Original Article

Prevalence and Associated Factors of Neonatal Hypothermia among Newborns within Six Hours of Birth in Pokhara.

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ABSTRACT

Background: Hypothermia is an important cause of neonatal morbidity and mortality. Persistent hypothermia leads to cold injury that results edema, scleroderma, pulmonary hemorrhage, jaundice and death. The objective of this study was to identify the prevalence and associated factors of neonatal hypothermia among newborns within six hours of Birth in Pokhara.

Methods: The institutional based quantitative descriptive cross sectional study was done among 402 systematic randomly selected respondents by using structured format and digital thermometer MT 100 after taking ethical approval from Nepal Health Research Council and Pokhara Academy of Health Sciences. Data was analyzed by using SPSS version 20. Multivariate logistic regression analysis was done for the variables ($p<0.25$) in bivariate analysis. The variables ($p< 0.05$) with Adjusted Odds ratio (AOR) at 95% CI in the multivariate logistic regression was considered as independent associated variables.

Results: The prevalence of neonatal hypothermia in the study area was about 43 percent. The significant independent factors of neonatal hypothermia were maternal age after 35 years ($p=0.03$, AOR: 4.087, 95% CI: 1.12-14.97), inadequate antenatal care ($p=0.03$, AOR: 0.52, 95% CI: 0.29-0.94), low birth weight ($p=0.00$, AOR: 0.433, 95% CI: 0.24- 0.77) and resuscitated babies at birth ($p =0.00$, AOR: 3.808)95% CI: 1.69- 4.65).

Conclusion: Out of 10 births, four babies were hypothermic in study site. Mother's age more than 35 years, inadequate antenatal care, low birth weight and resuscitation at birth were associated factors of Neonatal hypothermia. So, special care is necessary for low birth weight babies and during resuscitation.

Keywords: Neonate hypothermia, Prevalence, Factors

INTRODUCTION

The newborn's axillary body temperature below 36.5°C is called neonatal hypothermia.[1] It is classified as mild (36.0°C–36.4°C), moderate (32.0°C–35.9°C) and severe (< 32.0°C).[2] It is a major cause of neonatal morbidity and mortality. Every 1°C decrement of body temperature increases mortality by 80%.[3,4] Persistent hypothermia leads to neonatal cold injury that results edema, scleroderma, pulmonary hemorrhage, jaundice and death.[5]

The associated factors of neonatal hypothermia were neonatal age≤24 hours, low birth weight, preterm, no skin to skin contact to their mother immediately after delivery, no early initiation of breastfeeding within one hour, resuscitation at birth, obstetric complication, multiple pregnancy night-time delivery[6] and newborns with health problem.[7] The objective of this study was to identify the prevalence and associated factors of neonatal hypothermia among newborns within six hours of Birth in Pokhara.

MATERIALS AND METHODS

The study was carried out in Pokhara Academy of Health Sciences, Pokhara. It is the government-funded referral hospital of Gandaki Province, Nepal. It is 500 bedded hospital in which "Aama Tatha Nabjat Sishu Surakshya Karyakram" has been implemented. About 800-1000 normal and complicated deliveries occur in a month in this hospital. The patients of the rural areas and with low income families come to this hospital.The research proposal was ethically approved from Nepal Health Research Council (Ref. 2881) and Pokhara Academy of Health Sciences (Ref.5.2077/078). The institutional based quantitative descriptive cross sectional design was used. All the newborns born in the study site within six hours of birth with their mother from August 1 to September 30 were the study population of this study. The number of study population was 822 newborn babies with their 817 mothers. The abandoned newborns were excluded from the study because without maternal involvement, it would not possible to address most of the variables in the study. The sample size was calculated by using a single population proportion formula: n= $(z\alpha/2)^2$ pq/e² where, n= required sample size, z=standard normal distribution value at 95% confidence level, e= margin of error between the sample and population = 5% = 0.05, zα/2 = 1.96 for 95 % confidence interval, p= prevalence of neonatal hypothermia (64%). The calculated sample size

was 343. By adding a 10 % sampling error and a 5 % non-response rate, the sample size was 394. The final sample size was 402.

