Original Article

Effect of Suplemental Oxygen on the Apgar Score of Newborn Given to Mother Undergoing Elective Caesarian Section Under Spinal Anesthesia

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Abstract

Objective: To determine the effect of supplemental oxygen on APGAR score of newborn babies, given to pregnant ladies undergoing elective lower segment caesarian section under spinal anesthesia. **Study Design:** Cohort study: **Place and duration of study:** Combined Military hospital Rawalpindi, from Jun 2010 to Mar 2011. **Methodology:** One hundred and twenty full term pregnant ladies were enrolled by non probability consecutive sampling, who were scheduled for elective caesarian section under spinal anesthesia. The patients were randomized into two groups (A and B). In patients of Group A supplementation of oxygen was given to the mothers after spinal block, while in Group B, patients were not provided with supplemental oxygen after spinal anesthesia. Cases requiring general anesthesia or supplemental oxygen (in group B) for some other reasons causing maternal hypoxia were excluded from the study. APGAR Score at one minute and five minute was recorded. **Results:** In total of one twenty newborns, 56 (47%) were males and 64 (53%) females. Mean age of the pregnant ladies under study was 35 $\pm$ 5 in group A and 33 $\pm$ 7 in group B. In group A, the value of APGAR score at one minute varied from 6 to 10 and, at five minute it was from 8 to 10. While in group B, the results of APGAR score were same without any significant difference (P>0.05). **Conclusion:** Supplemental oxygen has no role on the APGAR score of newborns but simple psychological satisfaction to some of the mothers at the cost of wastage of oxygen while in some patients causing anxiety, so patients should be educated on this aspect and un-necessary use of supplemental oxygen must be avoided. **Key Words:** Spinal anesthesia, Caesarian section, Supplementary oxygen, APGAR Score.

INTRODUCTION

Central neuraxial block can impair respiratory function by paralysis of the intercostal muscles due to a high level block. Satisfactory regional anesthesia for caesarean delivery requires a block level upto at least the T5 dermatome and this can alter respiratory performance[1]. Therefore, many anesthesiologists will administer supplementary oxygen to mothers undergoing regional anesthesia for caesarean section. Increasing inspired maternal oxygen may increase oxygen delivery to the fetus during general anesthesia or epidural and spinal anesthesia[2,3,4]. However,Khaw KS and colleques in two different studies found no increase in fetal oxygenation when mothers received supplementary oxygen during regional anesthesia[6,7]. Thus, whether the administration of supplementary oxygen results in better short- and long-term clinical neonatal outcome remains debatable. No difference in APGAR scores and only a non-statistically significant improvement in umbilical artery pH was observed when oxygen was administered during epidural anesthesia[5]. Likewise, no beneficial effects on umbilical artery blood gases, APGAR scores and neurological adaptive capacity scores during elective caesarean section were found when 50% oxygen was delivered through a standard face mask,[8] and no improvement in APGAR scores or acid–base status was noted when supplementary oxygen was

administered, even if the uterine incision-to-delivery interval was prolonged[7]. Although the positive effects on the fetus and neonate are debatable, many would still administer supplemental oxygen because it might be of some benefit to the fetus and has no harmful effects. But in recent years, some evidence has raised concerns that maternal supplementary oxygen might be harmful as a result of increased neonatal free radical activity and in this regard some recent studies have shown poor neonatal outcome associated with hyperoxia and the generation of oxygen free radicals when high inspired oxygen fractions are administered during neonatal resuscitation at birth[9]. Practice guidelines now suggest initiation of resuscitation in newborns with air and only to use higher inspired oxygen fractions when initial resuscitation fails[10,11].

It was noted that the inhalation of oxygen during caesarean section, while undergoing spinal anesthesia resulted in increased oxygen free radical activity in both the mother and fetus. Reactive oxygen species are formed in the presence of hyperoxia under physiological conditions and are generated after hypoxia, ischaemia, and reperfusion[12]. They play a key role in mediating tissue injury. Thus, giving oxygen to the mother may benefit the fetus by increasing oxygenation, but also be harmful by accelerating lipid peroxidation.[15] The same authors also observed that maternal supplementary oxygen did not result in better fetal oxygenation or acid–base status when the uterine incision-to-delivery interval was prolonged[7]. So the need for supplementary oxygen during elective caesarean delivery has been questioned[9,13,14] and deemed by some to be unnecessary[12]. This study is aimed to determine the effect of supplemental oxygen on APGAR score of baby, given to pregnant ladies undergoing elective lower segment caesarian section under spinal anesthesia.

