

RESEARCH ARTICLE

A Study to Assess the Effectiveness of Prone Position and Position on Selected Cardiorespiratory Parameters Among the Neonates from Selected Nicu's of Sangli-Miraj-Kupwad Corporation Area

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Abstract: **Background:** Maintaining stable cardiorespiratory parameters is crucial in neonatal care, and body positioning can significantly influence these physiological variables. This study aimed to assess the effects of different body positions—prone, right lateral, and left lateral—on cardiorespiratory parameters in neonates. **Method:** A quantitative research design was adopted for this study. A purposive sampling technique was used to select 40 neonates. The cardiorespiratory parameters—heart rate, respiratory rate, and oxygen saturation—were measured and compared across three positions: prone, right lateral, and left lateral. Data were analyzed using descriptive statistics, paired t-tests, and ANOVA. **Results:** The findings revealed statistically significant differences in cardiorespiratory parameters across the three positions ($p < 0.05$). The prone position showed the highest values for heart rate (142 bpm), respiratory rate (40 breaths per minute), and oxygen saturation (97%). The right lateral position followed with a heart rate of 136 bpm, respiratory rate of 34 bpm, and SpO_2 of 97%. The left lateral position recorded the lowest values: heart rate of 132 bpm, respiratory rate of 34 bpm, and SpO_2 of 96%. Despite these variations, all parameters remained within normal physiological limits. **Conclusion:** Body position significantly affects cardiorespiratory parameters in neonates, with the prone position showing the most elevated readings. These findings suggest that careful consideration of body positioning may aid in optimizing cardiorespiratory function in neonatal care.

Keywords: Neonates, body position, cardiorespiratory parameters, prone position, oxygen saturation.

INTRODUCTION

A newborn's physiology is unique and complex, undergoing rapid changes over minutes, hours, days, and months. In contrast, adult human physiology tends to remain stable and consistent, with deviations often indicating illness or disorder. However, the dynamic and rapidly shifting nature of a newborn's physiological state is essential for adapting to life after birth.¹

The adaptation of cardiorespiratory parameters, such as oxygen saturation, respiratory rate, and heart rate, is one of the most obvious changes that occurs during the early years of a newborn's life. The infant's posture is one of the most significant external factors affecting these traits. Standing upright, on the other hand, may increase lung expansion and blood flow, which may stabilize breathing and heart rates. However, because their ability to regulate cardiorespiratory function is still developing, newborns are particularly susceptible to postural changes. Preterm babies' body positions can be used to maximize respiratory system performance. In this regard, it has been demonstrated that the prone position enhances arterial oxygenation, increases tidal volume, enhances diaphragm function, and decreases breathing effort during active sleep, thoracoabdominal incoordination, and carbon dioxide periods of apnoea. The prone

position also encourages a decrease in ventilatory parameters. However, clinical circumstances and respiratory assistance-related parameters are directly linked to the impact of body position. Crucial elements that influence how well body posture works for premature babies.²

The physiology of a newborn is unique and complex in that it changes over a period of minutes, hours, days, and months. Once a human reaches adulthood, our physiology typically remains stable and predictable, with any deviation potentially leading to pathology and disease. However, a newborn's rapid and ever-changing physiology is essential in adapting to a world outside the womb.³ Prone position may play an important role in improving and maintaining the optimal neonatal physiological parameters within desirable ranges⁴

MATERIAL AND METHOD

A quantitative research methodology was employed in this investigation. By using a non probability purposive sampling technique, 40 sample was chosen for conducting this study. To assess the cardiorespiratory parameters in neonates in different position. i.e. prone position, right lateral position and left lateral position

were assessed Kathrine's Kolcoba nursing theory⁵ which is the based on the basic comfort theory, as a conceptual

framework for this present investigation was used for this study.