The live newborns within six hours of life, born in PAHS with their mother was included in this study. They were available in the postnatal ward or post-operative ward. The mothers who were stable, able to speak and understand the Nepali language and give informed consent were included. The sample was selected by using systematic random sampling technique. Every other eligible baby was included in this study. Data was collected by the trained staff nurses from August 1 to September 30, 2020 by using pretested valid structured format and digital thermometer MT 100. The newborn's axillary body temperature was categorized as hypothermia (>36.5°C), normothermia (36.5°C- 37.5°C) and hyperthermia (> 37.5°C). SPSS Version 20 was used to analyze the data. The Candidate variables (p< 0.25) for multivariate logistic regression analysis was determined by using bivariate logistic regression. Adjusted Odds ratio (AOR) with 95% Confidence Interval was used as a measure of association. The p <0.05 in the multivariate logistic regression was taken as statistical significance

RESULTS

The average age the respondent mothers was 24.74 (SD=±4.58). The majority of the respondents followed Hindu religion ((91%), were housewives (85.1%), residing in the municipality (66.9%) and had attained secondary level education (59%). Similarly, neonatal hypothermia was more prevalent among babies born to elderly (58.3%), illiterate (65.2%) and employed (56.2%) mothers (Table 1).

Among 402 newborn babies, majority (85.8%) were born to mothers who had received adequate antenatal care. Most of the newborn babies were immediately dried (98.3%), properly wrapped (93.5) but not kept skin to skin contact with their mothers (95.77%). About seventy percent (69.7%) babies were transported warmly to the postnatal ward and Specialized Newborn Care Unit. One hundred seventy three (43.03%) babies were capped properly. Only 28% newborns were fed breast milk within one hour of birth (Table 2).

About two third (64.7%) births were occurred during the day time and 58 percent were delivered spontaneously (Table 3)

The average age of the newborn babies was 2.93(SD=±1.25) hours of life. Most of the newborn

Table 1: Socio demographic Characteristics of Mothers			
Characteristics	Hypothermia Yes (%) (%)	No (%)	Total (%)
Residence (in Municipality)			
Rural Municip.	56 (42.1)	77(57.9)	133 (33.1)
Urban Municip.	116 (43.1)	153(56.9)	269 (66.9)
Ethnicity:			
Janajati	63(34.1)	98(60.9)	161 (40)
Brhamin/Chhetri	56(44.4)	70(55.6)	126 (31.3)
Dalit	49(45.8)	58(54.2)	107(26.6)
Others	4(50)	4(50)	8(2)
Religion:			
Hindu	153(41.7)	214(58.3)	367 (91.3)
Buddhist	13(50)	13(50)	26 (6.5)
Others	6(66.7)	3(33.3)	9 (2.2)
Age in Years:			
<20	28(35)	52(65)	80 (19.9)
20-35 years	137(44.2)	173(55.8)	310 (77.1)
≥ 35 years	7(58.3)	5(41.7)	12 (3.0)
Educational Status:			
No Schooling	15(65.2)	8(34.8)	23 (5.7)
Basic Level	47(40.9)	68(59.1)	115 (28.6)
Secondary Level	95(40.1)	142(59.9)	237 (59.0)
University Level	15(55.6)	12(44.4)	27 (6.7)
Occupational Status:			
Housewife	139(40.6)	203(59.4)	342 (85.1)
Employed	27(56.2)	21(43.8)	48 (11.9)
Student	6(50)	6(50)	12 (3.0)
Parity:			
Primi	79 (43.4)	103(56.6)	182 (45.3)
Multi	93(42.3)	1 2 7 (57.7)	220 (54.7)