METHODOLOGY

A cohort study (quazi experimental) was conducted at the Department of Anesthesia, Combined Military Hospital, Rawalpindi after getting approval from Hospital ethical committee and informed consent of the patients, from Jun 2010 to Mar 2011. One hundred and twenty obstetric patients scheduled for elective caesarian section were randomly divided into two equal groups A and B. Full term patients with American society of anesthesiologist's physical status (ASA-PS I), with no cardio-respiratory disorders and without any complicated pregnancy were selected for study. Any patient with twin pregnancy, suspected congenital anomaly, pregnancy induced hypertension (PIH), gestational diabetes or patients requiring general anesthesia before the delivery of the baby were excluded from the study. After appropriate preoperative preparation, patients were received in the operating room. Base line cardio-respiratory monitoring were started. Intra venous line was maintained with two large bore cannulae. Ringer Lactate solution 20ml/kg was given to all patients 20 minutes before the sub-arachnoid block (SAB) as a standard protocol. Patients were then divided into two groups, A and B in random order. Patients in group A were started supplemental oxygen with mask till delivery of the baby untill cord clamping, at 10 liter per minute while the group B patients were not given supplemental oxygen until cord clamping of the baby.

Patients were monitored for hemodynamic and respiratory parameters including systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate, respiratory rate and arterial oxygen saturation in both groups. Babies were also provided room air (21% oxygen) for breathing/resuscitation and APGAR Score of the newborn babies from both the groups were assessed at one minute and five minute by a consultant paediatrician.

Statistical analysis of all the data was entered in statistical package for social sciences version 17 (SPSS Inc, Chicago, IL, USA). Frequencies and percentages were calculated for qualitative variables like gender and indications for caesarian section. Descriptive statistics were applied for quantitative variables like age, body weight of pregnant ladies and APGAR score of newborn at one and fine minutes. Independent sample t-test was applied to compare the mean values of APGAR Score at one minute and at five minute in the two groups. A P-value of < 0.05 in two tails was considered significant.

RESULTS

The demographic data of the patients and the indications of the surgery are given in Table 1. No statistical difference was found between two groups

regarding mean age, body weight and indications of surgery. There was no specific relation of APGAR score with sex of the newborns.

Table-1
Comparison of demographic data of patients in two groups

Parameters	Group A n=60	Group B n=60
Age (yrs) Mean±SD	35 ± 5	33 ± 7
Body Wt. (kg) Mean ± SD	64 ± 4	65 ± 3
Indications for C/Section (N%)		
Breech	18 (30%)	21 (35%)
Feto- Pelvic disproportion	16 (26.67%)	17 (28.33%)
Previous C/Section	26 (43.33%)	24 (36.67%)

The baseline hemodynamic parameters in two groups were also comparable, with no statistical difference (Table 2).

Table-2
Comparison of hemodynamic parameters in two groups (Mean ± SD)

Parameters	Group A n=60	Group B n=60
Systolic Blood Pressure	118±7	117±9
Diastlic Blood Pressure	68± 12	66±10
Mean Blood Pressure	82±12	86± 11
Base line Heart Rate	98±12	102±14
Base line Respiratory Rate	20±4	19±6
SaO2	98±2	97±3

The APGAR Score at time interval one minute and five minutes in the new born babies of two groups were compared in two groups. There was no significant statistical difference, P value > 0.05. (Table 3)

Table-3
Comparison of APGAR score at one minute and five minute in the newborns of two groups (Mean ± SD)

	Group A						Group B						P-Value
APGAR Score	6	7	8	9	10	**Mean±SD**	6	7	8	9	10	**Mean±SD**	
Newborn at One Minute	1	6	13	38	2	**8.57±0.78**	2	6	17	33	2	**8.45±0.85**	0.48
Newborn at Five Minutes	-	-	2	14	44	**9.68±0.53**	-	-	2	13	45	**9.72±0.52**	0.57

Table-4
Comparison of gender of the newborns in two groups with APGAR Score at one minute and five minutes

