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Incidence of neonatal hypothermia and its association with low birth weight, preterm delivery, APGAR score and nursing care

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Abstract

Introductions: Neonatal hypothermia increases morbidity and mortality . This study aimed to assess the incidence of neonatal hypothermia and its association with low birth weight, preterm delivery, APGAR score and nursing care practices.

Methods: A cross-sectional analytical study was carried out to assess the neonatal hypothermia in neonates born via vaginal deliveries at Maternity ward of Patan hospital, Patan Academy of Health Sciences (PAHS), Nepal, during Aug–Sept 2018. The study was approved from institutional review committee of PAHS. Axillary temperature was measured 4 times, at ten minutes and at 1,2, 4 hours after delivery by using Micro Life digital thermometer. The SPSS was used to analyse data for association of hypothermia with low birth weight, preterm delivery, APGAR score and nursing care practices. Chi square and fisher exact tests were used and $p < 0.05$ was considered significant.

Results: Out of 153 neonates, neonatal hypothermia was seen in 61 (39.8%), 66 (43.1%), 52 (33.9%) and 41 (26.8%) at 10 minutes and 1, 2 and 4 hours after delivery. There was statistically significant association between APGAR score and hypothermia at 1 hour. There was significant association between nursing care practices after delivery and hypothermia at 4 hours.

Conclusions: In this study, the incidence of neonatal hypothermia was high occurring in 40% at 10 minutes and 25% at four hours after delivery. Low APGAR score was associated with hypothermia.

Keywords: APGAR score, hypothermia, low birth weight, neonate, preterm

Introductions

The body temperature below 36.5°C is known as hypothermia which is a life threatening conditions for newborns.^{1,2} Consequences of neonatal hypothermia include increased risk of pulmonary vasoconstriction, reduction of peripheral perfusion, metabolic acidosis, jaundice, scleroderma, respiratory distress, growth retardation, hypoglycemia, pulmonary hemorrhage, necrotizing enterocolitis, impaired cardiac function, disseminated intravascular coagulopathy(DIC), respiratory distress syndrome, cardiac arrhythmia and eventually death.²⁻⁸

Globally, the prevalence of newborn hypothermia ranges from 8.5% to 52%.⁹ A global review showed the prevalence of newborn hypothermia among hospital setting deliveries in developing countries was 32% to 85%.¹⁰ In South Asian Countries, the high prevalence of newborn hypothermia is reported, in Sri Lanka¹¹ 63%, Pakistan¹² 49%, India¹³ 43% and Nepal⁴ 92.3%.

This study aim to assess the incidence of neonatal hypothermia, examine the associated factors which may help in prevention of neonatal hypothermia.

Methods

This was a cross sectional study to identify the incidence of neonatal hypothermia in vaginally delivered neonates at Maternity ward of Patan Hospital (PH), Patan Academy of Health Sciences (PAHS) during Aug-Sept 2018. This tertiary level teaching hospital has 8000 deliveries per year and approximately 65% are vaginal deliveries. Non-probability purposive sampling was used to calculate sample size using Cochran's formula.¹⁴

Study variables included obstetric characteristics of mothers, characteristics of neonates and nursing care practices. Normal APGAR score considered as 7-10 and Low APGAR score as less than 7. (Moderate Asphyxia - 4-6 APGAR and 3-0 severe asphyxia).

For nursing care practices A questionnaire was used and scores above the mean \pm 1SD (mean value with one standard deviation) was considered as "proper nursing care practice", and below as "improper nursing care practice".¹⁵

Microlife digital thermometer (MT60) was used to measure axillary temperature of neonates at four time points, 10 minutes, 1 hour, 2 hours and 4 hours after vaginal delivery. Temperature below 36.5°C was taken as hypothermia.

Ethical approval was obtained from Institutional Review Committee (IRC) of PAHS. Verbal permission was taken from nursing director of PH. Written informed consent was obtained from mothers. Data were analyzed by using SPSS version 16. Pearson's Chi-square and Fisher exact test was used to determine the association.

