

Original Article

A Study of Occurrence of Hypothermia in Newborn in Post Neonatal Ward and Factors Contributing It

Anjali Jagdish Dodiya¹, Khyati Mitesh Kakkad², Vaishali Nandkishor Prajapati³, Hardik Parmar³

Research Question : What is the occurrence of Hypothermia in healthy newborn during winter months and what are the factors contributing it ?

Settings : Post Neonatal Ward of tertiary care hospital.

Study Design : Cross-sectional study.

Participants : 675 normal delivered healthy newborn.

Methodology : All participants during month of December 2020 and January 2021 were screened for hypothermia. Factors contributing it and Effect of KMC on temperature change were statistically studied.

Results : Incidence of hypothermia was 13%. Preterm (34-37week) were 2 times more prone to have hypothermia compared with term neonates ($p < 0.05$). Neonates were 3.8 times more prone to develop hypothermia during early hours of life ($p < 0.05$). Hypothermia was observed more in newborns not breast fed within 2 hours (15.5%) and newborns with low birth weight (36%). With the help of paired t-test, effect of KMC in hypothermic newborn was statistically significant (p value < 0.05).

[J Indian Med Assoc 2024; 122(2): 52-4]

Key words : Hypothermia, KMC, Post Neonatal Ward.

India accounts for 21.7 neonatal deaths per 1000 live birth in 2019, which is unacceptably high as compared to developed countries¹. In order to attain the global development goal of reducing neonatal mortality to under 12 neonatal deaths per 1000 live births by 2030, there is a need to identify and quantify the predictors of neonatal mortality; especially those that are preventable by available low-cost interventions^{2,3}. One of the predictors of neonatal mortality that can easily be solved by available low-cost interventions is Neonatal hypothermia⁴. Neonatal hypothermia, defined as an axillary temperature less than 36.5°C, is associated with increased neonatal morbidity and mortality^{5,6}. They are susceptible to hypothermia due to physical and environmental factors. Physical factors that pre-dispose neonates to hypothermia include a large surface area to volume ratio, immature skin, low amount of insulating subcutaneous fat, poorly developed metabolic mechanisms for responding to thermal stress and altered skin blood flow^{4,7}. Many studies in literature have identified risk factors associated with Hypothermia in low-birth weight, pre-term, sick neonate while studies related to hypothermia in healthy term neonate are few. As a result, there is need to identify factors associated with Hypothermia in healthy term neonate who get easily unnoticed.

Department of Pediatrics, Narendra Modi Medical College, Ahmedabad, Gujarat 380008

¹MD, Senior Resident and Corresponding Author

²MD (Pediatric), Professor and Head

³MD (Pediatric), Associate Professor

Received on : 11/03/2023

Accepted on : 21/04/2023

Editor's Comment :

- In this study, the incidence of hypothermia was high (13%). Hence, Screening of all the newborn lying in Post Natal Ward as well as increase sensitivity regarding thermal control among mother has to be emphasized.
- Late Preterm, early hours of life, not breast-fed within 2 hours and low birth weight were the factors significantly associated with the hypothermia. Indicating round the clock monitoring for the thermal care of preterm babies during early hours of life.

Kangaroo Mother Care (KMC) is one of the safe and low cost method available, effective intervention as compared to conventional neonatal care for hypothermic babies. Skin to skin contact is the major component of KMC⁸. Hence, this study was undertaken to identify risk factors associated with Hypothermia in healthy term neonate in Post Neonatal Ward and to study the effectiveness of KMC in them.

MATERIALS AND METHODS

A cross-sectional study was conducted from December 1, 2020 to January 31, 2021 in Post Neonatal Care (PNC) ward of tertiary care hospital. All Normal delivered neonate with gestational age > 34 weeks and > 1.8 kgs were involved in the study. The data was collected from the mother and the indoor case sheet using a semi structured questionnaire. The axillary temperature of neonate, using digital thermometer was measured at 6'o clock in the morning. Neonate those who were identified as mild Hypothermic (Cold stress) (Temperature in range of 36°C-36.4°C) were given skin to skin contact with mother. Axillary temperature was again measured after

2 hours. Neonates who were moderate to severe hypothermic (Temperature <35.9) were admitted directly in NICU. Multivariate logistic regression analysis was used to assess the association of independent variables with the outcome variable. Odds Ratio (OR) with 95% CI was used as a measure of association and variables that p value less than 0.05 in the multivariate logistic regression were considered as significantly associated.

