



The Differences of Left Lateral and Head Elevation Position toward Heart Rate of Newborns with Asphyxia in the Perinatology Room RSUD Dr. Soediran Mangun Sumarso Wonogiri

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Abstract

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BACKGROUND: Asphyxia delivery results in hypoxic-ischemic encephalopathy and multiorgan failure. The organ most affected by hypoxia is the cardiovascular system. Newborns with asphyxia have a lack of oxygen (hypoxia) and have an increased heart rate (tachycardia). Giving baby positions, such as supination position, pronation, right lateral, left lateral, and head elevation, are expected to improve the hemodynamic of newborns with asphyxia.

AIM: This study was to determine the difference in effect between left lateral position and the head elevation position on the heart rate of newborns with asphyxia in the perinatology room of RSUD Dr. Soediran Mangun Sumarso Wonogiri.

METHODS: This research is a quasi-experimental quantitative study with a pre- and post-test non-equivalent control group design. Sampling using non-probability sampling technique with consecutive sampling. The sample was divided into two groups, namely, the intervention group with 30 respondents who got the left lateral position and the control group with 30 respondents who got the head elevation position. Data analysis was performed using the Statistical Package for the Social Sciences parametric test with paired t-test and independent t-test.

RESULTS: The results of paired t-test analysis in the intervention group obtained $p = 0.003$ ($p < 0.05$) and in the control group obtained $p < 0.001$ ($p < 0.05$), which means that both have a significantly on changes in the heart rate of newborns with asphyxia. The results of the independent t-test analysis obtained $p = 0.191$ ($p < 0.05$), which means that there is no significant difference in the heart rate of newborns with asphyxia in the intervention and control groups.

CONCLUSION: Both interventions, giving the left lateral position and the head elevation position, have a significantly effect on changes in the heart rate of newborns with asphyxia.

Introduction

Asphyxia causes hypoxic-ischemic encephalopathy and multiorgan failure. The organ most affected by hypoxia is the cardiovascular system. The hemodynamic instability occurs due to hypoxia, either *in utero* or during the newborn's resuscitation and transition causes other organs' effect. During delivery, the clinical focus during resuscitation of asphyxia infants is mostly to experience immediate heart rate changes and blood pressure [1]. Asphyxia births are assumed to be associated with intrapartum hypoxia-ischemia, which accounts for 1 million neonatal deaths annually. Asphyxia birth is also defined as a failure to initiate or maintain spontaneous breathing at birth [2]. Babies born with asphyxia experience a lack of oxygen (hypoxia) and have an increased heart rate (tachycardia) [3]. The determination of the heart rate is a basic assessment of the health of the newborns. It is a sensitive indicator for reference interventions during neonatal resuscitation and for accessing infants' clinical

status. The ineffectiveness of the heart rate assessment significantly increases the risk of hypoxia and neonatal mortality [4].

The global number of neonatal deaths decreased from 5 million in 1990 to 2.5 million in 2018. Every day there were 7000 deaths in 2018 compared to 14,000 in 1990. Neonatal mortality accounted for 47% of all children under 5 in 2018 [5].

The World Health Organization states that children who die within the first 28 days of birth suffer from conditions and diseases associated with a lack of quality care at birth or skilled care and immediately after birth care and in the 1st days of life. During 2019, there was 47% of under-5 deaths occurred in the newborns period, with about a third dying on the day of birth and nearly three-quarters dying within the 1st week of life. These neonatal deaths were caused by preterm birth, intrapartum-related complications (birth asphyxia or lack of breathing at birth), infections, and congenital defects account for most neonatal deaths [6].

Data from the Indonesian Data and Health Survey (IDHS) stated that in the 5 years before the 2017 IDHS, the neonatal mortality rate (NMR) was 15 deaths per 1000 live births, implying that one in 67 children died within the 1st month of life. The 2017 IDHS showed the NMR decreased more than 31%, from 35 per 1000 live births in the 2002–2003 IDHS to 24 per 1000 live births in the 2017 IDHS [7]. NMR in Central Java in 2018 was 6.1 per 1000 live births. The highest NMR was Rembang at 11.7 per 1000 live births, followed by Grobogan (11.5 per 1000 live births) and Banjarnegara (10.7 per 1000 live births). The district/city with the lowest IMR was Surakarta city 1.8 per 1000 live births. The average of Central Java Province is 6.1 per 1000 live births. Meanwhile, Wonogiri Regency is 6.9 per 1000 live births, which means it is still higher than the average of Central Java. This NMR contributes to 73% of infant mortality in Central Java [8].

Management of the delivery room for newborns should be carried out according to international guidelines, but there are no recommendations which are available for positions of infants performed immediately after birth. The positions that are given to infants are supination, right tilt, and left tilt. The positions measured were the heart rate and oxygen saturation analyzed through the monitor at the 5th and 8th min. The results obtained were that at the 5th and 8th min for the heart rate, there was no significant change in the supination position, right tilt, and left tilt. Meanwhile, the oxygen saturation showed a significant difference in the right oblique or left oblique position compared to the 5th and 8th min supination positions [9].