Results

Out of 153 neonates, 61 (39.8%) were hypothermic 10 minutes after delivery, 66 (43.1%) at 1 hour and 52 (33.9%) at 2 hours and 41 (26.8%) at 4 hours.

Mean birth weight (BW) was 2973.9 \pm 405.4 grams, 135 (88.2%) had normal BW . Full term deliveries were 145 (94.8%) and preterm 8 (5.2%). The mean gestational age was 38.6 \pm 1.8 weeks.

Normal APGAR score (7-10) at 1 minute in 145 (94.7%) . The mean APGAR score at one minute and five minutes was 7.8 \pm 0.6 and 8.8 \pm 0.6 respectively.

The mean nursing care practice score before and Immediate after delivery and in postnatal ward were 2.3 \pm 0.5, 3.4 \pm 0.8 and 6.3 \pm 0.7 respectively. Improper care before delivery was found in n=113 (73.9%), immediately after delivery n=121 (79.1%) and in postnatal ward n= 98 (64.1%).

There was no significant association between parity, low BW, preterm delivery and with neonatal hypothermia at 10 minutes and 1 hour after delivery ($p>0.05$). There was statistically significant association between APGAR score and neonatal hypothermia at 1 hour where ($p=0.02$), Table 1.

There was no significant association between parity, preterm, APGAR score, low BW and neonatal hypothermia at 2 and 4 hours ($p>0.05$), Table 2.

Table 1. Association of parity, gestational age, APGAR score and birth weight (BW) with newborn hypothermia at 10 minutes and 1 hour after delivery

Variables	Hypothermia 10 minutes, N=61		χ^2 /Fisher	p	Hypothermia 1 hour N=66		χ^2 /Fisher	p
	N (%)				N (%)			
	Present	Absent			Present	Absent		
Primi	26 (36.1)	46 (63.9)	0.80	0.3	28 (38.9)	44 (61.1)	1.0	0.32
Multi	35 (43.2)	46 (56.8)			38 (46.9)	43 (53.1)		
Preterm	5 (62.5)	3 (37.5)	-	0.27*	3 (37.5)	5 (62.5)	-	1.0*
Term	89 (61.4)	56 (38.6)			63 (43.4)	82 (56.6)		
APGAR Low	6 (75.0)	2(25.0)	-	0.60*	7 (87.5)	1 (12.5)	-	0.02
Normal	55 (37.9)	90 (62.1)			59 (40.7)	86 (59.3)		
BW Low	9 (50)	9 (50)	0.87	0.35	11 (61.1)	7 (38.9)	2.68	0.10
Normal	52 (38.5)	83 (61.5)			55 (40.7)	80 (59.3)		

Note: $p<0.05$ significant, *Fisher Exact Test where $p<0.05$ (2 tailed) is significance

Table 2. Association of parity, gestational age, APGAR score and birth weight with newborn hypothermia at 2 hours and 4 hours after delivery

Variable	Hypothermia at 2 hours (N=52)		χ^2 /Fisher	p	Hypothermia at 4 hours (N=41)		χ^2 /Fisher	p
	N (%)				N (%)			
	Present	Absent			Present	Absent		
Primi Parous	22 (30.6)	50 (69.4)	0.71	0.40	19 (26.4)	53 (73.6)	0.01	0.91
Multi Parous	30 (37.0)	51 (63)			22 (27.2)	59 (72.8)		
Preterm	2 (25)	6 (75)		0.72	2 (25)	6 (75)		1.0
Term	50 (34.5)	95 (65.5)			39 (26)	106 (73.1)		
APGAR Low	3 (37.5)	5 (62.5)		1.0	2 (25)	6 (75)		1.0
Normal	49 (33.8)	96 (66.2)			39 (26.9)	106 (73.1)		
BW Low	7 (38.9)	11 (61.1)	0.22	0.64	4 (22.2)	14 (77.8)		0.78
Normal	45 (33.3)	90 (66.7)			37 (27.4)	98 (72.6)		

Table 3. Association between nursing care practices scores (before delivery, immediate after delivery and in postnatal ward) with newborn hypothermia at 10 minutes and 1 hour after delivery

