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Original Research Article

Comparison of effect of suctioning first or drying first on the outcome of hypothermia and respiratory distress at 6 hours of age: a hospital based prospective cohort study

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ABSTRACT

Background: Around 10% of newborns need assistance to start and maintain effective breathing at birth, and perinatal asphyxia contributes to 23% of the 4 million annual neonatal deaths worldwide. Skilled resuscitation in the delivery room can help prevent many of these fatalities and reduce neurodevelopmental disabilities in survivors. Objectives were to compare the effect of suctioning first or drying first on the composite outcome of hypothermia and respiratory distress at 6 hours of age in depressed newborn requiring delivery room resuscitation.
Methods: The study was an institution-based prospective cohort study, conducted in tertiary care institute. The 380 depressed newborn requiring resuscitation were included in study and those who have major congenital malformation and preterm and meconium-stained liquor were excluded. All the enrolled newborn were randomised into 2 groups, based on block randomisation done by staff nurse. Those who were in suctioning group, were resuscitated by doing suctioning first and those who were in drying group were resuscitated by doing drying first remaining steps were done as per NRP protocol, all the newborn were admitted to NICU. Temperature, respiratory distress and blood sugar at 0, 1, 6 hour of age is recorded in predesigned proforma.
Results: Both the groups were comparable in term of maternal and neonatal characteristics. Incidence of hypothermia at admission was 26.8% for group D and 23.2% for group S (p=0.407). The 7.4% participants required intubation in group D and 4.7% in group S. Respiratory distress at admission was present in 62.1% for group D and 64.7% for group S patients (p value 0.368). At 6 hours of observation, it was seen that the presence of hypothermia in group D was 6.8% in group D and 2.6% in group S (p=0.091). During the same time period respiratory distress was present in 38.4% of group D infants and 38.8% of group S infants respectively (p=0.708).
Conclusions: As long as the neonatal resuscitation is performed properly, any one of the two can be done as the first step of the protocol, it can be said that the order of either drying first or suctioning first in the protocol of neonatal resuscitation provide comparable results in terms of neonatal respiratory distress, hypothermia, and other adverse outcomes.

Keywords: Hypothermia, Respiratory distress, Newborn, Outcome

INTRODUCTION

An approximately 10% of all neonates around the world require clinical resuscitation to establish their breathing and normal body functions. This translates to around 10 million babies/year, majority of them belonging to the developing world.[1,2] Delays in prompt resuscitation after birth, especially within the first 6 hours of life can exacerbate hypoxia, increase need for assisted ventilation, and contribute significantly to the establishment and complication associated with neonatal asphyxia.[3]

There are multiple protocols in place which lay down a step-by-step guideline for the neonatal resuscitation, set

and adopted by regional bodies of paediatricians. While these protocols closely follow the neonatal resuscitation protocol (NRP) prescribed by the American academy of paediatrics (AAP), they also differ from the latter in certain, often crucial ways. In the NRP set by the Indian academy of paediatrics (IAP), for example, drying of the baby is recommended as the first step of neonatal resuscitation, followed by suctioning. On the other hand, the AAP NRP protocol recommends the opposite, that the baby needs to be suctioned first, and then dried when initiating neonatal resuscitation.[4] These differences, while appear to be minor, might actually have important consequences in the health and survival of the neonate. The IAP NRP recommends drying before suctioning to prevent hypothermia, a condition that is very prevalent in low and middle-income countries such as India, and if persistent, can predispose the fragile neonate to developing potentially fatal conditions such as late onset neonatal sepsis, intraventricular haemorrhage, and worsening of respiratory distress.[5,6] On the other hand, suctioning the airway is essential to clear the airways of secretions, and is essential in the establishment of respiration in the newborn.

Pertinently, the debate as to which should be done first, suctioning or drying, is largely unresolved.[1,4] Therefore, the present study was planned with an aim of comparing the effects of suctioning first or drying first on development of hypothermia and respiratory distress in delivery room resuscitation.

