Original Article

MODE OF DELIVERY AND ITS SIGNIFICANCE WITH PRE-DUCTAL AND POST-DUCTAL OXYGEN SATURATION LEVELS IN HEALTHY TERM NEWBORNS

Prakash Kothari G[1*], Alis Santhiya Jemy M[2], Vishali G[3], Dr. Abirami A[4], Balagopal M[5]

[1,2,3,4] Postgraduate, Department of Paediatrics, Meenakshi Medical College Hospital And Research Institute, Kanchipuram.
[5] Professor & HOD, Department of Paediatrics, Meenakshi Medical College Hospital And Research Institute, Kanchipuram.

Corresponding Author: Prakash Kothari G, Post graduate, Department of Paediatrics, Meenakshi Medical College Hospital And Research Institute, Kanchipuram.

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Abstract

Introduction: The aim of this study is to find significance between mode of delivery and the pre-ductal and post-ductal oxygen saturation levels in healthy term neonates in 1st 10 minutes on life.

Method: Healthy term newborns between 37weekes to 42 weeks, who do not require any resuscitation measures were included in the study. Continuous recording was done using pulse oximetry in 1st 10 minutes of life.

Result: The mean time taken to reach preductal sp02 to 90% in LSCS is 7.3 +/-0-58 mins and in normal vaginal delivery it takes 6+/-0.78 mins to reach 90%. The mean time taken to reach postductal SPO2 to 90% in LSCS babies is 8.1+/-0.68 mins and in it takes 7.1+/-0.86 mins to reach 90% in normal vaginal delivered neonates.

Conclusion: Pre-ductal and post-ductal spo2 is significantly lower in babies delivered by LSCS when compared to vaginal delivery, there is significant difference in time reaching spo2 level of 90% or above in pre-ductal and post-ductal sites in babies delivered via LSCS compared to normal delivery.

Keywords: oxygen saturation, pulse oximetry, term newborns.

Introduction

Fetal life evolves in a low oxygen milieu when compared to neonatal life. Transition from fetal to neonatal life involves rapid changes in oxygen content of newborn within a span of time. Fetal life is characterized by low pao2 in circulating blood compared with newborn, intracardiac (foraman ovale) and extracardiac (ductus arteriosis) shunting and immature antioxidant system. Following birth, there is decrease in PVR and PAP, which leads to initiation of breathing. With initiation of breathing, PaO2 increases from 25-30mmhg to 75-85mmhg in the first few minutes after birth. the recent guideline of AAP recommends target oxygen saturation during 1st, 2nd, 3rd, 4th, 5th and 10th minutes as 60-65%, 65-70%, 70-75%, 75-80%, 80-85% and 85-95% respectively. According to AAP-NRP guidelines, most neonates, make transition to extra-uterine life without any intervention. within 30 seconds after birth, approximately 85% of term newborns will begin breathing and additional 10% will begin breathing in

response to drying and stimulation. For successful transition, approximately 5% of term newborns will receive positive pressure ventilation, 2% of term babies will be intubated, 1-3 babies per 1000 births will receive chest compressions or emergency medication. Pulse oximeter uses a light source and sensor to measure the absorption of red light passing through capillaries in the skin and estimates percentage of haemoglobin that is carrying oxygen. Pre-ductal saturation is measured by placing the pulse oximeter in the right hand or wrist. Post-ductal saturation is measured by placing the pulse oximeter over both the lower limbs.

METHODOLOGY:

Study design: Comparative cross-sectional study

Study duration: 12 months from June 2021 to May 2022

Study population: 124 healthy term newborns getting delivered in Meenakshi medical college Hospital.

Study area: Labour ward, Operation Theatre and NICU in the Department of Paedatrics, Meenakshi medical college Hospital and Research Institute, Kanchipuram.

Sampling method: Convenience sampling

Inclusion criteria: Healthy term newborns between (37-42 weeks) both male and female babies, APGAR score >7 in 1^{st} and 5^{th} minute, any mode of delivery.

Exlusion criteria: preterms <37week, post terms >42weeks, multiple pregnancies, birth asphyxia and trauma, major congenital malformations, MSL, PROM

Data collection: 1 pulse oximeter (CMS 500) is placed at the right wrist or palm and 1 more is placed at the left foot lying in server controlled radiant warmer. 1^{st} minute reading is noted and subsequently 2^{nd} ,3^{rd}, 4^{th} ,5^{th} and 10^{th} minute readings are recorded with protocol included criteria.

Statistical analysis: The data collected were entered in MS Excel and analyzed using SPSS 22 version. Categorical determinant variables were given as proportions. The continous variables were given in mean with S.D. The ANOVA was used to compare the means of SPO2 between gender, mode of delivery and term. The results were expressed with p-value and $p<0.05$ is considered significant.