Nursing care practices scores	Hypothermia at 10 minutes (N=61)		χ^2	p	Hypothermia at 1 hour after delivery (N=66)		χ^2	p
	N (%)				N (%)			
	Present	Absent			Present	Absent		
Before delivery								
Improper	48 (42.5)	65 (57.5)	1.23	0.27	44 (38.9)	69 (61.1)	3.10	0.08
Proper	13 (32.5)	27 (67.5)			22 (55)	18 (45)		
After delivery								
Improper	43 (38.1)	70 (61.4)	3.18	0.07	35 (31)	70 (69)	3.84	0.05
Proper	9 (22.5)	31 (77.5)			6 (15)	34 (85)		
In postnatal ward								
Improper	47 (42.9)	56 (57.1)	1.01	0.31	43 (43.9)	55 (56.1)	0.61	0.80
Proper	19 (34.9)	36 (65.5)			23 (41.8)	32 (58.2)		

Table 4. Association between nursing care practices and newborn hypothermia (before delivery, immediate after delivery and in postnatal ward) at 2 hours and 4 hours after delivery

Nursing care practices scores	Hypothermia at 2 h after delivery (N=52)		x ² /Fisher	p	Hypothermia at 4 h after delivery (N=41)		x ² /Fisher	p
	N (%)				N (%)			
	Present	Absent			Present	Absent		
Before delivery								
Improper	43 (38.1)	70 (61.4)	3.18	0.07	35 (31)	78 (69.0)	3.85	0.05
Proper	9 (22.5)	31 (77.5)			06 (15)	34 (85.0)		
After delivery								
Improper	41 (33.9)	80 (66.1)	0.03	0.96	37 (30.6)	84 (69.4)	4.22	0.04*
Proper	11 (34.4)	21 (65.6)			4 (12.5)	28 (87.5)		
Postnatal ward								
Improper	36 (36.7)	62 (63.3)	0.92	0.34	26 (26.5)	72 (73.5)	0.10	0.92
Proper	16(29.1)	39 (70.9)			15 (27.3)	40 (72.7)		

Nursing care practices (before and immediate after delivery and in postnatal ward) was not significantly associated with hypothermia at 10 minutes and 1 hour after delivery ($p > 0.05$), Table 3. There was significant association between nursing care practices after delivery and hypothermia at 4 hours, $p = 0.04$, Table 4.

Discussions

Current findings revealed that among 153 neonates, the incidence of neonatal hypothermia were 61 (39.8%), 66 (43.1%), 52 (33.9%) and 41 (26.8%) at 10 minutes, 1 hour, 2 hours and 4 hours after delivery respectively. More than a quarter continue to be hypothermic even at 4 hours.

Similar findings from Iran revealed that among 522 neonates, the incidence of neonatal hypothermia was 41.2%, 47.5%, 46.4% and 37.2% at 10 minute, 1 hour, 2 hours and 4 hours after delivery, slightly higher than current study.¹⁶

Another study from Uganda, among 300 newborns after vaginal delivery, parallel tympanic and rectal temperature measurements at 10, 30, 60, and 90 min showed neonatal hypothermia in 29% at 10 minutes slightly lower than the present study higher incidence at 30, 60, and 90 minutes (82%, 83% and 79% respectively) than the present study.⁶ This variation might be due to the difference in temperature measurement

site, methods of temperature measurement, environmental and cultural difference between the study areas.¹⁸

Another study of Iran revealed that the incidence of newborn hypothermia was higher than current study (53.3%) at 10 minutes after birth and lower on admission to the neonatal intensive care unit (NICU) at 1, 2 and 4 hours (13.6%, 2.7%, 0.5% and 0.3% respectively).¹⁷ This difference might be due to other associate conditions requiring NICU admissions, e.g. baby warmer, room warming system etc.

