

COMPARISON OF NEONATAL APGAR SCORE IN GENERAL ANESTHESIA AND SPINAL ANESTHESIA

Susan Saatsaz¹, *Sarvar Moulookzadeh², Rozita Rezaei¹ and Narges Norouz Khani¹

¹Department of Nursing and Midwifery of Amol University of Medical Sciences, Sari, IRAN

²Department of Information Technology Engineering, Tarbiat Modares University, Tehran, Iran

*Author for Correspondence

ABSTRACT

Type of anesthesia has a definite impact on the *Apgar score*. Considering the increasing rate of *Cesarean* section in Iran, this study was carried out to compare the effects of *Spinal anesthesia* and *General anesthesia* on *Apgar score* in neonates delivered by *Cesarean* surgery. In this cross-section study, 172 healthy, full-term pregnant women were selected from elective *Cesarean* section candidates in two same groups of *General anesthesia* and *Spinal anesthesia* at Imam Ali hospital in Amol city. Each group was assessed for time intervals of starting surgery to newborn retrieval. *Apgar score* at 1 and 5 minutes and demographic variables were determined and compared. The average of *Apgar scores* at 1 min and 5 min were respectively 8.64 ± 0.76 and 9.88 ± 0.32 in *Spinal anesthesia* group, and 8.24 ± 1 and 9.83 ± 0.55 in *General anesthesia* group. Regarding statistical view, there was a significant difference between *Apgar* minute 1 in both groups. Besides, there was no significant difference between demographic variables and time intervals between the starting surgery and newborn retrieval. *Spinal anesthesia* which leads to newborns with higher *Apgar score* and less side-effects is recommended.

Keywords: *Spinal Anesthesia, General Anesthesia, Newborns' Apgar Score*

INTRODUCTION

One of the most amazing and beautiful phenomena in the world is the child birth. Passing the embryonic phase and entering into life in the world outside of the womb is accompanied by serious and quick physiologic changes. That is why the newborn needs to be evaluated right after birth (Eslami and Fallah, 2008). *Apgar score* of newborns is a scientific, systematic, and rapidly obtained method which is one of the important indices of evaluating newborns' status after birth (Badr, 2007; Rafati *et al.*, 2006). If childbirth via Normal Vaginal Delivery (NVD) is not safe for mother and the child, *Cesarean* surgery seems necessary (Martin *et al.*, 2007). In the last 30 years, the rate of *Cesarean* surgery has considerably grown in both developed and developing countries (Martin *et al.*, 2007) in a way that now it is one of the most common surgeries which takes place all over the world (Badr, 2007; Nikpour *et al.*, 2011). More than 60% of pregnant women in Iran ask for *Cesarean* surgery because of unjustified reasons like fear of labor pain, or natural childbirth complications (Rafati *et al.*, 2006; Nikpour *et al.*, 2011; Jafari *et al.*, 2000). So, regarding the growing number of newborns that are born via *Cesarean* surgery, one of the concerning issues for mothers is the change and decrease of *Apgar score* for *Cesarean* babies which is directly related to increasing rate of death in these children. Consequently, paying enough attention to mothers' and newborns' complications is essential. Anesthesiologists must choose the healthiest way for *Cesarean* mothers which has the least side-effect on the child (Badr, 2007; Forghani *et al.*, 2003). One of the influential factors on low *Apgar score* of the child is the type of anesthesia. In the study conducted by Zhakarya *et al.*, on 150 newborns with low *Apgar score* (lower than 7), and 150 newborns with high *Apgar score* it was reported that some of the most common influential factors on the low *Apgar score* of newborns were *Cesarean* surgery with *General anesthesia* and preterm labor. There was a significant difference between the type of anesthesia and the low primary *Apgar score* of the newborn (Hoseinian *et al.*, 2010). In the study of Kolatat *et al.*, (1999) the *Apgar score* of the newborns whose mothers were under *General anesthesia* were lower than the *Apgar score* of the children whose mothers received regional analgesia (Kolatat *et al.*, 1999). Although *General anesthesia* is considered as an old alternative

