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To study the comparison of oxygen saturation in newborns delivered by normal vaginal delivery and caesarean section

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Abstract

Background: Oxygen is very commonly used in newborns especially preterm infants at birth and afterwards. Hypoxemia as well as hyperoxia both can be harmful to new born babies. Hence, monitoring of oxygen saturation is essential to keep a balance for minimising adverse outcomes

Results: The median SpO_2 value at 1,3,5, and 10 minutes after birth, respectively, for newborns born by caesarean section was 79% (75%-81%), 90% (88%-92%), 94% (92%-96%) and 96% (95%-97%). The median SpO_2 value at 1, 3, 5, and 10 minutes after birth, respectively, for newborns born by normal vaginal delivery was 82% (78%-84%), 92% (90%-94%), 94% (92%-96%) and 97% (96%-98%).

Conclusion: Significantly higher values of SpO_2 are achieved at 1 to 10 minutes after birth in neonates born by vaginal route as compared to caesarean route ($p \leq 0.05$).

Keywords: SpO_2, vaginal delivery, caesarean.

Introduction

Oxygen is very commonly used in newborns especially preterm infants at birth and afterwards. Hypoxemia as well as hyperoxia both can be harmful to new born babies. Hence, monitoring of oxygen saturation is essential to keep a balance for minimising adverse outcomes.

To monitor oxygen saturation in babies immediately after birth, there is an increasing evidence of using pulse oximetry in the labour room.[1]

Pulse oximetry provides the means for continuous non-invasive monitoring of oxygen saturation (SpO_2). Although not currently used for the purpose, recent international guidelines suggest that pulse oximetry may be useful in the assessment of newborns who require urgent resuscitation measures at the time of birth. Specifically it is envisaged that measured SpO_2 would guide the use of supplemental oxygen in these sick babies. Unfortunately there is a paucity of information regarding normal SpO_2 values during the crucial minutes immediately following birth. Clearly this information gap must be filled before pulse oximetry can be effectively exploited in the delivery room. In algorithms for neonatal resuscitation published by the International Liaison Committee on Resuscitation [2], clinical assessment of an infant's colour (a measure of oxygenation) and heart rate during neonatal transition is unreliable. Assessing colour is difficult and therefore is a poor proxy for tissue oxygenation during the first few minutes of life.

Healthy new barns have relatively low oxygen saturation in the first few minutes of life. Blood oxygen concentration, measured by pulse oximetry, often is used to determine the need of neonatal resuscitation.[3]

International Surveys show that oximetry is increasingly used during neonatal resuscitation. Various studies have found that SpO_2 in the first 5 minutes of life is much lower in babies delivered by caesarean section when compared to those delivered vaginally.[4]

Material and methods

Source of data

This prospective observational study was done on neonates born in J L N Medical College, Ajmer under the care of Division of neonatology, Department of Pediatrics at J L N Medical College, Ajmer. The resuscitation room was equipped with all necessary equipments required for neonatal resuscitation. SpO_2 data were gathered from 200 healthy, preterm and term newborns.

Method of collection of data

Inclusion criteria

All healthy, preterm and term newborns delivered vaginally or by caesarean section under the care of division of neonatology of Department of Pediatrics, J L N Medical College, Ajmer.

Newborns who were active, with good respiratory effort and heart rate; not requiring any resuscitation or supplemental oxygen were included in the study.

Exclusion criteria

- Any neonate that showed sign of distress, Including persistent central cyanosis, apnea, gasping, or bradycardia, which required supplemental oxygen, assisted ventilation , or resuscitation in the first few minutes after birth.
- Congenital anoma lies that might interfere with normal transition to extra uterine life.

Study Design: This was a prospective, observational study.

Methods

This study was conducted in the labour room of a tertiary care hospital and a total of 200 babies fulfilling the inclusion criteria were enrolled.

Maternal details including her age, haemoglobin concentration, medical illness and pregnancy related problems were recorded. Details of labour, for example, presentation, duration, spontaneous/induced, evidence of fetal distress, and passage of meconium were also noted.

Results

Our study included 82 (41%) females and 118 (59%) male newborns.

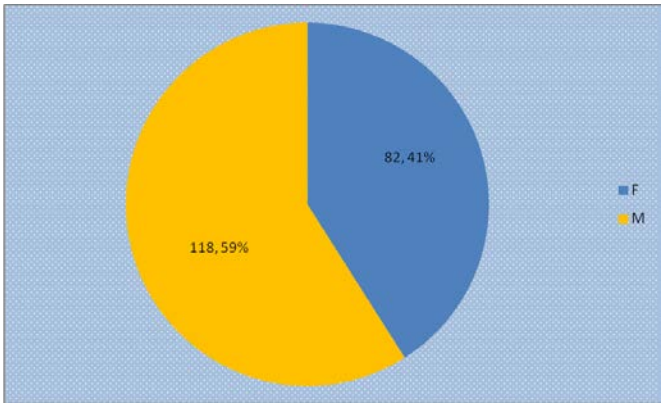

Table 1: Distribution of Newborns According To Birth Weight (N=200)

Birth wt group	Frequency	Percent
< 1500	17	8.5
1500-2500	78	39
>2500	105	52.5
Total	200	100.0

Table 1 shows the distribution of newborns according to the birth weight in grams The number of newborns with birth weight less than 1500 grams was 17 (8.5%), between 1501 grams to 2500 grams was 78 (39%) and more than 2500 grams was 105 (52.5%).

Table 2: Distribution Of Newborns According To Weight For Gestational Age (Aga/Sgailga) (N=200)

AGA/SGA/LGA	Frequency	Percent
AGA	171	85.5
LGA	11	5.5
SGA	18	9.0
Total	200	100.0

Table 2 shows the distribution of newborns according to weight for gestational age. 171 (85.5%) neonates were appropriate for gestational age (AGA), 18 (9%) neonates were small for gestational age (SGA) and 11 (5.5%) neonates were large for gestational age (LGA).