OBSERVATION

Out of total 675 neonates screened, 13% neonates were found to be hypothermic. Out of total hypothermic newborn, 96.7% of neonate were mildly hypothermic, 3.3% were moderately hypothermic while no newborn with severe hypothermia was identified. Out of total 381 male neonates 12.3% developed Hypothermia while out of total 294 female neonates 14.6% developed Hypothermia. In the month of December, total 439 neonates were screened out of which 78 neonates were found Hypothermic (17.7%). In month of December, lowest temperature reached was 10°C. Total 236 neonates were screened in month of January out of which 12 neonates were found Hypothermic (5%). Lowest temperature reached in the month of January was also 10°C. In present study, various pre-disposing factors were Neonate with gestational age 34-37 weeks (18.2%), early hours of life (45%), not breast fed within 2 hours (15.5%), neonates with birth weight <2 kg (36%), those who were night-time delivered (Table 1).

In present study, Preterm (34-37weeks) were 2 times more prone to have hypothermia compared with term neonates (p value-0.001, 95% CI:1.3, 3.4). Neonates were more prone to develop hypothermia during early hours of life. (p value-0.0005) (Table 2). The mean temperature before initiation of KMC was 36.17 (SD 0.14) and the mean temperature after 2 hours of KMC was 37.21 (SD 0.16). The increase in temperature was statistically significant using a paired t-test (t-52.76, p-value- 0.0001).

DISCUSSION

The proportion of Hypothermia was 13% in present study which is in accordance to a study carried out among home delivered healthy neonates in 10 villages of Haryana, India where incidence of hypothermia was 19.1% and 3.1%, respectively in winter and summer, 24 hours after delivery^{9,10}. In a study carried out among home delivered neonate in rural Uttar Pradesh, India, incidence of hypothermia in normal birth weight neonate was 43%, which was higher compared to the present study^{11,12}. Another such study carried out in Nepal among healthy term neonate, the proportion of hypothermia was 85%^{9,14}. In spite of being tertiary

care hospital and not so cold city, occurrence of hypothermia was high.

In the present study, Late preterm (34 week to <37 week) were 2 times more prone to have hypothermia compared with term neonates (p value-0.001, 95% CI: 1.3, 3.4). Similar findings were observed in study conducted by Yibeltal Asmamaw Yitayew, *et al*¹ and F Zayeri, *et al*². The possible reason could be larger surface area to body mass in neonate, less subcutaneous fat stores and limited capacity to generate heat from fat store.

Neonate less than 6 hours were at highest risk of

Table 1 — Socio-demographic Characteristics of Mother and their effect on Hypothermia

Variables/Category	Hypothermic	Normo-thermic	Total
Age of mother :			
<20 years	12(13.3%)	92(86.6%)	104
20-30 years	73(13.8%)	453(86.2%)	526
30-40 years	5(12%)	37(88%)	42
>40 years	0(0%)	3(100%)	3
Religion :			
Hindu	37(41.1%)	252(58.9%)	289
Muslim	53(58.8%)	333(41.2%)	386
Educational status :			
Illiterate	17(13.1%)	92(86.9%)	109
Primary	21(10%)	189(90%)	210
Secondary	26(11.2%)	205(88.8%)	231
Higher secondary	18(20.9%)	68(79.1%)	86
Graduate	8(20.5%)	31(79.5%)	39
ANC visit :			
0	0(0%)	3(100%)	3
1	4(9.7%)	37(90.3%)	41
2	18(15.2%)	100(84.8%)	118
3	38(16%)	200(84%)	238
4	26(10%)	214(90%)	240
5	4(12.5%)	28(87.5%)	32
6	0(0%)	3(100%)	3