Research Article

method (Martin *et al.*, 2007; Jafari, *et al.*, 2000), the use of *Spinal anesthesia* method has recently developed very much because of high rate of *General anesthesia* side-effects (Martin *et al.*, 2007). The results of Jafari *et al.*, (2000) study confirmed that the side-effects of *General anesthesia* are higher than *Spinal anesthesia* (Jafari *et al.*, 2000). The study of Mancuso *et al.* on 179 pregnant woman with optional *Cesarean* surgeries in three groups of *General anesthesia*, *Spinal anesthesia*, and the group of changed from *General anesthesia* into *Spinal anesthesia* reported that the lowest amount of disorder (1.1%) was seen in the newborns of *Spinal anesthesia* group, and the highest amount of disorder (25.9%) was seen the newborns of *General anesthesia* group. Among anesthesia methods, Regional analgesia had more supremacy in newborns' consequences (Mancuso, 2010). The *Spinal anesthesia* in *Cesarean* surgeries has been introduced as the best method in the Teaching Hospital of Lako University (Afolabi, 2003). The recent study in Malawi showed that the death rate of mothers and children who undergone *General anesthesia* was higher than the death rate of those who received *Spinal anesthesia*. Consequently, it is recommended that *Spinal anesthesia* becomes the chosen method in the developing countries. Nowadays in the developed countries, regional analgesia is the first option in *Cesarean* surgeries and *General anesthesia* is considered as the second option. In some parts of Canada, most of its big cities, the areas which are connected to the capital, and major hospitals, regional analgesia is considered as the primary method (Badr, 2007; Martin *et al.*, 2007). In 1992, 84% of *Cesarean* surgeries were conducted by using regional analgesia method, and the rest were conducted by using *General anesthesia* in the USA (Forghani *et al.*, 2003). In 1998, 90% of optional *Cesarean* surgeries and 80% of emergency *Cesarean* surgeries were done through *Spinal anesthesia* (Norouzi *et al.*, 2007). In the Hospital of Westindies University in Antigua, the percent of using *Spinal anesthesia* increased from 20% in 1996 to 80% in 2001, and reached 90% till 2002 (Martin *et al.*, 2007). Regarding the high rate of *Cesarean* surgery with *General anesthesia* in Iran, ambiguity and difference among the results of some studies on the effects of anesthesia type on newborns' Apgar, and also using *Spinal anesthesia* as the superior method in some countries, the researchers decided to evaluate the impacts of *General anesthesia* method and *Spinal anesthesia* method on newborns' Apgar score by omitting intervening variables.

METHODS AND MATERIALS

This cross-sectional study was conducted on 172 pregnant women who were healthy and term candidates of optional *Cesarean* surgery in Imam Ali Hospital of Amol. The samples used in this study were judgmental samples. 86 women were placed into *General anesthesia* group and other 86 women were placed into *Spinal anesthesia* group in a way that from among the pregnant women who had come to this hospital- after confirmation of a gynecologist and an anesthesiologist- the women who had high-risk pregnancy (those who had illness records, or who had used medicines which had side-effects on embryo's health and ...), the newborns who were risky (congenital anomalies), as well as mothers for whom it took more than 15 minutes from inducing anesthesia to newborn retrieval were considered as intervening variables on newborns' Apgar score and omitted from the sample. Finally, 172 healthy mothers who had delivered healthy babies were studied, and then, the babies Apgar scores were analyzed in both groups.

In *General anesthesia* method, such medicines as Thiopental Sodium (5 mg/kg), Succinyl Choline (1.5 mg/kg), Halothane (0.5%), Nitrous oxide and Oxygen with proportion of 50%, and Neuromuscular (0.5 mg/kg) were used. In *Spinal anesthesia*, 75 mg of Lidocaine 50% (diluted by CSF) and needle number 24-25 were used through inter lumbar vertebrae space of L₃-L₄ or L₄-L₅.