In a study of Ethiopia, axillary temperature of the newborn measured by using digital thermometer (model of MT-101 MT-111) revealed that among 356 neonates, the prevalence of neonatal hypothermia of admitted to NICU of a Public Hospitals in Addis Ababa was 228 (64%), higher than in present study.¹⁸

A study in neonatal Unit of Aga Khan University Hospital, Pakistan, the axillary temperature measured by mercury thermometer in 300 neonates found 144 (49.5%) had hypothermia and 14.8% remained hypothermic at 2 hours after delivery. It was higher than present study. It might be due to different methods of temperature measurement.¹² A low-reading digital thermometer was used to record the temperature from axilla in a study in India revealed that the incidence of hypothermia was 43%.¹³

Current study did not find statistically significant association between parity and neonatal hypothermia, similar to the report from Uganda.⁶

Current study showed no statistically significant association between preterm and neonatal hypothermia, similar to the studies from Iran¹⁶ and Uganda⁶. In contrast, other studies from Iran¹⁷, Taiwan¹⁹, Ethiopia¹⁸, Pakistan¹⁹, India¹³ revealed significant association between preterm and newborn hypothermia. Preterm deliveries may be prone to develop hypothermia, these controversial findings need in-depth study.

Current study revealed that there was statistically significant association between APGAR score and neonatal hypothermia at 1 hour after delivery (but no association at 10 minutes, 2 and 4 hours), similar to the study from Taiwan¹⁹, Iran¹¹, Pakistan¹² and Ethiopia²⁰; probably due to temperature decreased when the baby were resuscitated. In contrast, the study from California found significant association between low APGAR score and newborn hypothermia.²¹ This may be because of less number of babies with low APGAR in present study.

Present findings revealed that there was no significant association between low BW hypothermia, similar to Ethiopian¹¹ and Indian²³ study. But, studies from Uganda⁹ and Pakistan¹² have reported association between low BW and newborn hypothermia. In present study less number of LBW babies may have influenced the statistical significance. In present study, there was significant association between nursing care practices (immediately after delivery) and neonatal hypothermia at 4 hours after delivery, similar to Iranian¹⁶ study. These findings show the nursing care may have long term effect on hypothermia for up to 4 hours after delivery. There are also, controversial findings from northwest Ethiopia²³ and southern Nepal⁴ that there was no significant association between care practices and newborn hypothermia, possibly due to the difference in thermal care practices.

Some of the limitations of present study include a single center data on hypothermia up

to 4 hours after delivery and not up to 24 hours, due to time and resource constrain during thesis research, and thus the findings may not be generalized.

Conclusions

This study found more than one third of neonates suffered from hypothermia at 10 minutes and more than a quarter continued to be hypothermic at 4 hours. The APGAR score had significant association with hypothermia at 1 hour and nursing care practice was associated with hypothermia at 4 hours, shows there is need of improvements.

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Conflict of Interests

None

Fundings

None

References

1. World Health Organization. Thermal protection of the newborn: a practical guide [Safe Motherhood Practical Guide]. Geneva: World Health Organization; 1997. [Google Scholar Weblink](#)
2. Datta P. Pediatric nursing. 3rd ed. New Delhi: Jaypee Brothers Medical Publishers, 2015. p.82-5.
3. Interprofessional Education and Research Committee of the Champlain Maternal Newborn Regional Program (CMNRP). Newborn thermoregulation: self-learning guide. Champlain Maternal Newborn Regional Program (2013); 2013. [Weblink](#)