RESULTS

The study found that neonates heart rate, respiratory rate, and oxygen saturation changed slightly depending on their position, but all stayed within normal limits. Overall, the prone position showed the highest heart rate (142 bpm), respiratory rate (40 bpm), and oxygen saturation (97%), followed by the right lateral position (HR = 136 bpm, RR = 34 bpm, SpO₂ = 97%) and lowest in the left lateral position (HR = 132 bpm, RR = 34 bpm, SpO₂ = 96%). These differences were

Sr.no	Demographic variables	Frequency	Percentage
1.	Age (in day)	1-10	77.5
		11-20	15
		21-30	7.5
2.	Gender	Male	57.5
		Female	42.5
3.	Weight (in kg)	1.5-2.5	62.5
		2.5-3.5	37.5
4.	Type of delivery	L.S.C. S	82.5
		F.T.N. D	17.5

statistically significant with $p < 0.05$, indicating that body position has a measurable effect on these parameters.

CONCLUSION

In all the three positions i.e. prone position, right lateral position and left lateral position. The heart rate, respiratory rate and oxygen saturation was assessed before and after the intervention. Its calculated p value is less than 0.05 level of significance. Hence the null hypothesis is rejected i.e. H01: - There is no significant difference between post-test cardiorespiratory parameters in prone position and lateral position at the 0.05 level of significance. The study concluded that all the cardiorespiratory parameters were significantly improved were within normal limits in prone position as compare to right lateral position and left lateral position.

KEYWORDS:

Prone Position, Right Lateral Position, Left Lateral Position And Selected Cardiorespiratory Parameters I.E. Heart Rate, Respiratory Rate And Oxygen Saturation.

Section I: - Demographic variable frequency and percentage distribution.

Section II: - Assessment of the cardiorespiratory parameters before and after prone position among the neonate.

Section III: - Assessment of the cardiorespiratory parameters before and after right lateral position among the neonate.

Section IV: - Assessment of the cardiorespiratory parameters before and after left lateral position among the neonate.

Section V: -Comparison of the post- test cardiorespiratory parameters between prone position and lateral position among the neonate.

SECTION-I

Table No. 1. Distribution of demographic data by frequency and percentage
n= 40

Table 1 depicts that Majority of the neonates 31 (77.5) were from age group between 1 to 10 days. For gender male neonates were 23 i.e. (57.5) involved in this study. The birth weight of neonate was (62.5%) between 1.5 to 2.5 kg. And 2.5 to 3.5 kg. the type of delivery majority of by caesarean section. Was (82.5%).

SECTION II

Table no 2. Assessment of the cardiorespiratory parameters before and after prone position among the neonate.
n= 40

Cardiorespiratory parameters			Mean	S.D.	t-value	p- value
Prone position	Heart Rate (b/min)	Pre-test	136.8	6.497	6.0948	0.00001 < 0.05
		Post -test	142.05	5.053		
	Respiratory Rate (b/min)	Pre-test	37.95	4.425	9.8438	0.00001 < 0.05
		Post -test	40.2	4.171		

	Spo2 (%)	Pre-test	97.02	0.659	5.2372	0.00001 < 0.05
		Post -test	97.82	0.747		

Table no 2 depicts that to the cardiorespiratory parameters among neonates in prone position the result showed that, according to day 1st with a minute (i.e. pretest) and after 2 hrs. (i.e. post-test)

- 1) The mean and S.D. of heart rate was 136.8 ± 6.4973 as a pre-test, and 142.05 ± 5.0533 after 2 hrs. as a post test. t-value is 6.0948 and p-value is 0.00001 which is less than 0.05. Hence there is difference between pre-test and post-test.
- 2) Respiratory rate was 37.95 ± 4.4257 with in minute and 40.2 ± 4.1707 as a post test. t-value is 9.8438 and p-value is 0.00001 which is less than 0.05. Hence there is difference between pre-test and post-test.
- 3) oxygen saturation was 97.025 ± 0.6597 with in minute and 97.825 ± 0.7472 as a post test. t-value is 5.2372 and p-value is 0.00001 < 0.05. which is less than 0.05. Hence there is difference between pre-test and post-test.

In the prone position the mean heart rate, respiratory rate and oxygen saturation was within normal limits which the less than 0.05 Hence there is difference between pre-test and post-test.

