf sign*
3) *Heel to ear*
4) *Popliteal angle*

Development assessment at **three** months of age in both study and control groups are comparable

Charpak et al 2001[25]: ***psychomotor development was similar in their study and control groups***

Feldman et al 2002[26]: ***study group infants showed more alertness, mean Psychomotor Developmental Index was higher than among control group (85.47 vs. 80.53)***

1. Hands Open / Close

- Note the position of infant's hands.
- At birth – hands closed some or all the time
- 2 months – closure of hands on stimulation.
- 3 months – hands normally open.
- 4 months – closed hands abnormal
- Fisting / clenching of hands - indicator of excessive extensor tone, abnormal at any time.

Hands open - Normal infant

Fisting 2 months - Neuromotor abnormality

Hands closed, neuromotor abnormality at 3.5 months

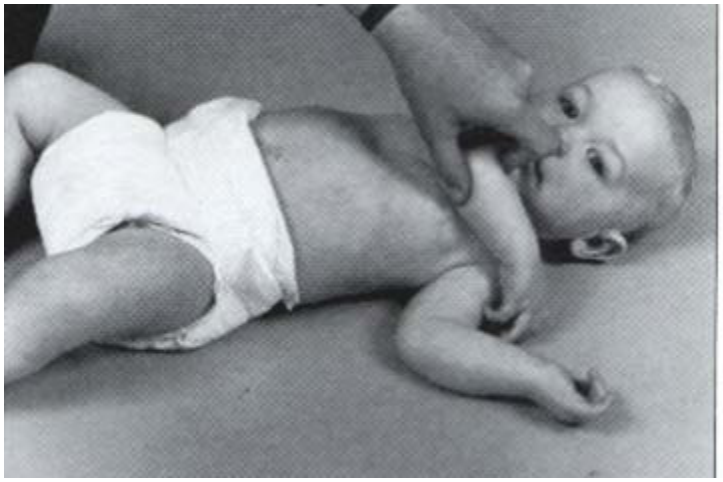
2. Scarf sign

Normal: changes

3 monthly

Normal Scarf Sign 0-3 months 0°-15°

Normal scarf sign 4-6 months 15°-45°



Normal Scarf Sign 7-9 months 45° - 60°

Normal Scarf sign 10-12 months 60° - 85°

Scarf sign

Abnormal

Progression from

Marked hypotonia

to

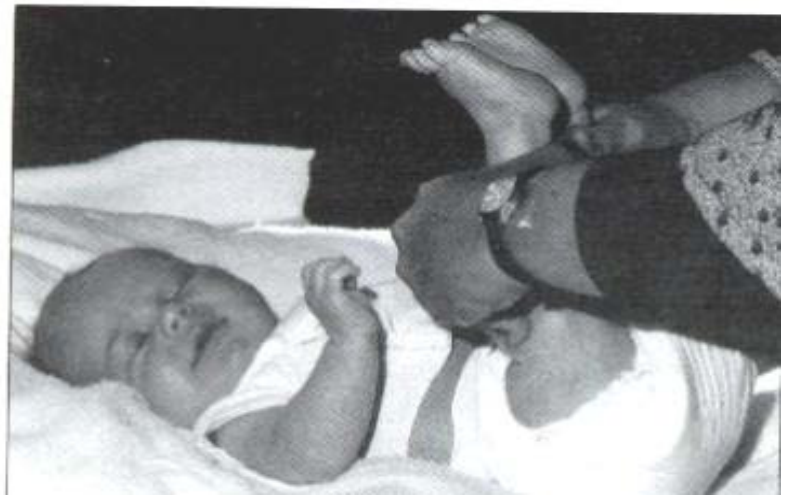
Spastic Tetraparesis

Abnormal Scarf sign, 0 - 3 months

Abnormal Scarf sign 4 - 6 months

Abnormal Scarf sign 7 - 9 months

Abnormal Scarf sign 10 - 12 months



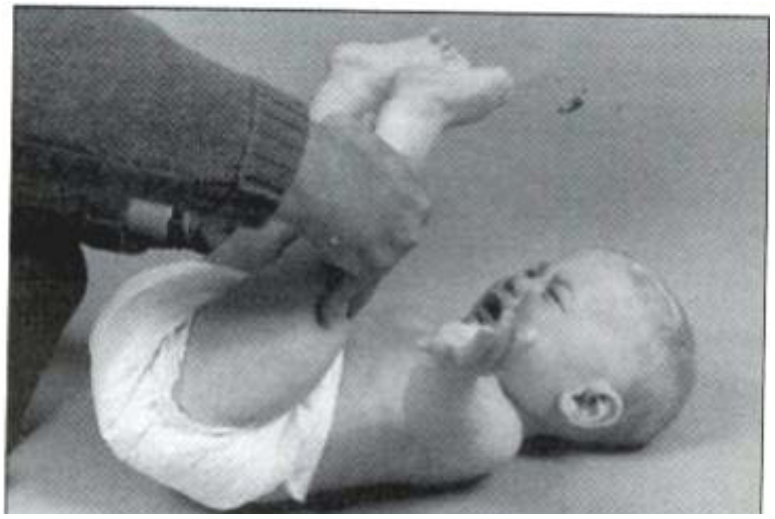
3) Heel to ear

Normal

Excellent Indicator of Hypertonia

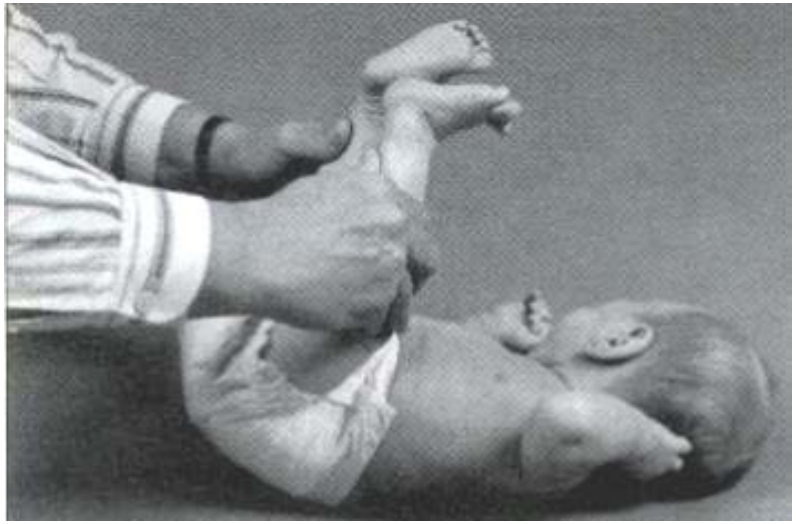
Normal heel to ear 0 - 3 months, 100° - 90°