The positions given to babies are left lateral, pronation, and supination. In the neonatal intensive care unit (NICU), the left lateral position can be used as an alternative for mild respiratory failure. Preliminary results show that breathing was normal for 30 min after changes in the baby's body position. Heart rate, respiration, and arterial blood pressure did not change significantly at all positions (left lateral, pronation, and supination). Although there was no significant change in the oxygen fraction at the three positions, the SpO₂ was higher in the left lateral and pronation positions than in the supination position [10]. This study was conducted on two groups of infants, namely, infants with asphyxia and infants without asphyxia. Babies born with asphyxia are at risk for increased intracranial pressure. This study's finding was that babies who were given a head elevation position of 30° could lower intracranial pressure [11]. Another study was divided into two groups: A group of infants given supination and pronation positions measured through a monitor over 15 min. For the first 10 min, there were measurements of SpO₂, heart rate, and arterial blood gases (ptcO₂ and ptcCO₂). It was then continued for another 5 min while the flow and pressure were recorded on the monitor. The supination and pronation positions

did not show significant changes in lung function in infants with ventilator-attached respiratory distress syndrome [12].

The purpose of this research was to determine the difference in effect between the left lateral position and the head elevation position on the heart rate of newborns with asphyxia in the perinatology room RSUD Dr. Soediran Mangun Sumarso Wonogiri.

Ethics approval

Ethical clearance was carried out at the Health Research Ethics Commission of the Muhammadiyah University of Surakarta, with a letter number 2958/B.2/KEPK-FKUMS/VI/2020.

Materials and Methods

The research method was a quasi-experimental research with a pre- and post-test non-equivalent control group design. The researcher used the quasi-type because it used two groups: The intervention group (left lateral position) and the control group (head elevation position). Moreover, the researcher conducted it from April 2020 to October 2020. The sampling technique used by researchers was non-probability sampling with a consecutive sampling method. This study samples were 60 babies, 30 babies included in the intervention group and 30 babies included in the control group. The inclusion criteria in this study were newborns aged <24 h with mild asphyxia with appearance, pulse, grimace, activity, and respiration (APGAR) 7–10; newborns <24 h with moderate asphyxia with APGAR 4–6; newborns with a birth weight of more than 2500 g who received standard treatment, namely, babies treated in an incubator, inserted with D5 ¼ NS infusion, given 1 l/min nasal oxygen cannula; and parents who agreed that their babies were used as the research sample, as shown by the consent of the parents/guardians. At the same time, the exclusion criteria in this study were newborns aged >1 day; newborn with APGAR score 0–3 (severe asphyxia); babies with low birth weight (weight 1500–2500 g); babies with low birth weight (weight <1500 g); and newborns with the congenital disease (such as babies with congenital heart disease, down syndrome, anencephaly, hydrocephalus, omphalocele, diaphragmatic hernia, and duodenal atresia).

Administration of intervention occurred in the 1st min of resuscitation, and analysis was carried out after the 1st min. It stopped after 10 min or when the infant was finally removed from the resuscitation table (whichever comes first). The positions given to babies were the supination position, right tilt, and left tilt. The parameters measured were heart rate and oxygen saturation, analyzed through a monitor at the 5th and 8th min [9]. Meanwhile, the head elevation position was given at a 30° position [11].

Researchers were assisted by research assistants, namely, nurses and doctors who worked at the hospital. The pediatrician had authority over the safety of assigning positions to newborns with asphyxia. The nurse, in this case, intervened in giving the left lateral position and head elevation position. The left lateral position and the head elevation position were given for 10 min in newborns with asphyxia. Measurement of heart rate changes was carried out before being given the left lateral position and head elevation position. After 10 min, the measurement of the heart rate was carried out again in both positions.

Results

The study results were analyzed using the statistical program of Statistical Package for the Social Sciences version 20.0.

Table 1 shows the mothers' gestational age in the intervention group with a mean of 38.17 ± 2.276 weeks; the birth weight with a mean of 3022.07 ± 460.962 g. Meanwhile, the control group showed maternal gestational age with a mean of 38.30 ± 1.236 weeks and the birth weight with a mean of 2901.33 ± 305.660 g.

Table 1: The characteristics of the respondents (n = 60)

Intervention group (n = 30)				
Mother's characteristics	Min.	Max.	Mean	Std. deviation
Gestational age	28	41	38.17	2.276
Babies birth weight	2200	4100	3022.07	460.962
Control group (n = 30)				
Mother's characteristics	Min.	Max.	Mean	Std. deviation
Gestational age	37	41	38.30	1.236
Babies birth weight	2520	4000	2901.33	305.660

Table 2 shows the frequency distribution of the neonate's heart rate with pre- and post-asphyxia getting the left lateral position and head elevation position. The paired t-test results of left lateral position showed $p = 0.003$ ($p < 0.05$), and the paired t-test results of head elevation position showed $p < 0.001$ ($p < 0.05$), indicating a significant heart rate difference between before and after providing the left lateral position and head elevation position.