METHODS

This institution-based prospective cohort study was carried out in the labor room, obstetrics operation theatre, and neonatal intensive care unit (NICU) of the department of pediatrics at Umaid hospital, Dr. SN medical college, Jodhpur. Conducted over a year, from September 2021 to October 2022, the study focused on assessing the impact of initial interventions (suctioning first vs. drying first) on hypothermia and respiratory distress in neonates. The study population included depressed term neonates within the first 6 hours of life who required neonatal resuscitation. By focusing on term neonates, the study aimed to provide clearer insights into optimal resuscitation practices for this specific group. Exclusion criteria were applied to enhance the study's accuracy and reliability, excluding neonates who were preterm or post-term, those born to mothers with meconium-stained amniotic fluid, and neonates with major congenital anomalies. These criteria helped ensure that the study results would be more specifically applicable to otherwise healthy term neonates.

Sample size and sampling technique

The sample size was calculated based on the formula for difference between proportions of two study groups:

Neach group=[[Z1-α X {√(2P(1-P)}] + [Z1-β X {√(P1(1-P1) + P2(1-P2)}]] / (P1-P2)2.

Based on findings reported by Kumar et al considering P1 as 60%, P2 as 71% at 95% confidence level and 80% power, the calculated sample size for each group of participants was 186, which was rounded off to 190 neonates.[1] A consecutive sampling technique was utilised, where neonate meeting the study criteria were randomly assigned to each of the two groups, group D being drying first group, and Group S being suctioning first group by envelope method. This process was continued until the required sample size was reached for each of the study groups.

Study technique

After delivery, if a newborn was found to be apnoeic or limp, the umbilical cord was clamped immediately, and baby was placed under radiant warmer with neck slightly extended for initial steps of resuscitation. The newborns were then randomized into 2 groups, whether to do drying first (group D) or suctioning first (group S) using an envelope method, each envelope containing a code corresponding to one of the groups as determined by a random number table generated by a consultant statistician who was not a part of the present study. The allocation of each newborn to a study group was performed by a staff nurse who was not a part of the data collection or analysis for the study.

Resuscitation was thereafter done by the paediatricians as per the allocation group and sequence of the protocol. For the suctioning first group, wall mounted suction was used with a pressure not exceeding 100 mmHg (80-100 mmHg). Each attempt at suctioning was limited to no more than 3 to 5 seconds, and care was taken to avoid vigorous or deep suctioning (deep pharyngeal suctioning can cause vagal stimulation leading to bradycardia or apnoea). Suctioning was first done from mouth (M) then nose (N) to prevent aspiration. For the drying first group, prewarmed towels was used to dry the whole-body surface of the neonate. If the towel became wet during the procedure, the wet towel was discarded to prevent further heat loss and a fresh warm towel was used for continued drying. Drying was done from head to toe first head then whole body, during drying we rub the body gently. If after the completion of initial steps including tactile stimulation, the baby continued to have apnoea/gasping breathing or bradycardia (heart rate<100/minute), positive pressure ventilation was initiated.

All neonates were admitted to the NICU and monitored for hypothermia at admission (after completion of resuscitation), at 1 hour, 6 hours and clinical details were recorded on predesigned proforma. The development of respiratory distress in a newborn was measured using Downe's score.[7]All study participants details were recorded in a predesigned proforma. Each included neonate was followed from admission till 24 hours of life,

with vital parameters monitored at admission, 1 hour, and 6 hours of birth (Figure 1).