Table 2: Behavioral Factors of Neonatal Hypothermia within 6 Hours of Birth			
Behavioral Factors	Hypothermia Yes (%)	No (%)	Total (%)
ANC Visit:			
Adequate	141 (40.9)	204 (59.1)	345 (85.8)
Inadequate	31 (54.4)	26 (45.6%)	57 (14.2
Immediate Drying of the Baby:			
Yes	168 (42.5)	227 (57.5)	395 (98.3)
No	4 (57.1)	3 (42.9)	7 (1.7)
Proper wrapping of the Baby:			
Yes	158 (42)	218 (58)	376 (93.5)
No	14 (53.8)	12 (46.2)	26 (6.5)
Skin to Skin contact with Mother:			
Yes	5 (29.4)	12 (70.6)	17 (4.22)
No	167 (43.4)	218 (56.6)	385 (95.77)
Wearing cap to the baby			
Yes	71 (41)	102 (59)	173 (43.03)
No	101 (44.1)	128 (55.9)	229 (56.96)
Initiation of breastfeeding within 1 hour of Birth			
Yes	43 (38.1)	70 (61.9)	113 (28.1)
No	129 (44.6)	160 (55.4)	289 (71.9)
Warm Intra- Facility Transportation:			
Yes	114 (40.7)	166 (59.3)	280 (69.7)
No	58 (47.5)	64 (52.5)	122 (30.3)

babies were single birth (99%), term (89.8%) and had normal birth weight (84.3%). Similarly, the babies were born to mothers with obstetric complications (36.1%), with health problem (26.1%) and received resuscitation (23.4%) like stimulation, suctioning and bag mask ventilation. (Table 4)

The prevalence of neonatal hypothermia was 42.8%. The mean auxiliary body temperature of the newborn was 97.98°F (SD=±0.77).

In the bivariate analysis, the variables like age of the mother, antenatal care , skin to skin contact with their mother, initiation of breastfeeding within 1 hour, birth weight and undergoing resuscitation procedure showed association with the occurrence of hypothermia (p<0.25). In multivariate analysis, mother's age, antenatal care, birth weight and undergoing resuscitation procedure showed significant association with neonatal hypothermia

Table 3: Birth Context Related Factors of Neonatal Hypothermia within 6 Hours of Birth

Related Factors:	Hypothermia Yes (%)	No (%)	Total (%)
Delivery Time:			
Night	56 (39.4)	86 (60.6)	142 (35.3)
Day	116 (44.6)	144 55.5)	260 (64.7)
Delivery Mode:			
Spontaneous	99 (42.7)	133(57.3)	232 (57.7)
Instru. Assisted	7(43.8)	9 (56.2)	16 (4.0)
CS	66 (42.9)	88 57.1)	154 (38.3)

(p<0.05). The neonates born to mothers after 35 years of age were 4 times more likely to be hypothermic compared to babies born before 35

Table 4: Newborn Physiology Related Factors of Neonatal Hypothermia within 6 hours of Birth

Newborn Physiology Related Factors	Hypothermia Yes (%)	Hypothermia No (%)	Total (%)
Neonatal Age in Hours:			
0-2	74 (46)	87 (54)	161 (40.0)
2-4	75 (40.8)	109 (59.2)	184 (45.8)
4-6	23 (40.4)	34 (59.60)	57 (14.2)
Birth Weight:			
< 2.5 Kg	38 (60.3)	25 (39.7)	63 (15.7)
≥ 2.5 Kg	134 (39.5)	205 (60.5)	339 (84.3)
Gestational Age:			
< 37 Weeks	20 (48.80)	21 (51.2)	41 (10.2)
≥37 Weeks	152 (42.1)	209 (57.9)	361 (89.8)
APGAR Score:			
<7	34 (56.7)	26 (43.3)	60 (14.9)
≥7	138 (40.4)	204 (59.6)	342 (85.1)
Sex :			
Male	90 (40.7)	131 (59.3)	221 (55.0)
Female	82 (45.3)	99 (54.7)	181 (45.0)
Number of Birth:			
Singleton	170 (42.7)	228 (57.3)	398 (99.0)
Multiple	2 (50)	2 (50)	4 (1.0)
Born with Health Problem:			
Yes	57 (54.3)	48 (45.70)	105 (26.1)
No	115 (38.7)	182 (61.3)	297 (73.9)
Maternal Obstetric complications:			
Yes	65 (44.8)	80 (55.2)	145 (36.1)
No	107 (41.6)	150 (58.4)	257 (63.9)
Received Cardiopulmonary Resuscitation(CPR):			
Yes	58 (61.7)	36 (38.3)	94 (23.4)
No	114 (37)	194 (63)	308 (76.6)