By using chronometer, time intervals of inducing anesthesia to womb cut and womb cut to newborn retrieval were estimated. Also, Apgar of minute 1 and minute 5 were scored through common method of scoring. Such variables as mother's age, newborn's age and sex were recorded through checklists by the researchers. Selected people participated in the study with complete consent and without any intrusion by the researchers, and the data was recorded totally confidentially. After data gathering, the data was analyzed by spss₁₆ and descriptive analytical statistics (independent T-test, and Pearson correlation coefficient). P<0.05 was considered as significant.

Research Article

RESULTS AND DISCUSSION

The Findings

Regarding the results of the research, the average of mothers' age in *General anesthesia* group was (ci 95%: 26.177-25.303) 25.74 years of age, and in *Spinal anesthesia* was (ci 95%: 28.900- 27.900) 28.40 years of age. The average of newborns' age in *General anesthesia* group was (ci95%: 39.206- 39.034) 39.12 weeks, and in *Spinal anesthesia* group was (ci 95%: 39.145- 38.995) 39.07 weeks. In *General anesthesia* group, 49 babies were girls (57%) and 37 were boys (43%). In *Spinal anesthesia* group, 46 babies were girls (53.5%) and 40 were boys (46.5%).

The average of Apgar minute 1 in *General anesthesia* group was 8.24 ± 1 , and in *Spinal anesthesia* was 8.64 ± 0.76 , ($p = 0.005$). The average of Apgar minute 5 in *General anesthesia* group was 9.83 ± 0.55 , and in *Spinal anesthesia* was 9.88 ± 0.32 , ($p = 0.4$).

The average time of starting surgery to womb cut in *General anesthesia* group was 155.31 ± 69.06 seconds, and in *Spinal anesthesia* group was 157.85 ± 60.51 seconds; there was no significant difference between the two groups ($p = 0.79$). The average of womb cut time to newborn's retrieval was 49.69 ± 26.08 seconds in *General anesthesia* group, and 57.05 ± 31.92 seconds in *Spinal anesthesia*. There was no significant difference between these two groups ($p = 0.10$).

The average of total time of starting surgery to newborn's retrieval was 205 ± 73.95 seconds in *General anesthesia* group and 214.90 ± 73.97 seconds in *Spinal anesthesia*. There was no significant difference between the two groups, ($p = 0.38$). As a result, there was no significant difference between the two groups of *General anesthesia* and *Spinal anesthesia* in the above-mentioned times from statistics point of view.

Table 1: Mean and Standard Deviation of Apgar Minute 1 and Apgar Minute 5 for the Newborns through Optional Cesarean

P-value	Mean	Number	Apgar	Group
0.005	8.24 (1)	86	Minute 1	<i>General anesthesia</i>
	8.64 (0.76)	86		<i>Spinal anesthesia</i>
	9.83 (0.55)	86		<i>General anesthesia</i>
0.4			Minute 5	
	9.88 (0.32)	86		<i>Spinal anesthesia</i>

Table 2: Mean and Standard Deviation of in Surgery Times of Optional Cesarean (in seconds)

Starting surgery to newborn retrieval (SD)	Womb cut to newborn retrieval (SD)	Starting surgery to womb cut (SD)	Group
205 973.95	49.69 (26.08)	155.31 (69.06)	<i>General anesthesia</i>
214.90 (73.97)	57.05 (31.92)	157.85 (60.51)	<i>Spinal anesthesia</i>
0.87	1.65	0.25	T
0.38	0.1	0.79	P-value

CONCLUSION AND DISCUSSION

The results of this research revealed that the Apgar of newborns in minutes 1 and 5 in *General anesthesia* group is lower than the newborns in *Spinal anesthesia* group. In the study of Sultana *et al.*, (2004) on 50 pregnant women with optional *Cesarean* surgery, the *Apgar* score of newborns in minutes 1 and 5 in *General anesthesia* group were meaningfully lower than *Spinal anesthesia* (Sultana *et al.*, 2004). In the study conducted by Martin *et al.* on term and preterm newborns, as well as the study of Afolabi *et al.* on newborns who were born through emergency *Cesarean*, there were same results achieved (Martin *et al.*,