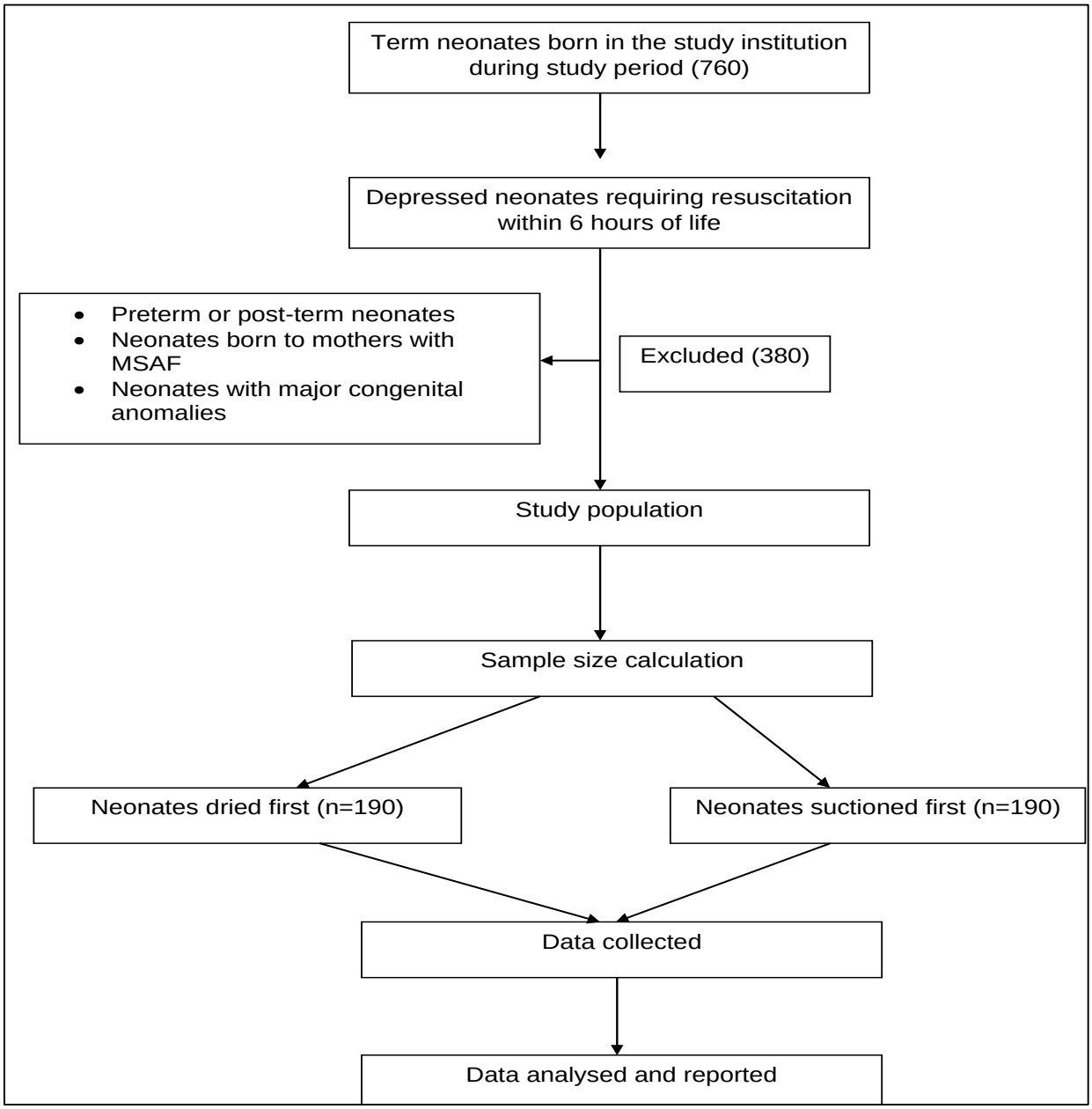

Figure 1: The methodology of the present study.

Hypothermia was defined as rectal temperature of <36.50 Celsius which was recorded by using rectal probe of tecotherm.

Blood glucose is measured by glucometer, first we clean the lateral side of heel of foot, after it get dried, a lancet is used to prick the heel of the foot, first drop is wiped off and the next drop is used to measure blood glucose.