years age (p=0.03, 95% CI: 1.12-14.97). Babies born to mothers who had not received adequate antenatal care were 0.52 times more likely to have hypothermia when compared to those born to mothers who received adequate antenatal care (p=0.03, 95% CI: 0.29-0.94). Similarly, low birth weight babies were 0.4 times more likely to be hypothermic when compared to normal birth weight babies (p=0.00, 95% CI: 0.24- 0.77)). Likewise, newborns who had resuscitation at birth (CPR) were 2.8 times more likely to be hypothermic when compared with those who had no resuscitation (p = 0.00, 95% CI: 1.69- 4.65). (Table 5)

DISCUSSION

This study found the prevalence of neonatal hypothermia within six hours of birth among institutional deliveries was 42.8% which was comparable to the findings of other studies. The previous studies showed the prevalence of newborn hypothermia as in Zambia (44-69%),[8] Ethiopia (50-69.8%),[9,13-15] Nigeria (62-68%),[7] Zimbabwe (85%),[11] Sub-Sahara, Africa (66.3%),[10] India (64%), [6] and Bangladesh (34%).[12] The difference might be due to differences in behavioral factors like antenatal care, immediate care as proper wrapping, skin to skin contact, putting cap to the baby, warm intra-facility transportation, initiation of breastfeeding within one hour of birth.

The study found the elderly pregnancy, inadequate antenatal care, low birth weight and undergoing resuscitation procedure had significant association to neonatal hypothermia (p<0.05). The neonates born to mothers after 35 years of age were 4 times more likely to be hypothermic compared to babies born before 35 years age (p=0.03,

Table 5: Bivariate & Multivariate Logistic Regression Analysis of Associated Factor of Neonatal Hypothermia within 6 hrs of Birth

Characteristics	Hypothermia Yes (%)	No (%)	COR (95% CI)	P value	AOR (95% CI)	P value *
Mother's Age						
<20	28(35)	52(65)				
20-34	137(44.2)	173(55.8)	0.39 (1.1-1.45)	0.16	4.09 (1.12-14.97)	0.03
≥ 35	7(58.3)	5(41.7)				
Antenatal Care:						
Adequate	141(40.9)	204(59.1)	0.52 (0.26- 1.01)	0.05	0.52 (0.29-0.94)	0.03
Inadequate	31 (54.4)	26 (45.6)				
Birth Weight:						
< 2.5 Kg	38 (60.3)	25 (39.7)	0.43 (0.23-0.8)	0.00	0.43 (0.24- 0.77)	0.00
≥ 2.5 Kg	134(39.5)	205(60.5)				
Received Resuscitation:						
Yes	58 (61.7)	36 (38.3)	2.94(1.35- 6.39)	0.00	2.81 (1.69-4.65)	0.00
No	114 (37)	194 (63)				

*p<0.05 indicates significant association.

95% CI: 1.12-14.97). Babies born to mothers with inadequate antenatal were 0.52 times more likely to have hypothermia when compared to those born to mothers receiving adequate antenatal care (p=0.03, 95% CI: 0.29-0.94). Elderly pregnancy and inadequate antenatal care were not identified as independent variables in the previous studies. Similarly, low birth weight babies were 0.4 times more likely to be hypothermic when compared to normal birth weight babies (p=0.00, 95% CI: 0.24-0.77). The low birth weight babies were 2 to 4 times more likely to be hypothermic than normal weight babies as concluded by Akter & et al. (p=0.03; OR, 2.0; CI, 1.06 to 3.82), Seyum & Ebrahim (AOR=3.75, 95% CI: 1.29, 10.88) and Ukke & Diriba (AOR = 3.61, 95% CI: 2.10, 6.18). [12-14] But Shrestha SD found as no significant association between low birth weight and neonatal hypothermia (p>0.05) in Nepal. [17] Likewise, the resuscitated newborns were 2.8 times more prone to be hypothermic than those who had no resuscitation (p =0.00, 95% CI: 1.69- 4.65). This finding was congruent to the findings of previous studies which found 2.4 to 3.7 times as concluded by Demissie & et al. (AOR = 3.65, 95% CI: 1.52, 8.78), Akter & et al. (p=.001, OR, 2.43; CI: 1.47 to 4.00) and Yitayew & et al. (p=0.024, AOR=2.9, 95% CI: 1.1-7.2). [8, 12, 15]