Normal heel to ear 4 -6 months, 90° - 60°

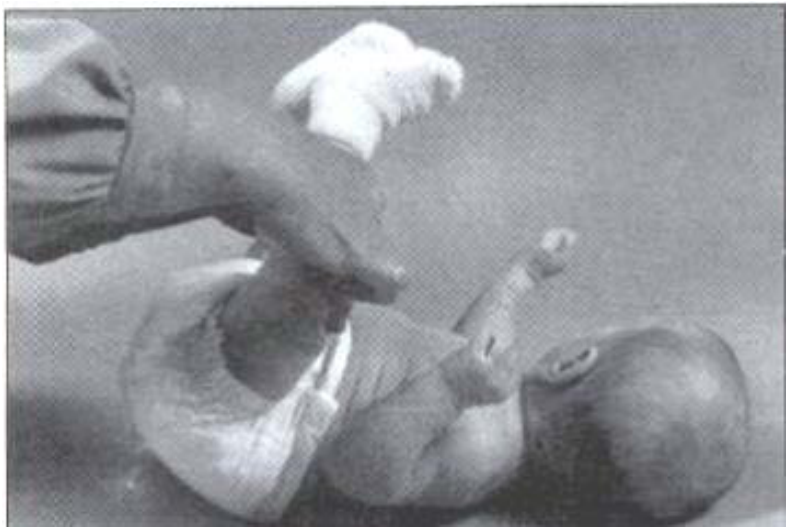


Normal heel to ear 7 - 9 months, 60° - 40 °

Normal heel to ear 9 - 18 months 40° - 10°



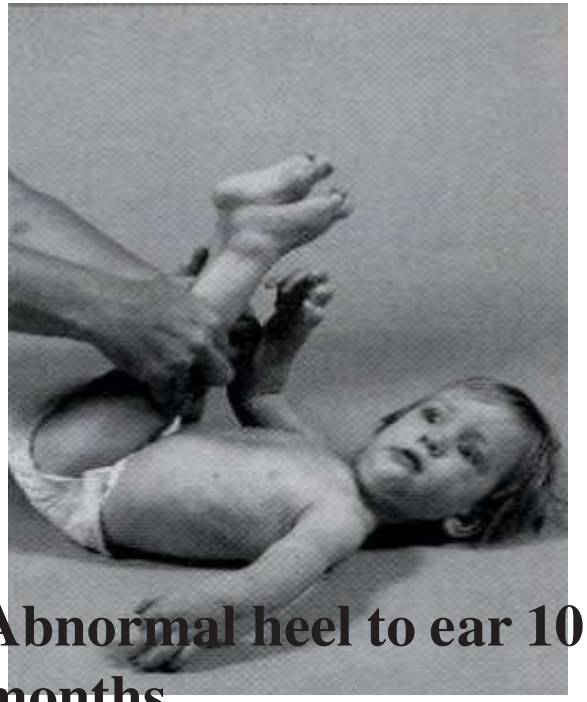
Abnormal heel to ear 0 - 3 months



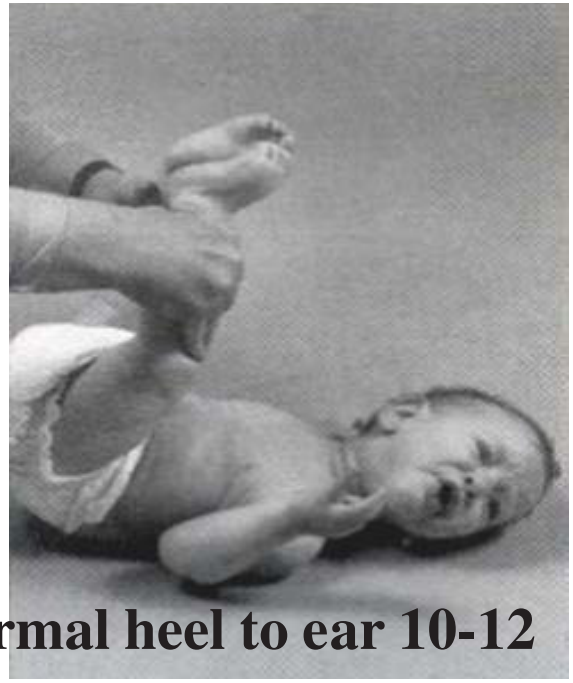
Abnormal heel to ear 4 - 6 months

Heel to ear

Abnormal



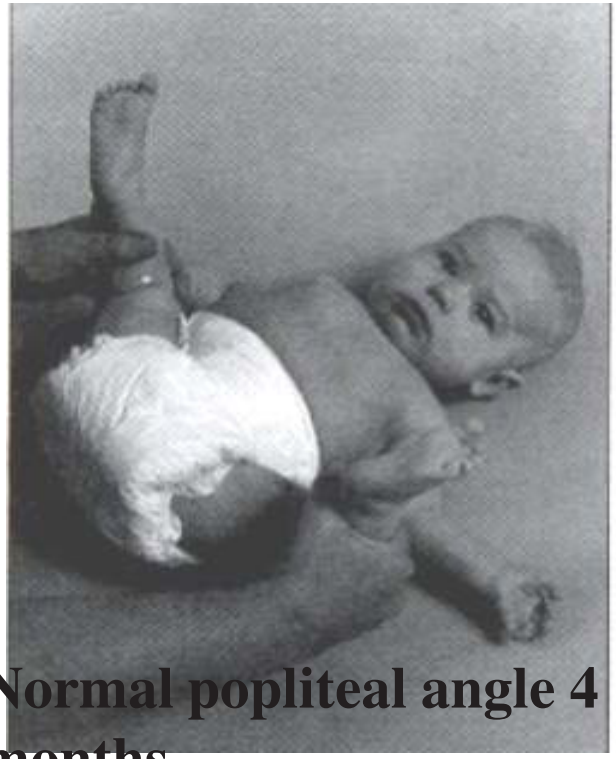
Abnormal heel to ear 10 -12 months



Abnormal heel to ear 10-12 months

Normal Popliteal angle 0 - 3 months

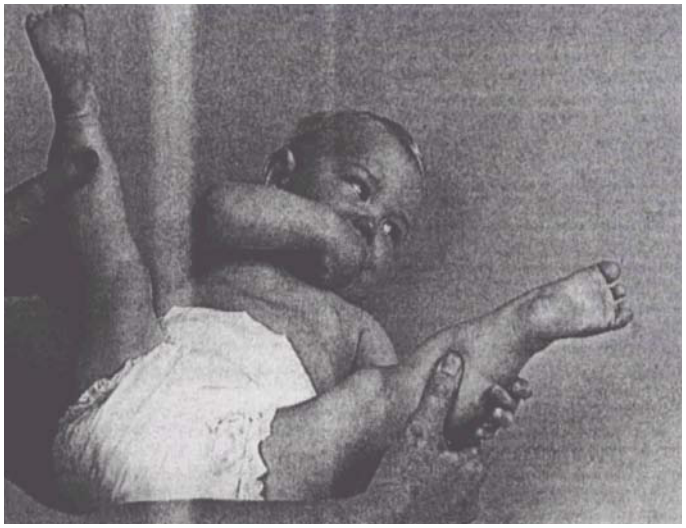
Normal popliteal angle 7 - 9 months



Normal popliteal angle 4 - 6 months

4) Popliteal angle

Normal



Normal popliteal angle 10 - 12 months

Popliteal angle

Abnormal

Abnormal popliteal angle 0 - 3 months

Abnormal popliteal angle 4 - 6 months

Abnormal popliteal angle 7 - 9 months

Abnormal popliteal angle 12 months

KEY MESSAGE