Gender	APGAR Score of Newborn from group A at one minute						APGAR Score of Newborn from group B at one minute					
	6	7	8	9	10	Mean + SD	6	7	8	9	10	Mean + SD
Male (28)	1	2	5	18	2	8.64+0.87	-	4	8	15	1	8.46+0.79
Female (32)	-	4	8	20	-	8.50+0.71	2	2	9	18	1	8.44+0.91

Table-5

Gender	APGAR Score of Newborn from group A at five minute						APGAR Score of Newborn from group B at five minute					
	6	7	8	9	10	**Mean ±SD**	6	7	8	9	10	**Mean ± SD**
Male (28)	-	-	1	9	18	**9.61+0.56**	-	-	-	9	19	**9.68±0.47**
Female (32)	-	-	1	6	25	**9.75+0.51**	-	-	2	4	26	**9.75±0.56**

Figure-1
Graphic presentation

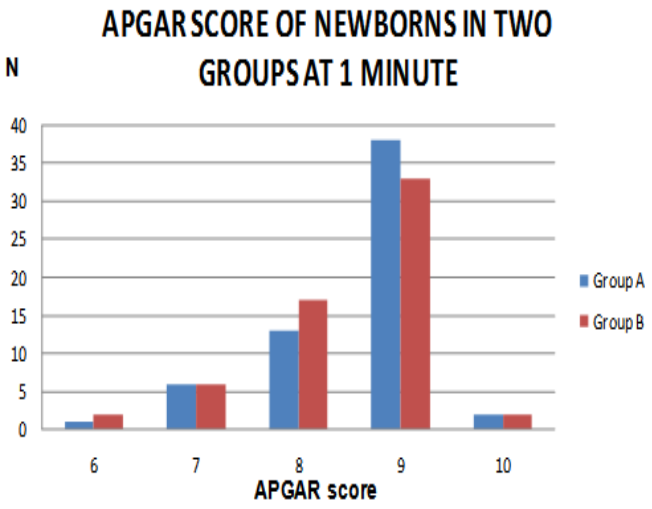
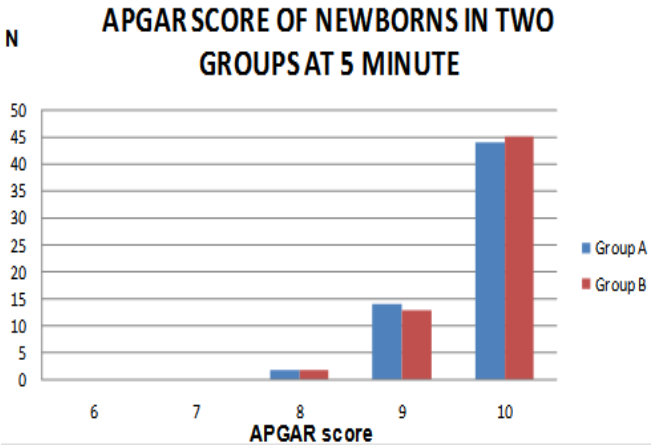


Figure-2



DISCUSSION

The APGAR score was devised in 1952 by Dr. Virginia Apgar who was an anesthesiologist, as a simple and repeatable method to quickly and summarily assess the health of newborn children immediately after birth in order to ascertain the effects of obstetric anesthesia on babies[16 17] . The Apgar score is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two, then summing up the five values thus obtained. The resulting APGAR score ranges from zero to 10.

The five criteria are summarized using words chosen to form an acronym (Appearance, Pulse, Grimace, Activity, Respiration).

	SCORING SYSTEM		
Measurable	**0**	**1**	**2**
Appearance	Blue or pale	Body pink; hands and feet blue	Completely pink
Pulse (Heart Rate)	Absent	Less than 100 beats per minute	More than 100 beats per minute
Grimace (Reflex Irritability)	Absent	Grimace	Grimace and cough or sneeze
Activity (Muscle Tone)	Limp	Some flexing of arms and legs	Active motion
Respiration	Absent	Slow, irregular; weak cry	Good; strong cry