This study found mode of delivery, gestational age, APGAR-Score, birth asphyxia, no skin to skin contact with their mothers, not capping, not warm intra-facility transportation, no early initiation of breast feeding, presence of obstetric complication, babies with health problem and birth time as not independent factors of neonatal hypothermia which were consistent to the findings of Delavar & et al. and Shrestha SD. Delavar & et al. found no significant association of parity, gestational age, delayed appropriate clothing and skin-to skin contact to neonatal hypothermia.[16] And Shrestha SD found no significant association between parity, preterm, APGAR score and neonatal hypothermia (p>0.05). [17] But these findings were in contrast to the findings of Alebachew & et al., Akter & et al., Seyum & et al., Ukke & Diriba and Yitayew & et al. [10, 12- 15] Alebachew & et al. concluded no skin to skin contact (AOR = 2.87,95% CI: 1.48, 5.57), dressed without cap (AOR = 2.10, 95% CI: 1.17, 3.76), not warm intra facility transportation (AOR = 3.18, 95% CI: 1.84, 5.48), babies born to mothers having obstetric complication (AOR = 2.42, 95% CI: 1.28, 4.57), preterm newborns (AOR = 3.37, 95% CI: 1.53, 7.44) and babies with health problems (AOR = 4.24, 95% CI: 1.92, 9.34) as independent variables of neonatal hypothermia. [10] Akter & et al. found

significant determinants of neonatal hypothermia like preterm (p=0.03), normal delivery (p=0.012), birth asphyxia (p=0.001) and caesarean section(C/S) delivery (p=.006; OR 1.35; CI, 1.18-2.12).[12] Seyum & et al. revealed no skin to skin contact (AOR=2.81, 95%CI: 1.40, 5.66), night time delivery (AOR=6.61, 95%CI: 3.75, 11.66), delayed initiation of breast feeding (AOR=7.58, 95%CI: 3.61, 15.91) and problems of the neonates (AOR=3.10, 95%CI: 1.06, 9.46) as significantly associated factors of neonatal hypothermia. [13] Ukke & Diriba found the preterm neonates (AOR = 4.81, 95% CI: 2.67, 8.64), no skin to skin contact to their mother immediately after delivery (AOR=4.39, 95% CI: 2.38, 8.11), no early initiation of breastfeeding within one hour after birth (AOR = 3.72, 95% CI: 2.07, 6.65) and presence of obstetrical complication(s) during pregnancy/labor (AOR = 2.46, 95% CI: 1.07, 5.66) as having significant association to neonatal hypothermia (p< 0.05).[14] Likewise Yitayew & et al. found the independent factors of neonatal hypothermia as preterm neonates (p=0.03, AOR 2.6, 95% CI: 1.1-6.2), no skin-to-skin contact with their mother immediately after delivery (p=0.041, AOR 3.1, 95% CI: 1.3-7.8) and neonates delivered at night time (p=0.045, AOR 2, 95% CI: 1.02-4).[15]

Limitation: It is single institutional based study and the neonates were included in study were only born in Hospital. Due to COVID 19, the newborns admitted in SNCU could not be included in the study as frequent access to data collectors was impossible. As this study was conducted only in the summer season, it couldn't show the significance of seasonal variation for neonatal hypothermia. Besides, the impact of air temperature of the delivery and postnatal units wasn't considered due to absence of inbuilt thermostat and humidity control in the Pokhara Academy of Health Sciences.

CONCLUSION

The prevalence of Neonatal hypothermia within six hours of birth in the study area was about 43 percent. Mothers age more than 35 years, inadequate antenatal clinic visit, low birth weight and resuscitation at birth were independent factors of Neonatal hypothermia. Therefore, special attention is needed for the thermal care of low birth weight neonates and warm resuscitation. Additionally, there should be strict adherence to the WHO recommendation of thermal care for newborns including skin-to-skin contact immediately after delivery and initiation of breastfeeding within 1 hour of birth.

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