Ethical consideration

The study was approved by institutional ethics committee of SN medical college, Jodhpur, Rajasthan (SNMC/AcadCT/IEC/2022/Plan/634).

Statistical analysis

After the collection of data, the data was cleaned, anonymised and analysed with the statistical program Statistical Package for the Social Sciences (IBM SPSS, version 22). The data were categorized and expressed in proportions. The continuous data were expressed as mean±SD. Comparison between two study groups were performed using unpaired t-test and chi-square tests. Analyses of outcomes over time were performed using the Cochran's Q test for categorical data and repeated measures ANOVA with a post hoc Bonferroni's test for continuous data. For the purposes of the present study, a $p<0.05$ was considered to be statistically significant.

RESULTS

A total of 380 participants were recruited for the present study, half of whom were dried first and the other half suctioned first. Mothers of the participants of group D had a mean age of 25.5±4.7 years, while that of group S was 25.4±4.6 years. The sex ratio observed was 1:0.94 for group D and 1:0.92 for group S. Majority of deliveries in both the study groups was spontaneous vaginal deliveries. Majority of the mothers of the study participants in both the study groups did not have any antenatal risk factors (52.1% in group D and 64.7% in group S). Among the mothers who did have antenatal risk factors, the most common was the presence of hypertensive disorders of pregnancy (Table 1).

The incidence of hypothermia at admission was 26.8% for group D and 23.2% for group S (p value=0.407). 7.4% participants required intubation in group D and 4.7% in group S. Respiratory distress at admission was present in 62.1% for group D and 64.7% for group S patients (p value 0.368). The mean serum glucose levels of group D infants was 44.8±2.8 mg/dl, while that for group S was 45.3±3.1 mg/dl (p=0.487).

At 1 hour after resuscitation, hypothermia was present in 15.3% of group D neonates and 11.1% group S neonates (p-value 0.225). At the same time, respiratory distress was present in 47.1% of group D and 47.9% of group S participants respectively (p=0.702). The mean serum glucose level was 99.7±3.9 mg/dl for group D and 99.8±4.3 mg/dl for group S (p=0.777).

At 6 hours of observation, it was seen that the presence of hypothermia in group D was 6.8% in group D and 2.6% in group S (p=0.091). During the same time period respiratory distress was present in 38.4% of group D infants and 38.8% of group S infants respectively (p=0.708), and the mean blood glucose for the two groups were 106.2±3.8 mg/dl and 105.8±4.1 mg/dl respectively (p=0.248).

It was observed that there was a statistically significant reduction in the presence of hypothermia and respiratory distress in the study participants from admission to1 hour and 6 hours of follow-up for both the drying as well as the suctioning groups (p<0.001). In turn, there was also a statistically significant increase in the mean serum glucose levels of the two study groups over the time period (p<0.001) (Table 2).

Regarding the outcomes of the participants in the two groups, 10.5% participants in group D and 10% of group S required bag and mask ventilation. Endotracheal intubation was done in 6.8% of group D and 4.7% of group S participants. However, on statistical analysis, the difference between the two study groups with respect to the requirement of advanced resuscitation was found not to be statistically significant (p=0.601). 6.8% of infants in group D died, while for group S it was 4.7%. this difference was also found not to be statistically significant on analysis (p=0.380).