A low score on the one-minute test may show that the neonate requires medical attention[18] but is not necessarily an indication that there will be long-term problems, particularly if there is an improvement by the stage of the five-minute test. A score of 10 is uncommon due to the prevalence of transient cyanosis, and is not substantially different from a score of 9. Transient cyanosis is common, particularly in babies born at high altitude. A score of 7-10 is considered normal and means that a newborn is in good condition and doesn't need more than routine post-delivery care. A score of 10 is extremely unusual as almost all newborns lose one point for bluish-gray coloring in their hands and feet before they have warmed up. A score less than 7 means the infant needs some assistance; for example, help in breathing. This could mean something as simple as suctioning the infant's nostrils or it could mean providing oxygen. A baby with a score of 3 or less may need immediate lifesaving measures, such as resuscitation. Babies who have a low five-minute APGAR score are more likely to need additional intervention and special care, and perhaps will spend time in the NICU (neonatal intensive care unit). Getting early and regular prenatal care is one of the best ways to promote a healthy pregnancy, thus helping to ensure a newborn gets a good start and scores high on the APGAR. Maternal oxygen supplementation during regional anesthesia for caesarean section has been routinely practiced for many years. It was Crawford who advocated the "use of maternal oxygen therapy until the time of delivery" in the 1984 edition of his book on obstetric anesthesia. This opinion of Crawford established the practice of supplementing oxygen in all elective caesarean sections[20], the basic aim being to prevent maternal hemoglobin desaturation and improve maternal and neonatal oxygenation and overall neonatal outcome.

Satisfactory regional block for caesarean section requires a block of Aβ fibers up to the level of T5 dermatome leading to reductions in maternal peak expiratory flow rates, forced vital capacity and forced expiratory volume. In the normal healthy parturient these changes in ventilatory parameters accompanying spinal anesthesia are well tolerated[21].

However Toni et al, found the incidence of foetal acidaemia to be higher during regional anesthesia as compared to general anesthesia, attributed to the hypotension which occurred during spinal anesthesia leading to decreased uteroplacental perfusion and decreased intervillous blood flow[22]. The routine provision of supplementary oxygen to uncomplicated pregnancies subjected to LSCS under regional anesthesia has recently been dogged by controversy. Previous studies have shown that maternal administration of oxygen does improve foetal oxygenation and acid base balance along with biophysical profile during foetal hypoxia[23,24]. However, other studies have demonstrated that administration of oxygen does not have any beneficial effects on the foetal oxygenation or acid-base status. Khas et al[25] have reported that administration of 35% FIO2 did not cause any change in the fetal umbilical vein pO2 (UVpO2). This UVpO2 was improved when maternal FIO2 was increased to 47%-100%, but not to the same proportion as increase in maternal pO2. There was a correlation between maternal umbilical arterial O2 tensions but APGAR scores and umbilical artery pH did not improve with increasing maternal hyperoxia.

Like various others Cogliano et al, studied the effects of supplementary oxygen to mothers undergoing elective LSCS under spinal anesthesia found no significant differences in the umbilical arterial or venous pH, partial pressures of O2 and CO2 in the event of a prolonged uterine incision to delivery interval during LSCS and hence concluded that their data did not support the routine administration of supplementary oxygen during elective LSCS under spinal anesthesia[26]. A further concern regarding maternal O2 supplementation is related to the increased oxygen free radical (OFR) activity in both mother and the baby. It has been further observed that neonates resuscitated with oxygen resulted in poorer neonatal outcome because of generation of OFR as compared to resuscitation with air[27]. This has led to a change in practice and one of the neonatal resuscitation manuals has ceased to recommend the use of oxygen[28].

In our study, we clinically measured APGAR scores of newly born babies at one minute and five minute, and tried to determine any change in the babies born in two groups of mothers; that in mothers breathing room air (21% Oxygen) versus mothers breathing high flow oxygen (10 liter) per minute through a disposable face tight transparent mask. Our results were in the favor of that provision of supplementary oxygen to mothers undergoing elective caesarian section under uneventful

spinal anesthesia have no significant difference on the outcome of babies as far as their APGAR score is concerned.

CONCLUSION

The clinical practice of providing high flow supplementary oxygen to 'without risk' mothers undergoing elective LSCS under regional anesthesia does not improve neonatal outcome. In our opinion it is more important for the anesthesiologist to avoid hemodynamic alterations associated with regional anesthesia, rather than resort to increasing the mother's discomfort and anxiety with an oxygen face mask as well as wastage of oxygen resource leading to economical loss to the state and institution.

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