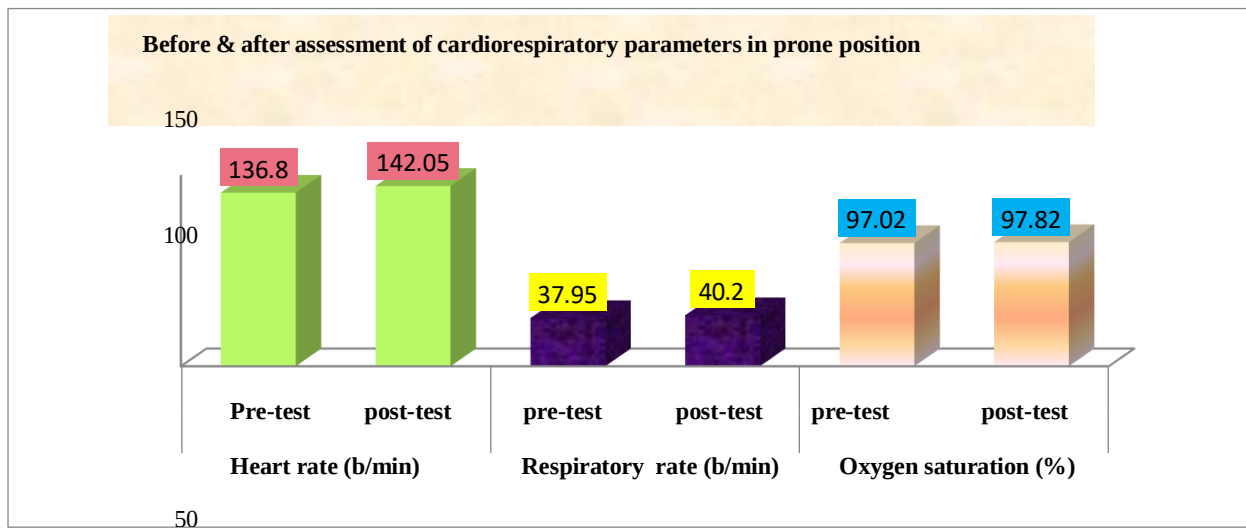


Figure no 1-. Assessment of the cardiorespiratory parameters before and after prone position among the neonate

SECTION III

Table no 3. Assessment of the cardiorespiratory parameters before and after right lateral position among the neonate n=40

Cardiorespiratory parameters		Mean	S.D.	t-value	p- value
Right lateral position	Heart Rate (b/min)	Pre-test	130.5	3.863	18.1672 0.00001 < 0.05
		Post -test	136.9	5.637	
	Respiratory Rate (b/min)	Pre-test	33.65	2.476	0.9158 0.3653 > 0.05
		Post -test	34.05	2.986	
	Spo2 (%)	Pre-test	95.82	1.238	5.9083 0.00001 < 0.05
		Post -test	96.97	0.158	

Table no 3 depicts that to cardiorespiratory parameters in the right lateral position the result showed that, On day 1st with in minute (i.e. pre- test) and after 2 hrs. (i.e. post-test)

- 1) The mean and S.D. of heart rate was 130.5 ± 3.863 as a pre- test, and 130.5 ± 3.863 after 2 hrs. as a post test.t-test 18.1672 and p-test is 0.00001 which the less than 0.05 Hence there is difference between pre-test and post-test.
- 2) Respiratory rate was 33.65 ± 2.476 with in minute and 34.05 ± 2.9867 as a post - test t-test is 0.9158 p-test is 0.3653. which the less than 0.05 Hence there is difference between pre-test and post-test.
- 3) Oxygen saturation was 95.825 ± 1.238 with in minute and 96.975 ± 0.1581 as a post test.t-test is5.9083 and p-value is 0.00001. which the less than 0.05 Hence there is difference between pre-test and post-test. The right lateral position as pretest and post-test. The mean respiratory rate it was less. Mean of heart rate and oxygen saturation was normal limits for pre as well as post-test.