Table 2 — Multivariate Logistic Regression Analysis of Factors associated with Neonatal Hypothermia

Variables/Category	Hypothermia		COR (95% CI)	P value
	Yes	No		
Gender :				
Male	47(12.3%)	334(87.7%)	1.078 (0.7,1.7)	0.8
Female	43(14.6%)	251(85.4%)	1	
Time of delivery :				
Night	60(13.6%)	381(86.4%)	3.872 (2.2,6.8)	0.4
Day	30(0.12%)	204(87.2%)	1	
Birth weight (grams) :				
<2500	35(16.3%)	179(83.6%)	0.7740 (0.4,1.3)	0.6
≥2500	55(11.9%)	406(88%)	1	
Gestational age (weeks) :				
35-37	50(18.2%)	224(81.8%)	2.058 (1.3,3.4)	0.001
>37	40(10%)	361(90%)	1	
Initiation of breast feeding within 2 hours :				
Yes	67(12.7%)	460(87.3%)	1.000 (0.6,1.7)	1
No	23(15.5%)	125(84.5%)	1	
Hour of life (hours) :				
<6	55(45%)	67(55%)	1.061(0.6,1.7)	0.0005
≥6	35(6.3%)	518(93%)	1	

hypothermia (45%). Similar results were observed by F Zayeri, *et al* where 53.3% were hypothermic immediately after birth⁹. It is well documented in literature that neonates loses heat immediately after birth by conduction, convection, evaporation and radiation. As age advances occurrence of hypothermia reduces, this may be because by 6 hours, they get clothed, breast fed, counselled for skin to skin contact.

Neonate who were initiated with breast feeding within 2 hours were protected for Hypothermia as compared to neonates who were breast fed after 2 hours. Similar findings were proved by Jeffrey Pradeep Raj, *et al*¹³ and by Gebresilasea Gendisha Ukke, *et al*¹⁶. This could be due to the fact that breastfed babies get adequate calories from the breast milk which protects them from the hypothermia^{9,17}. Another reason could be skin-to-skin contact with their mothers' body^{9,18,19}.

As per Table 2, Neonates delivered at night time were 3.8 times more prone to develop hypothermia compared to neonate delivered at day time (p value-0.4, 95% CI-2.2, 6.8). This finding is comparable to studies conducted in Northeast Ethiopia by Yibeltal Asmamaw Yitayew, *et al* where Delivery time showed a significant association with neonatal hypothermia. (AOR=2)¹⁵.

In our study the increase in temperature after 2 hours of KMC was statistically significant using a paired t-test (t-52.76, p-value- 0.0001). Effectiveness of KMC has been established in low-birth weight and preterm neonate in an updated Cochrane review (Conde-Agudelo, Diaz-Rossello, Beltzan 2011)⁸. Also, Skin to skin contact immediately after birth prevents Hypothermia, is been very well explained in the study of Yibeltal Asmamaw Yitayew, *et al* where neonates who had no skin-to-skin contact within 1 hour after delivery had a 3.1 times higher odds of hypothermia compared to those who had skin-to-skin contact¹⁵. While few studies in literature²⁰, proves the effectiveness of KMC in healthy neonates, this study was undertaken to study effect of KMC in stable term neonate.

CONCLUSION

Inspite of various research and awareness in the field of hypothermia, the incidence of hypothermia was high in present study. Preterm delivery, early hours of life were the factors significantly associated with the hypothermia in the present study. Hence, there is a need to spread awareness among mothers and nurses in Post Neonatal Ward regarding low-cost early measures like wapping with 2-3 layers, early breast-feeding, use of mitten and socks, regular measurement of temperature and look for signs of hypothermia to prevent occurrence of hypothermia.

REFERENCES

- 1 The World Bank- India; data.worldbank.org; accessed on July 1, 2010.