Table 3: Distribution of Newborns According To Gestational Age (N=200)

Gestational Age group	Frequency	Percent
< 34	28	14.0
34- (36+6)	60	30.0
≥ 37	112	56.0
Total	200	100.0

Table 3 Distribution of newborns according to their gestational age at birth is shown in. In our study, 28 (14%) neonates had a gestational age of < 34 weeks while 60 (30%) had a gestational age of 34-(36+6) weeks. The number of term newborns with gestation of ≥ 37 weeks was 112 (56%).

Table 4: Distribution of Newborns According To Type of Delivery (N=200)

Type of Delivery	Frequency	Percent
LSCS	121	60.5
NVD	79	39.5
Total	200	100.0

Table 4 shows the distribution of newborns according to the type of delivery. Out of total 200 newborns, 121 (60.5%) were born by caesarean section and 79 (39.5%) were born by vaginal route.

Table 5. Comparsion of Spo2 Value At 1 To 10 Minutes After Birth According To Type Delivery (N=200)

Delivery Type	LSCS	NVD	Z	P value
1 min	79(75-81)	82(78-84)	-5.813	0.000
2 min	82(80-86)	86(80-86)	-4.924	0.000
3 min	90(88-92)	92(91-93)	-4.554	0.000
4 min	91(88.5-94)	93.5(88.5-94)	-4.433	0.000
5 min	94(92-96)	95(92-95)	-4.218	0.000
6 min	95(93-96)	96(93-96)	-3.398	0.001
7 min	95(93-96)	96(93-96)	-3.530	0.000
8 min	96(95-97)	96.5(95-97)	-3.955	0.000
9 min	96(95-97)	97(95-97)	-3.955	0.000
10 min	96(95-97)	96.5(95-97)	-3.078	0.002

Table 6: shows Comparison of SpO_2Values at 1 to 10 Minutes after birth in newborns born by caesarean section and by normal vaginal delivery. The median SpO_2 value at 1, 3, 5, and 10 minutes after birth, respectively, for newborns born by caesarean section was 79% (75%-81%), 90% (88%-92%), 94% (92%-96%) and 96% (95%-97%). The median SpO_2 value at 1, 3, 5, and 10 minutes after birth , respectively, for newborns born by normal vaginal delivery was 82% (78%-84%), 92% (90%-94%), 95% (93%-96%) and 96% (96%-98%). The oxygen saturation values were significantly lower in babies born by LSCS as compared to normal vaginal delivery. (p value < 0.05)

Discussion

This study reports the changes in preductal SpO_2 during the first 10 minutes after birth in 200 healthy preterm and term infants. To avoid bias and to acquire corrective data in the measurement of SpO_2 in the first 10 minutes after birth in a safe and accurate manner. We used pulse oximeter calibrated for its higher sensitivity and accuracy for each minute. With this method, the preductal SpO_2, which is considerably higher than postductal SpO_2, could be recorded rapidly following delivery. Thus, we optimized our data so that they were least likely to be affected by artifacts.

All enrolled newborns in our study had no respiratory distress, oxygen requirement at birth and serious complications. All of them survived to discharge. The mean duration of hospital stay of neonates born at less than 34 weeks of gestation was 13.58 days, of neonates born at gestation 34 weeks to 36+6 weeks of gestation was 7.91 days while that of neonates born at and after gestation 37 weeks of gestation was 3.87 days.

We found that in the first ten minutes after birth infants born via caesarean had significantly lower SpO_2 values than those born by vaginal route. This is consistent with the findings of Harris [5] who postulated that this difference was due to the greater amount of lung fluid after caesarean section which may interfere with transition to air breathing.

In contrast other researchers found no significant difference in SpO_2 measurements in infants born vaginally versus caesarean births. [3] It may be explained on the basis that the latter group of studies had smaller sample sizes and used older-generation pulse oximeters.

In our study 79 newborns were delivered vaginally while 121 newborns were delivered by caesarean section. Vaginally born newborn had a median SpO_2 of 82% (78-84) at 1 min, 95% (93-96) at 5 min and 96 (96-98) at 10 min of life which were significantly higher at all intervals of time (p value < 0.001) when compared with caesarean section with mean SpO_2 of 79% (75-81), 94% (92-96) and 96% (95-97) at 1,5,10 minutes of life.

In a study by Dawson et al [4] when term vaginal and caesarean deliveries were compared it was found that vaginally delivered babies had mean SpO_2 of 67% at 1 min, 92% at 5 min and 96% at 10 min of life which were significantly higher as compared to caesarean deliveries ($p \leq 0.001$) with mean SpO_2 of 54%; 85% and 94% at 1,5 and 10 minutes of life.

Our findings were consistent with other studies stating that oxygen saturation may be lower over the first few minutes in infants born by caesarean section delivery.[1.6]

Our study had results similar to study by Harris et al [5] who used pulse oximetry in the immediate postpartum period to evaluate continuous changes in the neonates SaO_2. They reported a low value for SpO_2 at one minute of 61% followed by an increase to 82% at seven minutes. However, values for SpO_2 were lower in neonates who remain relatively desaturated after birth and are at risk for not maintaining adequate oxygen delivery if cardiac output becomes compromised. They suggested careful monitoring of neonatal oxygenation in the delivery room, even after normal delivery.

Conclusion

Significantly higher values of SpO_2 are achieved at 1 to 10 minutes after birth in neonates born by vaginal route as compared to caesarean route ($p \leq 0.05$).

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