Research Article

2007; Afolabi *et al.*, 2003). In the studies of Lucas *et al.*, (2000) on 202 babies born through Cesarean surgeries with *General anesthesia* method, the *Apgar* score of minute 1 was significantly lower than *Spinal anesthesia* (Lucas *et al.*, 2000). This result is in congruity with the results of references number 7, 12, and 15. BY the way, in some studies, there was no clear difference seen between the *Apgar* score of newborns in two methods of *General anesthesia* and *Spinal anesthesia*. In a study on 1586 pregnant women who undergone Cesarean surgery within two groups of *General anesthesia* and regional analgesia, it was revealed that the *Apgar* minute1 and *Apgar* minute 5 were lower in *General anesthesia* group. However, there was a same portion of newborns who suffered from asphyxia, and no evidence regarding supremacy of any anesthesia method on the other one- from the view point of mother or newborn complications- was found (Afolabi *et al.*, 2007). In a study conducted on 84 pregnant women who undergone optional Cesarean surgery in two groups of *Spinal anesthesia* and *General anesthesia*, it was concluded that newborn complications were the same, and there was no significant difference, neither any influence on newborn *Apgar* score (Kavak *et al.*, 2001). The study of Petropoulos *et al.* on 238 women with normal pregnancy and optional Cesarean surgery in three groups of *General anesthesia*, *Spinal anesthesia*, and epidural anesthesia, the results showed that the neonatal sequence was the same and the type of anesthesia had no effect on neonatal consequences (Petropoulos *et al.*, 2003). Also in a study on 96 pregnant women aged from 18 to 40 years of age who suffered from Eclampsia, it was revealed that there was no significant difference between *Apgar* minute 5 in two groups of *General anesthesia* and *Spinal anesthesia* (Rafiee *et al.*, 2003). In Tonni *et al.*, (2007) study on 900 pregnant women who had optional Cesarean surgery in three groups of *General anesthesia*, *Spinal anesthesia*, and epidural anesthesia, it was concluded that the status of embryo and newborn was better in epidural anesthesia than the other two methods (Tonni *et al.*, 2007). Regarding the results of this research and other researches, from among various reasons (mother- related, placenta, umbilical cord, or embryo), it is possibly the type of anesthesia medicines used for mothers (Badr, 2007) which is influential over the low *Apgar* score (Kazem and Olad, 2005). This factor directly and indirectly affects on the newborn in *General anesthesia* and *Spinal anesthesia* (Rafati *et al.*, 2006), and must have the lowest adverse effect on embryo and newborn's *Apgar* score (Badr, 2007). Besides, the adverse effect of the medicine has a direct relation with the amount and time of describing the medicine before the delivery (Rafati *et al.*, 2006). Almost most of anesthesia medicines quickly pass through placenta and badly affect on embryo, like Asidosis, Hypoxia, breathing disorder, and also decreasing effects on newborn's *Apgar* score (Jafari *et al.*, 2000). In a study on 100 newborns who were born in three groups of normal vaginal delivery, *General anesthesia*, and *Spinal anesthesia*, it was revealed that the newborns' *Apgar* score was significantly lower in *General anesthesia* group which was reported to be the result of anesthesia medicine passing through the placenta and its breathing deteriorating effect, and increasing the time of anesthesia (Rafati *et al.*, 2006). In various studies, the higher *Apgar* score in *Spinal anesthesia* method in comparison to *General anesthesia* method is due to decreasing of adverse drug effects in *Spinal anesthesia* method (Jafari *et al.*, 2000; Forghani *et al.*, 2003; Rafiee *et al.*, 2003). Of course in Cesarean surgery with *Spinal anesthesia*, if the medicines are not used correctly, the sympathetic system will stop, and decrease in mother's blood pressure will reduce the bloodstream in womb and placenta, as well as causing Hypoxia and Asidosis of the embryo. Although in minor Asidosis there is no danger for the newborn, major Asidosis can sometimes cause permanent and irreversible complications, and can increase the death rate in newborns (Rafati *et al.*, 2006). In a study on pregnant women with optional Cesarean surgery in three groups of *General anesthesia*, *Spinal anesthesia*, and Epidural anesthesia, the lowest acidity and highest Oxygen pressure was reported in *Spinal anesthesia* group (Tonni *et al.*, 2007). Another study confirmed the lower acidity of newborn's umbilical artery in *Spinal anesthesia* method- compared to *General anesthesia*, while revealed that if the Cesarean surgery is not emergency, it does not affect the newborn's umbilical artery (Afolabi *et al.*, 2007). In an analysis on 200 newborns through normal vaginal delivery and 200 term newborns through optional Cesarean surgery, there was a positive difference between Acidemia and *Apgar* minute1 and *Apgar* minute 5 (Aminzadeh, 2006)). In their study on 96 mothers in two groups of high risk pregnancy and low risk pregnancy- among which emergency Cesarean consisted the largest part