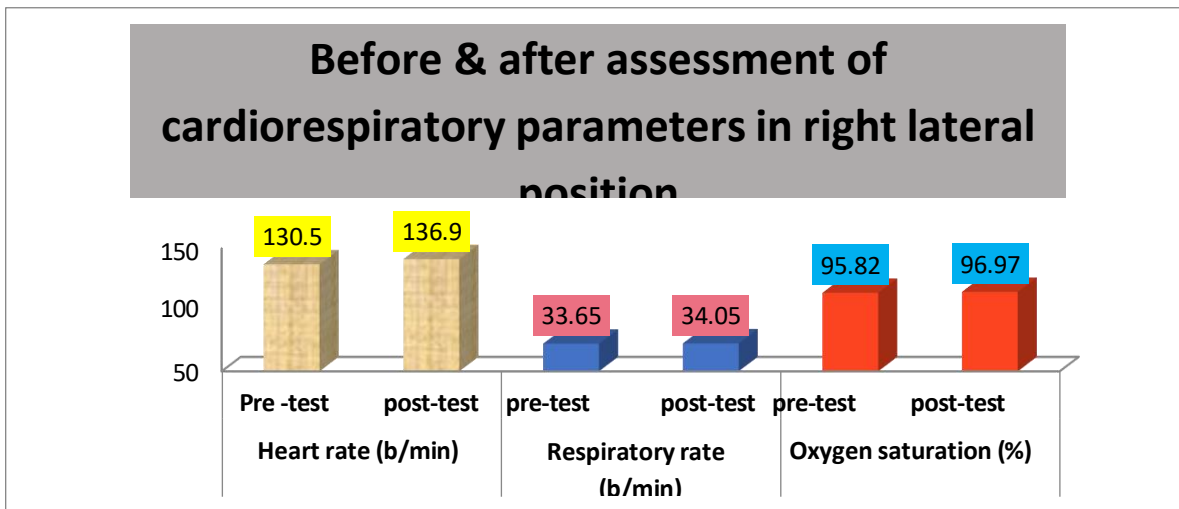


Figure no 2-. Assessment of the cardiorespiratory parameters before and after right lateral position among the neonate

SECTION IV

Table no 4. Assessment of the cardiorespiratory parameters before and after left lateral position among the neonate.
n=40

Cardiorespiratory parameters			Mean	S.D.	t-value	p- value
Left lateral position	Heart Rate (b/min)	Pre-test	131.9	5.904	0.8498	0.4006 > 0.05
		Post -test	132.1	4.595		
	Respiratory Rate (b/min)	Pre-test	34.87	2.662	0.7541	0.4552 > 0.05
		Post -test	34.35	3.231		
	Spo2 (%)	Pre-test	96.37	1.125	5.029	0.00001 < 0.05
		Post -test	97.3	0.563		

Table no 4 depicts that to the cardiorespiratory parameters in the left lateral position the result showed that, On day 1 st with in minute (i.e. pre- test) and after 2 hrs. (i.e. post-test)

- 1) The mean and S.D. of heart rate was 131.9 ± 5.9043 as a pre- test, and 132.1 ± 4.5954 after 2 hrs. as a post test.t-test is -0.7541 p-value 0.4552 which the less than 0.05 Hence there is difference between pre-test and post-test.
- 2) Respiratory rate was 34.875 ± 2.6621 at with in minute and 34.35 ± 3.2308 as a post test.t-test- 0.7541 p-value is 0.4552 which the more than 0.05 Hence there is no difference between pre-test and post-test.
- 3) oxygen saturation was 96.375 ± 1.1251 with in minute and 97.3 ± 0.5638 as a post test. t-test is 5.029 p-value 0.00001 which the less than 0.05 Hence there is difference between pre-test and post-test. The left lateral position as pre-test and post-test. The mean respiratory rate it was less. Mean of heart rate and oxygen saturation was normal limits for pre as well as post-test