RESULTS:

This study was conducted over a period of 12months. 124 babies were included in this study. We did not include newborns which required some form of resuscitation after birth and babies with known congenital anomalies. Of the 124 babies, 67 babies were male babies (54.03%), and 57 babies were female babies (45.97%), depicted in figure 1. Mean age the mother was 26 years (85.4%). 74.9% of the mother were parity one and 25.1% were multiparous depicted in figure 2. Figure 3, shows the mean time taken to reach preductal sp02 to 90% in LSCS is 7.3 +/-0-58 mins and in normal vaginal delivery it takes 6+/-0.78 mins to reach 90%. Figure 4, shows The mean time taken to reach postductal SPO2 to 90% in LSCS babies is 8.1+/-0.68 mins and in it takes 7.1+/-0.86 mins to reach 90% in normal vaginal delivered neonates.

Table 1, shows that mean preductal SPO2 is significantly lower in babies delivered by when Compared to babies delivered by normal vaginal delivery at all time of measurement. Table 2, shows that mean postductal SPO2 is significantly lower in babies delivered by LSCS when compared to babies born by vaginal delivery at all time of measurement.

Figure 1: gender distribution

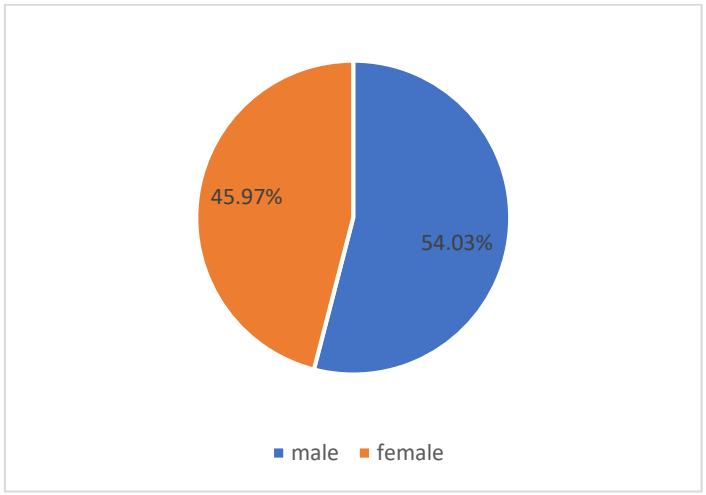

Figure 2: parity of mothers

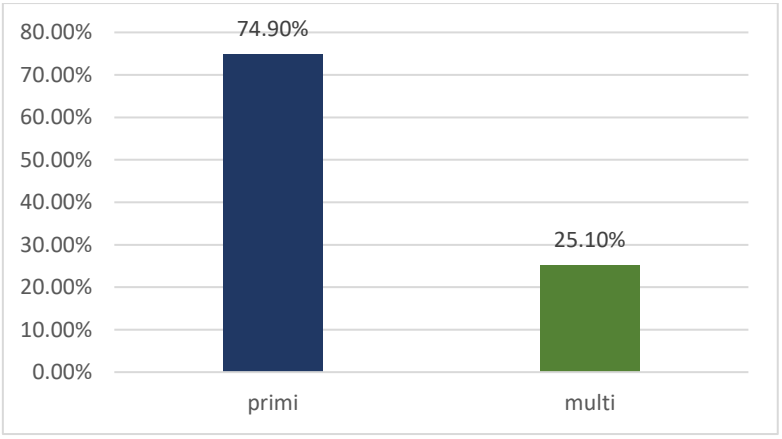

Figure 3: Time taken to reach 90% SPO2 at preductal site with mode of delivery

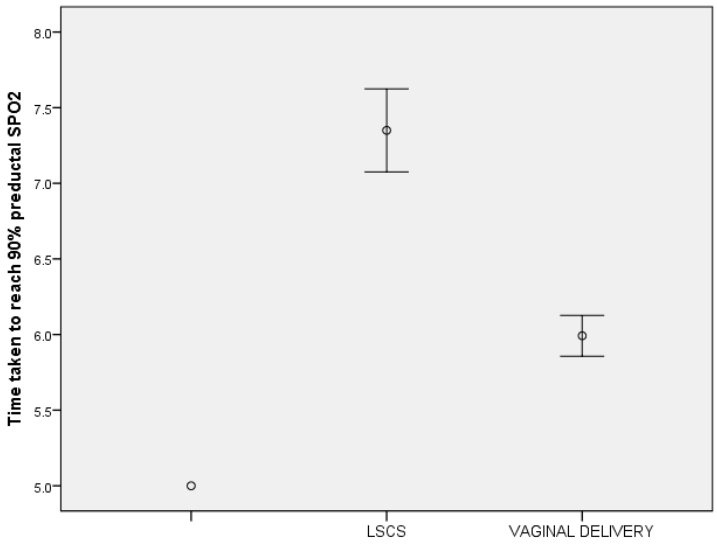

Figure 4: Time taken to reach 90% SPO2 at postductal site with mode of delivery

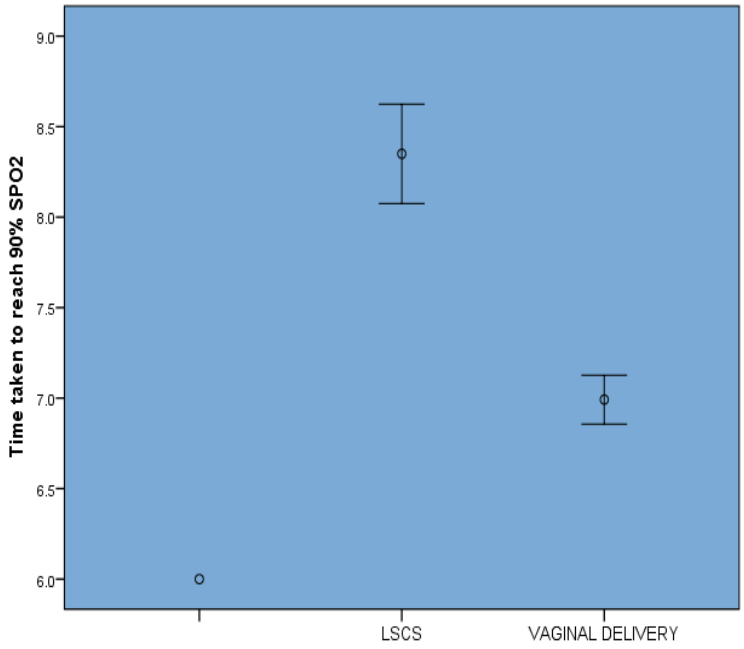

Table 1: Preductal SPO2 vs mode of delivery

SPO2 LEVEL							
Mode of delivery		**1 min**	**2 min**	**3 min**	**4 min**	**5 min**	**10 min**
LSCS	**Mean**	69.38	71.38	74.4	77.45	84.47	92.08
	S.D	1.67	1.67	1.57	1.57	1.57	2.28
VAGINAL DELIVERY	**Mean**	69.94	72.94	75.95	79.0	86.28	92.4
	S.D	1.32	1.30	1.08	.82	.80	1.02
p value		<0.001	<0.001	<0.001	<0.001	<0.001	0.199

Table 2: Postductal SPO2 vs mode of delivery

Mode of delivery		**SPO2 LEVEL**					
		1 min	**2 min**	**3 min**	**4 min**	**5 min**	**10 min**
LSCS	**Mean**	66.38	68.38	71.45	74.45	81.47	90.7
	S.D	1.67	1.67	1.57	1.57	1.57	.866

VAGINAL DELIVERY	**Mean**	67.93	69.93	72.93	76.04	83.27	91.43
	S.D	1.327	1.327	1.30	1.08	.80	1.243