Research Article

of risk factors, AhmadPour-Kacho *et al.*, (2010) came to conclusion that the *Apgar score* minutes 1 and minute 5 as well as the amount of acidity of newborn's umbilical artery in low risk group was higher than high risk group. Besides, there was a meaningful difference, while for low risk mothers, there was not a significant difference between acidity of umbilical artery and newborn's *Apgar score* (Ahmadpour-Kacho *et al.*, 2010). With regard to afore-mentioned subject, in the study of Jafari *et al.*, (2000) the *Apgar score* of newborns who were born through *Spinal anesthesia* was higher than those who were born through *General anesthesia*, despite the high amount of newborn's Acidemia (Jafari *et al.*, 2000). Another influential factor on newborns' *Apgar score* is the time of closing umbilical cord. As shown in Jahazi *et al.*, (2008) study on 64 healthy term newborns from mothers with normal vaginal delivery in two groups of early closing (30 seconds) and late closing (3 minutes) of umbilical cord, late closing of umbilical cord will significantly increase the *Apgar score* of the newborns (Jahazi *et al.*, 2008). Furthermore, it is possible that mothers' stress is one of the factors influencing over newborns' *Apgar score*. Bazrafshan *et al.* study revealed that the amount of stress in women while pregnancy and also while delivery increases the amount of Epinephrine in Plasma which is influential over the newborns' *Apgar score* of minute 1 and minute 5. In this regard, a significant negative statistical relationship has been achieved (Bazrafshan and Mahmmodzadeh, 2009).

Laudenbach *et al.*, (2009) showed that in *Cesarean* surgery with *General anesthesia* method, mothers and newborns are exposed to more stress and higher levels of stress level than *Spinal anesthesia* method (Laudenbach *et al.*, 2009). This finding is in congruity with the findings of other researches (Adam *et al.*, 2003; Kale *et al.*, 2006). The higher *Apgar score* in *Spinal anesthesia* method is due to mother's awareness and relative blockage of sympathetic system which leads to lower decrease of stress of such hormones as Epinephrine and Norepinephrine. However, in *General anesthesia* method, as a result of disorder in sympathetic system as well as direct effect of Adrenal Glands, the reduction of these hormones occurs more (Forghani *et al.*, 2003; Norouzi *et al.*, 2007; Rafiee *et al.*, 2003).

In this paper, there was no significant difference between newborns' *Apgar* minute 1 and minute 5, and time intervals of starting surgery to womb cut, womb cut to newborn retrieval, starting surgery to newborn retrieval in two groups of *General anesthesia* and *Spinal anesthesia*, and the two groups were the same. In Forghani *et al.*, (2003) study, there was no significant difference between above-mentioned time intervals and newborns' *Apgar score* in minute 1 and minute 5 (Forghani *et al.*, 2003; Norouzi *et al.*, 2007). In the study of Martin *et al.*, increasing the time of *General anesthesia* (more than 10 minutes) was concluded to be one of the probable influential factors in decreasing the *Apgar score* (Martin *et al.*, 2007). Bazrafshan and Mahmmodzadeh (2009) study concluded that if the time of inducing anesthesia to newborn retrieval takes less than 15 minutes, there will be no threats for the baby, and the anesthesia medicine (including Propofol) cannot affect on newborn's *Apgar score* negatively (Badr, 2007). In the present study, this time was estimated no more than 5 minutes.