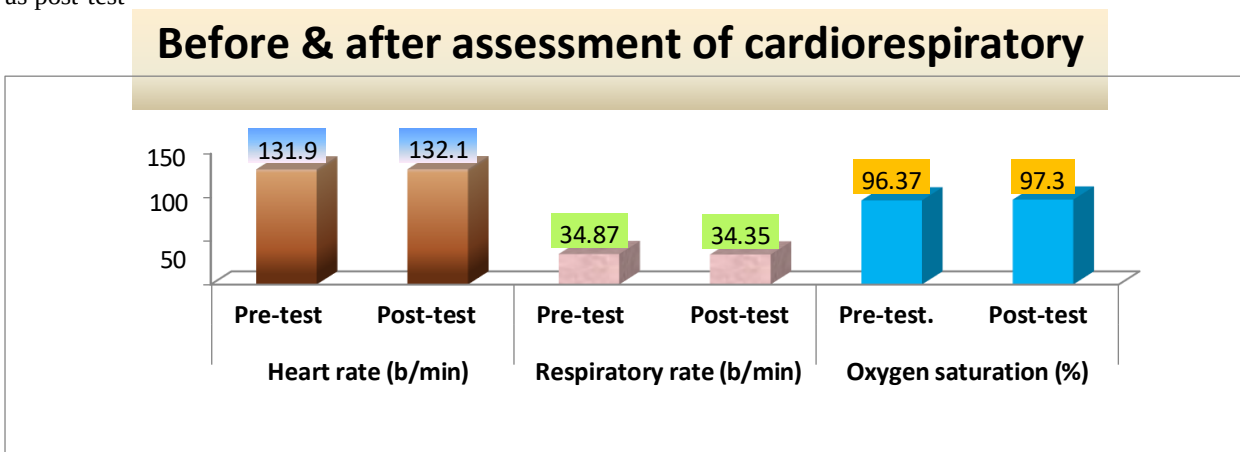


Figure no 3-. Assessment of the cardiorespiratory parameters before and after Left lateral position among the neonate

SECTION-V

Table no 5. Comparison of the cardiorespiratory parameters in prone, right lateral and left lateral position among the neonate.

Cardiorespiratory Parameters	Prone position	Right lateral position	Left lateral position	F(p)at 5% Significance	
	Post-test	Post-test	Post-test	F-	
Heart rate (b/min)	142.05± 5.053	136.9± 5.637	132.1± 4.595	49.8475	0.00001
Respiratory rate (b/min)	40.2 ± 4.171	34.05± 2.986	34.35± 3.231	152.356	0.00001
Oxygen saturation (%)	97.82 ± 0.747	96.97± 0.158	97.3 ± 0.563	26.1481	0.00001

Table no 5 despites that using a F: F-test (ANOVA) with repeated measure.

The difference between the prone position, right lateral position, and left lateral position is the p value. during every time frame. The mean score for cardiorespiratory measures in the three positions of the neonates under study is shown in Table No. 5.

1) In the prone position, the mean heart rate was 142.05± 5.053; in the right lateral position, it was 136.9± 5.637; and in the left lateral position, it was 132.1± 4.595. The p value, which is less than 0.05, indicates that there is a statistically significant difference among the three positions. The pre-test and post-test differ as a result.

2) In prone position, the respiratory rate was 40.2 ± 4.171, in right lateral position, it was 34.05 ± 2.986, and in left lateral position, it was 34.35 ± 3.231. Statistical significance exists between the three positions because the p value is less than 0.05, at 0.00001. The pre-test and post-test differ as a result.

3)Oxygen saturation mean values were 97.82 ± 0.747 in prone position, 96.97 ± 0.158 in right lateral position, and 97.3 ± 0.563 in left lateral position. The p value of 0.00001, which is less than 0.05, indicates that there is a statistically significant difference among the three positions.

Consequently, the pre-test and post-test differ from one another.