4. Mullany LC, Katz J, Khatri SK, LeClerq SC, Darmstadt GL, Tielsch JM. Neonatal hypothermia and associated risk factors among newborns of Southern Nepal. *BMC Med.* 2010;8:43. [DOI PubMed GoogleScholar](#)
5. Khanal V, Gavidia T, Adhikari M, Mishra SR, Karkee R. Poor thermal care practices among home births in Nepal: further analysis of Nepal Demographic and Health Survey 2011. *PloSOne.* 2014;9(2):e89950. [DOI PubMed GoogleScholar](#)
6. Byaruhanga R, Bergstrom A, Okong P. Neonatal hypothermia in Uganda: prevalence and risk factors. *J Tropical Pediatr.* 2005;51(4):212-5. [DOI PubMed GoogleScholar](#)
7. Horn EP, Bein B., Steinfath M, Ramaker K, Buchloh B, Höcker J. The incidence and prevention of hypothermia in newborn bonding after cesarean delivery: a randomized controlled trial. *AnesthAnalg.* 2014. 118(5):997-1002. [DOI PubMed GoogleScholar](#)
8. Nayeri F, Nili F. Hypothermia at birth and its associated complications in newborn infants: a follow up study. *Iranian J Publ Health.* [GoogleScholar Weblink](#)
9. Zulala NN, Sitaresmi MN, Sulistyarningsih. Vaginal delivery to reduce the risk of hypothermia to newborn. *AIP Conference Proceedings.* 2017;1868(1):090009. [DOI GoogleScholar](#)
10. 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 Perinatol.* 2006;26(10):597-604. Retrieved from: [DOI PubMed GoogleScholar Weblink](#)
11. Madhvi P, Wickremasinghe R, Jayasooriya KB, Nawarathne NI, Ranaweera R. Mothers' knowledge and practices on thermoregulation of neonates in Sri Lanka. *European International Journal of Applied Science and Technology.* 2014;1(4):55-69. [GoogleScholar Weblink](#)
12. Ali SR, Mirza R, Qadir M, Ahmed S, Bhatti Z, Demas S. Neonatal hypothermia among hospitalized high risk newborns in a developing country. *Pak J Med Sci.* 2012;28(1):49-53. [GoogleScholar Weblink](#)
13. Bhatia A, Srivastava A, Sharma U, Rastogi R. Incidence and risk factors for neonatal hypothermia at presentation. *Int J Med Res Prof.* 2017;3(3):175-9. [DOI Weblink](#)
14. Cochran WG. *Sampling techniques.* 2nd ed. New York: John Wiley and Sons; 1963.
15. Zadzasha Y, Delavar AM, Akbarian Z, Hajiahmadi M, Hadoghi MH. Improvement of hypothermia control and management methods in term newborns after training on neonatal hypothermia with the help of clinical audit. *Journal of Babol University of Medical Sciences.* 2015;17(12):12-8. [DOI GoogleScholar](#)
16. Delavar M, Akbarianrad Z, Mansouri M, Yahyapour M. Neonatal hypothermia and associated risk factors at baby friendly hospital in Babol, Iran. *Ann Med Health Sci Res.* 2014;4(S2):S99-103. [DOI PubMed GoogleScholar](#)
17. 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 PubMed GoogleScholar Weblink](#)
18. Demissie BW, Abera BB, Chichiabellu TY, Astawesegn FH. Neonatal hypothermia and associated factors among neonates admitted to neonatal intensive care unit of public hospitals in Addis Ababa, Ethiopia. *BMC Pediatr.* 2018;18(1):263. [DOI PubMed GoogleScholar](#)
19. Chang HY, Sung YH, Wang SM, Lung HL, Chang JH, Hsu CH, Jim WT, Lee CH, Hung HF. Short- and long-term outcomes in very low birth weight infants with admission hypothermia. *PloSOne.* 2015;10(7):e0131976. [DOI PubMed GoogleScholar](#)
20. Tasew H, Gebrekristos K, Kidanu K, Mariye T, Teklay G. Determinants of hypothermia on neonates admitted to the intensive care unit of public hospitals of Central Zone, Tigray, Ethiopia 2017: unmatched case-control study. *BMC Res Notes.* 2018;11(1):576. [DOI PubMed GoogleScholar Weblink](#)
21. Kalengada PK, Mangalgi S, Pradeep GC. To assess the thermoregulation of neonates in the postnatal wards of the hospital: a prospective study. *Indian J Child Health.* 2016;3(2):143-6. [GoogleScholar Weblink](#)
22. Seyum T, Ebrahim E. Proportion of neonatal hypothermia and associated factors among new-borns at Gondar University teaching and referral hospital, Northwest Ethiopia: a hospital based cross sectional study. *Gen Med.* 2015;3(4):1-7. [DOI GoogleScholar](#)
23. Miller SS, Lee HC, Gould JB. Hypothermia in very low birth weight infants: distribution, risk factors and outcomes. *J Perinatol.* 2011;31(S1):S49-56. [DOI PubMed GoogleScholar](#)