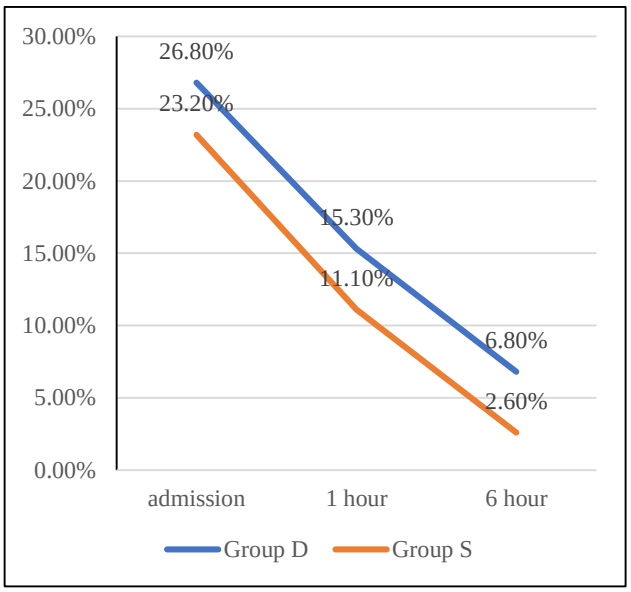

Figure 2: Percentage of newborn having hypothermia in drying and suctioning group.

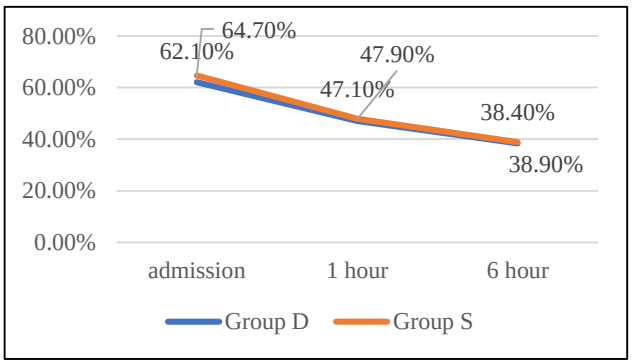

Figure 3: Percentage of newborn showing respiratory distress in drying and suctioning group.

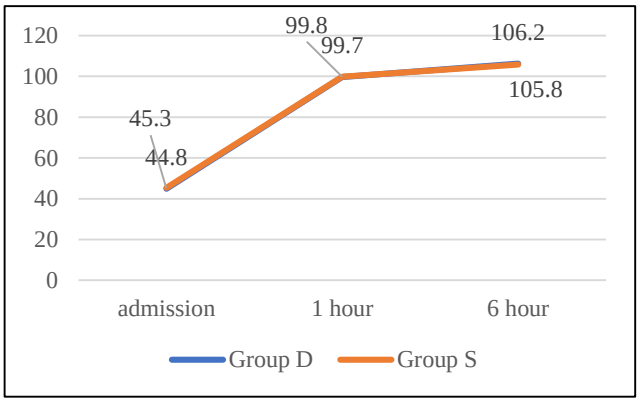

Figure 4: Serum glucose at 1 hour and 6 hours of admission in drying group and suctioning group.

Table 1: Sociodemographic characteristics of the study participants, (n=380).

Parameters	Group D, (n=190)	Group S, (n=190)	P value
Mean age of the mothers	25.5±4.7	25.4±4.6	0.827
Sex ratio	1: 0.94	1: 0.92	0.918
Spontaneous vaginal delivery	107 (56.3%)	100 (52.6%)	0.471
Risk factors			
Abruptio placenta	1 (0.5%)	0 (0%)	0.274
Anaemia	0 (0%)	3 (1.6%)	
Cephalopelvic disproportion	3 (1.6%)	2 (1.1%)	
Eclampsia	1 (0.5%)	0 (0%)	
Foetal distress	1 (0. 5%)	0 (0%)	
Gestational DM	2 (1.1%)	1 (0.5%)	
Hypertensive disorder of pregnancy	15 (7.9%)	14 (7.4%)	
Hypothyroidism	1 (0.5%)	2 (1.1%)	
In-vitro fertilization	5 (2.6%)	4 (2.1%)	
Leakage per vaginum	13 (6.8%)	10 (5.2%)	
Malaria	1 (0.5%)	0 (0%)	
Malpresentation	3 (1.6%)	1 (0.5%)	
None	99 (52.1%)	123 (64.7%)	
Obstructed labour	14 (7.4%)	11 (5.8%)	
Oligohydramnios	2 (1.1%)	0 (0%)	
Polyhydramnios	1 (0.5%)	1 (0.5%)	
Post-dated	5 (2.6%)	8 (4.2%)	
Pre-eclampsia	5 (2.7%)	1 (0.5%)	
Single loop of cord	14 (7.4%)	3 (1.6%)	
Twins	4 (2.1%)	6 (3.2%)	

Table 2: Clinical characteristics of the study participants, (n=380).