WHAT IS ALREADY KNOWN ?

- **KMC is the humane and physiological answer for comprehensive low cost care for LBW Infants.**

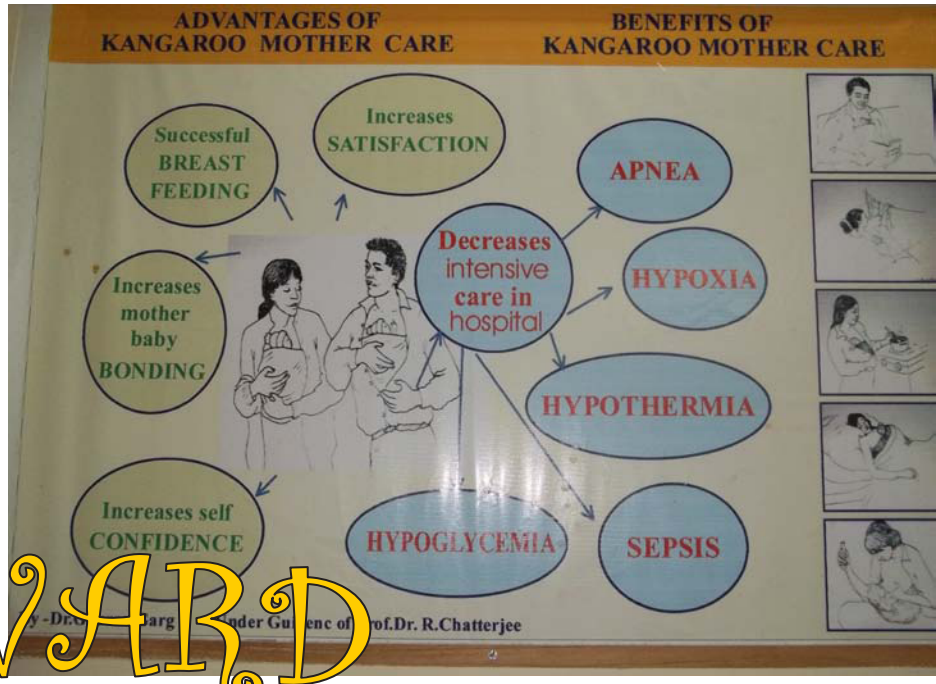
KEY MESSAGE

"WHAT THIS STUDY ADDS?"

KMC Ward

for patients of poor socio-economic status living in far flung remote areas with constraints on both means of travel and communication

KMC WARD


ADVANTAGES OF KANGAROO MOTHER CARE
BENEFITS OF KANGAROO MOTHER CARE
Successful BREAST FEEDING
Increases SATISFACTION
APNEA
Decreases intensive care in hospital
HYPOXIA
Increases mother baby BONDING
HYPOTHERMIA
Increases self CONFIDENCE
HYPOGLYCEMIA
SEPSIS
Prof.Dr. R.Chatterjee

KMC WARD

HIGH RISK FOLLOW UP CLINIC

- Evaluation of ROP
- Evaluation of hearing assessment
- Screening for congenital hypothyroidism
- Monitoring growth & neurodevelopment

THANK YOU, MOM

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- Nursing mothers & babies