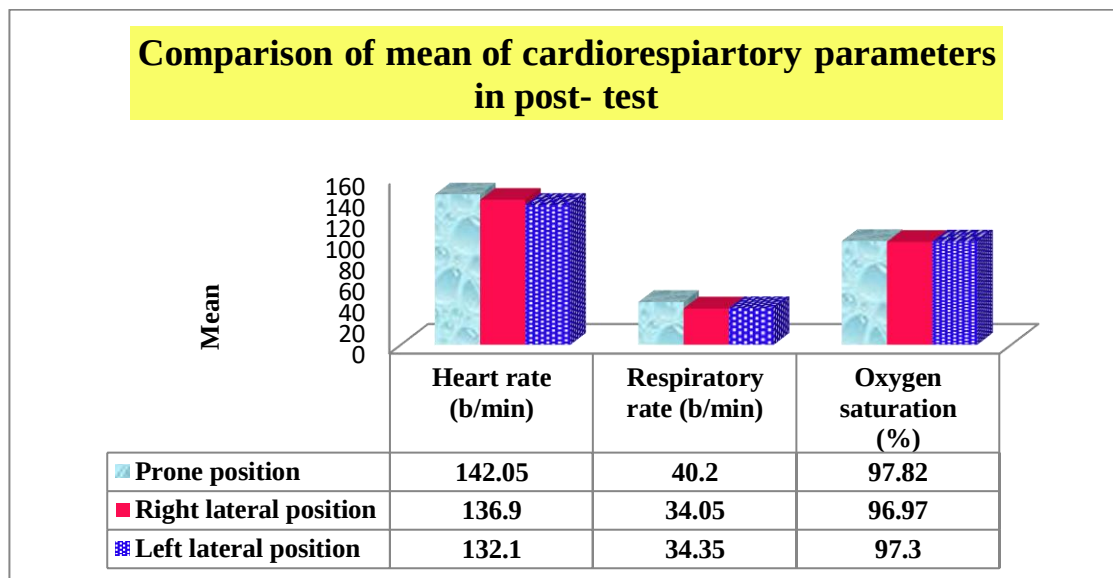


Figure no 4-. Comparison of mean of cardiorespiratory parameters in post- test.

DISCUSSION

Discussion on the Comparison of post-test Cardiorespiratory Parameters Across Prone, Right Lateral, and Left Lateral Positions in Neonates.

The assessment of heart rate, respiratory rate, and oxygen saturation (SpO₂) in neonates across different body positions provides valuable insights into their physiological responses. The findings from the current study, which utilized repeated measures analysis, and using the ANOVA test indicate significant differences in

these parameters among the three positions, with all values remaining within normal limits.

Heart Rate (HR) The mean HR was highest in the prone position 142 followed by the right lateral position 136 bpm, and lowest in the left lateral position 132 bpm. These differences were statistically significant ($p < 0.05$). There is no significant difference in HR among prone and lateral positions.

Respiratory Rate (RR) The mean respiratory rate was highest in the prone position 40 bpm followed by the right lateral position 34 bpm and lowest in the left lateral

position 34 bpm These differences were statistically significant ($p < 0.05$). Research indicates that body position can influence respiratory rate in neonates.

Oxygen Saturation (SpO_2): The mean SpO_2 was highest in the prone position 97% followed by the right lateral position 97 % and lowest in the left lateral position 96% These differences were statistically significant ($p < 0.05$).

Previous studies have reported that the prone position is associated with improved oxygenation in neonates.

The current study's findings suggest that the prone position more effective in maintaining optimal oxygen saturation levels as compare to both lateral positions. During the data collection procedure, there were the environmental disturbances and other barriers was hence the intervention failure criteria was applied i.e. heart rate was more than 160 b/min respiratory rate was more than 60/min and the saturation was below 92 % stop the intervention and restart the intervention.

CONCLUSION

This study assessed the effects of body positioning prone, right lateral, and left lateral on neonatal cardiorespiratory parameters: heart rate (HR), respiratory rate (RR), and oxygen saturation (SpO_2). All parameters remained within normal limits across positions. However, significant differences were observed, leading to the rejection of the null hypothesis ($p < 0.05$). The prone position demonstrated superior outcomes, with higher HR and SpO_2 levels, suggesting enhanced oxygenation and respiratory stability. This positioning may optimize lung function by improving ventilation/perfusion matching and reducing the work of breathing. The left lateral position also maintained HR, RR, and SpO_2 within normal ranges, indicating no adverse effects on cardiorespiratory function in healthy neonates.

However, some studies have reported slightly lower oxygen saturation levels in lateral positions compared to prone positioning. These findings highlight the influence of body position on neonatal cardiorespiratory parameters.^{6,7} While the prone position may offer superior oxygenation and respiratory stability, it is essential to balance these benefits with potential impacts on cardiac function. Lateral positions, particularly the left lateral, also provide favourable outcomes without adverse effects on cardiorespiratory parameters.

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