Variables	At admission	1 hour	6 hours	P value
Hypothermia				
Group D (190)	51 (26.8%)	29 (15.3%)	13 (6.8%)	<0.001
Group S (190)	44 (23.2%)	21 (11.1%)	5 (2.6%)	<0.001
P value	0.407	0.225	0.091	-
Respiratory distress				
Group D (190)	118 (62.1%)	90 (47.1%)	73 (38.4%)	<0.001
Group S (190)	123 (64.7%)	91 (47.9%)	71 (38.9%)	<0.001
P value	0.368	0.702	0.708	-
Serum glucose				
Group D (190)	44.8±2.8	99.7±3.9	106.2±3.8	<0.001
Group S (190)	45.3±3.1	99.8±4.3	105.8±4.1	<0.001
P value	0.487	0.777	0.248	-

DISCUSSION

The primary aim of the present study was to compare and contrast two modalities, i.e., drying first or suctioning first at the beginning of the neonatal resuscitation protocol and observe their effects on the neonatal outcomes, viz-a-viz their hypothermia and respiratory distress status. With regards to that, it was seen that both the modalities were almost equally effective. In both the study groups, the proportion of babies with neonatal hypothermia and/or respiratory distress fell precipitously at 6-hour follow-up. All of these were statistically significant on analysis, but the differences between the groups were not statistically significant. The findings of the present study were consistent with findings reported by Kaushik et al, Foster et al and Adams et al.[8-10] This indicates that as long as all of the steps of the neonatal resuscitation protocol are being properly followed, it does not matter whether the babies are dried first or suctioned first. In a 2018 study, Shikuku et al described the practice and outcomes associated with neonatal resuscitation as observed in 138 cases in a tertiary care hospital of Kenya. It was observed by the authors that drying first (OR 2.9, p=0.035) was associated with a better neonatal outcome at 1 hour.[11]

Kumar et al determined the composite outcome of hypothermia at admission or respiratory distress at 6 hours of age was similar in suctioning first and drying first, respectively [46 (59.7%) vs. 55 (71.4%); RR (95% CI), 0.84 (0.66-1.05); p=0.13]. that is also observed in our study.

Briadar et al conducted a study to compare the effect of suctioning first or drying first on bradycardia outcomes during resuscitation and the need and duration of positive pressure ventilation, hypothermia at NICU admission or onset of respiratory distress at 6 hours of age, duration of NICU stays, and death, The authors observed that bradycardia during resuscitation and the need and duration of positive pressure ventilation was high in the suction first group (p=0.046). Incidence of hypothermia at NICU admission, onset of respiratory distress at 6 hours of age was also high in the suction first group. Duration of NICU stay was high in the suction first group (<0.001).

Limitations

The primary limitation of the present study was that it was conducted among neonates born in only one institution, which limits the generalizability of the findings. The open label non-blinded nature of the trial also was a limitation, which was the case due to substantial resource constraints. As the paediatricians were aware of the procedures being done and their sequence, there was a risk of introduction of information bias into the study.

CONCLUSION

Therefore, it can be said that the order of either drying first or suctioning first in the protocol of neonatal resuscitation provide comparable results to each other in terms of neonatal respiratory distress, hypothermia, and other adverse outcomes. As long as the neonatal resuscitation is performed properly, any one of the two can be done as the first step of the protocol.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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