Table 3 shows the results of the independent t-test. $p = 0.191$ ($p \geq 0.05$) so that there was no difference in heart rate between the group that got the left lateral position and the one who got the head elevation position.

Table 2: The analysis of neonates heart rate with asphyxia pre- and post-test got left lateral position and head elevation position (n = 60)

Variable	Group	Min	Max	Mean of pre-test	Mean of post-test	Mean difference (s.b)	Std. deviation	p-value
Heart rate	Intervention group (n = 30)	128 (136)	170 (170)	139.73	143.93	4.2 (6.975)	12.202-7.492	0.003
	Control group (n = 30)	100 (130)	170 (160)	128.10	146.20	18.1 (16.121)	16.346-5.641	<0.001

Discussion

The left lateral position and the head elevation position were given for 10 min in newborns with asphyxia. Measurement of heart rate changes was carried out before being given the left lateral position and head elevation position. After 10 min, the measurement of the heart rate was carried out again in both positions using pulse oximetry. Measurement of the heart rate using pulse oximetry was carried out after 10 min of a given position change [13]. Heart rate measurement is a vital assessment during resuscitation for newborns. Heart rate measurement can be done by auscultation/palpation, pulse oximetry, and electrocardiogram. Of the three measurements, pulse oximetry and electrocardiogram have better accuracy than using auscultation/palpation [4]. Another study stated that measuring the baby's heart rate during asphyxia was most accurate using Doppler ultrasound transducers positioned along the sternum and using the pulmonary or aortic valve examination mode. The use of this appliance was effective during infant asphyxia and resuscitation [14].

Characteristics of the respondents indicated that the youngest gestational age of mothers in the intervention group was 28 weeks and a greatest of 41 weeks with a mean of 38.17 ± 2.276 ; the smallest birth weight of 2200 g and a greatest of 4100 g with a mean of 3022.07 ± 460.962 . Meanwhile, the control group showed a youngest maternal gestational age of 37 weeks and a greatest of 41 weeks with a mean of 38.30 ± 1.236 ; and smallest birth weight of 2520 g and a greatest of 4000 g with a mean of 2901.33 ± 305.660 . There was no relationship between maternal gestational age and changes in the baby's heart rate at the time of giving the head elevation position 30° [13].

The frequency distribution of the newborns heart rate with pre- and post-asphyxia got the left lateral position, and the results were the pre, smallest $128 \times/\text{min}$, and greatest $170 \times/\text{min}$ values. As for the post value, the smallest value was $136 \times/\text{min}$, and the greatest value was $170 \times/\text{min}$. The frequency distribution of the newborns heart rate with pre- and post-asphyxia got head elevation. The results obtained were the pre, smallest $100 \times/\text{min}$, and greatest $170 \times/\text{min}$ values. As for the post value, the smallest value is $130 \times/\text{min}$, and the greatest value was $160 \times/\text{min}$. Nurses might be able to take immediate action by reporting to the doctor if there was bradycardia ($<120 \times/\text{min}$) or tachycardia ($>160 \times/\text{min}$) on newborns with asphyxia [15]. The incidence of tachycardia could be increased by the incidence of asphyxia in newborns [3].

Heart rate before and after given left lateral position. The paired t-test results showed $p = 0.003$

Table 3: Independent t-test analysis of neonates heart rate with asphyxia pre- and post-test got left lateral position and head elevation position (n = 60)

Variable	Average (s.b)	p-value	Mean difference (IK 95%)
Heart rate after left lateral positioning (n = 30)	143.93 (7.492)	0.191	-2.267 (-5.694-1.161)
Heart rate after head elevation positioning (n = 30)	146.20 (5.641)		

($p < 0.05$), indicating a significant difference in heart rate between before and after giving the left lateral position. The paired t-test results showed a value of $p < 0.001$ ($p < 0.05$), thus indicating a significant difference in heart rate between before and after giving the position of head elevation. The independent t-test results obtained $p = 0.191$ ($p \geq 0.05$) so that there was no difference in heart rate between the groups who got the left lateral position and those who got the head elevation position. The practice of giving positions to babies in the NICU room to reduce the incidence of intraventricular hemorrhage, there were several suggested positions, and the most potential is to offer a middle position and a bed elevation of 30° [16].

Experiments in the lateral, right lateral, and pronation positions before providing food for premature infants (≤ 34 weeks) obtained comparable heart rate and oxygen saturation results in these three positions [17]. Other studies comparing the way premature babies (pronation, supination, and left lateral) obtained normal heart rate results at these three positions, only slightly better in the pronation position [18].

Conclusion

Both of the positions have a significant change in newborns' heart rate with asphyxia. There was no significant difference in newborns' heart rate with asphyxia in the both of the position.

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