- 2 United Nations — Sustainable development goals. Secondary sustainable development goals, 2015. Available: <http://www.un.org/sustainabledevelopment/summit>
- 3 Darmstadt GL, Bhutta ZA, Cousens S — Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; **365**: 977-88.
- 4 Lunze K, Bloom DE, Jamison DT — The global burden of neonatal hypothermia: systematic review of a major challenge for newborn survival. *BMC Med* 2013; **11**: 24.
- 5 World Health Organization — Thermal protection of the newborn: a practical guide. Geneva: World Health Organization, 1997.
- 6 Lunze K, Yeboah-Antwi K, Marsh DR — Prevention And management of neonatal hypothermia in rural Zambia. *PLoS One* 2014; **9**: e92006.
- 7 Kumar V, Shearer JC, Kumar A — Neonatal hypothermia in low resource settings: a review. *J Perinatol* 2009; **29**: 401-12.
- 8 Conde-Agudelo A, Díaz-Rossello JL — Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database Syst Rev* 2016; **2016(8)**: CD002771. doi:10.1002/14651858.CD002771.pub4. PMID: 27552521; PMCID: PMC6464509
- 9 Zayeri F, Kazemnejad A, Ganjali M, Babaei G, Nayeri F — Incidence and risk factors of neonatal hypothermia at referral hospitals in Tehran, Islamic Republic of Iran. *East Mediterr Health J* 2007; **13(6)**: 1308-18. doi: 10.26719/2007.13.6.1308. PMID: 18341181.
- 10 Kumar R, Aggarwal AK — Body temperature of home delivered newborns in north India. *Tropical Doctor* 1998; **28**: 134-6.
- 11 Kumar V, Shearer JC, Kumar A, Darmstadt GL — Neonatal hypothermia in low resource settings: a review. *J Perinatol*. 2009; **29(6)**: 401-12. doi: 10.1038/jp.2008.233. *Epub* 2009 Jan 22. PMID: 19158799.
- 12 Darmstadt GL, Kumar V, Yadav R, Singh V, Singh P, Mohanty S, *et al* — Introduction of community-based skin-to-skin care in rural Uttar Pradesh, India. *J Perinatology* 2006; **26(10)**: 597-604.
- 13 Pradeep Raj J, Kumar TS, Kumar KS — Prevalence Of Hypothermia Among Normal Term Neonates In A South Indian City And Assessment Of Practice And Knowledge Risk Factors Among Mothers- A Hospital Based Cross-Sectional Study. *Indian Journal of Medical Research and Pharmaceutical Sciences* 2015; **2(12)**.
- 14 Johanson RB — Effect of post-delivery care on neonatal body temperature. *Acta Paediatrica* 1992; **81**: 859-63.
- 15 Yitayew YA, Aitaye EB, Lechissa HW, Gebeyehu LO — Neonatal Hypothermia and Associated Factors among Newborns Admitted in the Neonatal Intensive Care Unit of Dessie Referral Hospital, Amhara Region, Northeast Ethiopia. *Int J Pediatr* 2020; **2020**: 3013427. doi: 10.1155/2020/3013427. PMID: 33014077; PMCID: PMC7519202.
- 16 Ukke GG, Diriba K — Prevalence and factors associated with neonatal hypothermia on admission to neonatal intensive care units in Southwest Ethiopia - A cross-sectional study. *PLoS One* 2019; **14(6)**: e0218020. doi: 10.1371/journal.pone.0218020. PMID: 31170252; PMCID: PMC6553781.
- 17 Sing M, Rao G, Malhotra AK — Assessment of newborn baby's temperature by human touch: a potentially useful primary care strategy. *Indian Paediatrics* 1992; **29**: 449-52.
- 18 Cheah FC, Boo NY — Risk factors associated with neonatal hypothermia during cleaning of newborn infants in labour room. *Journal of Tropical Paediatrics* 2000; **46**: 46-50.
- 19 Iyengar SD, Bhakoo ON — Prevention of neonatal hypothermia in Himalayan vialges. Role of the domiciliary caretaker. *Tropical and Geographical Medicine* 1991; **43**: 293-6.
- 20 Nimbalkar SM, Patel VK, Patel DV, Nimbalkar AS, Sethi A, Phatak A — Effect of early skin-to-skin contact following normal delivery on incidence of hypothermia in neonates more than 1800g: randomised control trial. *Journal of Perinatology* 2014; **34(5)**: 364-8.