p value		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

DISCUSSION:

In our study, on comparing the preductal and postductal SPO2 level at1,2,3,4,5 and 10 min in above table, the mean preductal SPO2 is significantly higher than post ductal SPO2 and the results are statistically significant by ANOVA test. Mariani et al. found significantly decreased postductal SpO2 levels at 3, 4, 5, 10, and 15 minutes in healthy term newborns when compared to preductal measures at the same time points. Our study result shows the mean preductal & postductal SpO2 is significantly lower in babies delivered by LSCS when compared to babies born by vaginal delivery at all time of measurement and gender has no significant association with preductal and postductal SPO2. Study by Adil et al., has shown similar results with the spo2 saturation among neonates by vaginal mode of delivery being higher than spo2 levels among neonates delivered by LSCS both in preductal and post ductal measurement. In our study, the mean time is 6.1 mins and 7.1 mins to reach preductal and post ductal spo2 to 90%. The mean time taken to reach preductal SPO2 to 90% in LSCS delivered babies is 7.3+/-0.58 mins and in normal vaginal delivery, it takes 6+/-0.78 mins to reach 90%. The mean time taken to reach postductal SPO2 to 90% in LSCS babies is 8.1+/-0.68 mins and it takes 7.1+/-0.86 mins to reach 90% in normal vaginal delivered neonates. When comparing infants born via caesarean section to infants born vaginally, the time it took to reach the desired saturation levels was linked to the retention of pulmonary fluid (Toth et al.)

CONCLUSION:

In conclusion, in postductal measurements, the time necessary to obtain SpO2 levels below 90% was longer. In neonates born by caesarean section, reaching a 90 percent SpO2 level took longer both preductally and postductally. The measurement site and mode of delivery must be taken into consideration for O2 saturation measurement in healthy newborn.

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Conflict of interest: no conflict of interest.

Ethical approval & informed consent: this study was approved by the Institutional Ethics Committee

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