Another factor which is influential on newborn's *Apgar* and considered in the process of decision making about the anesthesia method is the side-effects of each anesthesia method. Algert *et al.*, (2009) in their study, mentioned that not only short-term side-effects of *General anesthesia* must be paid attention, but long-term side-effects must be noticed also (Algert *et al.*, 2009). It must also be considered that general outbreak of side-effects in mothers who undergone *Cesarean* surgery with *General anesthesia* is more than *Spinal anesthesia* method (Tonni *et al.*, 2007). These side-effects have their final influence over the embryo and newborn's *Apgar* (Norouzi *et al.*, 2007). In the conducted analysis, most of intraoperative side-effects with *General anesthesia* included: Hypertension, difficult intubation, Hypoxia as a result of failure in intubation, Pulmonary Edema, Aspiration, Hypovolumic shock as a result of intrauterine bleeding, addition of Hypotension due to description of Thiopental to the afore-mentioned situation, delay in recovery, and mortality (Rafati *et al.*, 2006; Norouzi *et al.*, 2007). On the other hand, in severe crisis of Hypertension, such threats as Cerebral hemorrhage and cardiac problems must be considered (Tonni *et al.*, 2007). *Spinal anesthesia* has some disadvantages including decrease of blood pressure; decrease of embryo's heart beat, accidental complete spinal block, urinary retention, abscess or Hematoma epidural, and after delivery headaches (Martin *et al.*, 2007). Decrease of blood pressure is one of the most common

Research Article

side-effects in mothers which lead to Asphyxia of the embryo (Tonni *et al.*, 2007). As a result, the *Spinal anesthesia* method which is a low risk and safe method which leads to delivery of babies with higher *Apgar score* can be suggested. Limitations of this study included lack of measuring arterial blood gases and newborns' *Apgar score* simultaneously, appointing the time of closing umbilical cord and level of mothers' stress while pregnancy and while delivery. In general, the results of this study revealed that the *Apgar score* minute 1 and minute 5 of newborns who were born through *Cesarean* surgery with *Spinal anesthesia* was higher than those who were born via *Cesarean* surgery with *General anesthesia*. Of course, time intervals of starting surgery to newborn retrieval had no effect on the *Apgar score*. Therefore, choosing *Spinal anesthesia* method which is a safer method with lower side-effects and leads to delivery of newborns with higher *Apgar score* is suggested. It must also be considered that *Spinal anesthesia* method is used in other countries as the best anesthesia method in *Cesarean* surgeries.

ACKNOWLEDGEMENT

The authors appreciate the services of Deputy of research in Babol University of Medical Sciences for its financial support. The authors are also thankful to Dr. Ali Bizhani and Mr. Gholi Nya in Biometric Department of Babol University of Medical Sciences as well as all gynecologists, anesthesiologists, and diligent personnel of Imam Ali Hospital in Amol who willingly helped the authors during the whole phases of this research.

REFERENCES

- Adam HA, Meyer P, Stoppa A, Muller-Goch A, Bayer P and Hecker H (2003). Anesthesia for caesarean section. Comparison of two general anesthetic regimens and *Spinal anesthesia*. *Anesthetist* 52(1) 23-32.
- Afolabi BB, Kaka AA and Abudu OO (2003). Spinal and general anesthesia for emergency caesarean section: Effects on neonatal *Apgar score* and maternal haematocrit. *Nigerian Postgraduate Medical Journal* 10(1) 51-55.
- Afolabi BB, Lesi FEA and Merah NA (2007). *Regional Versus General Anesthesia for Cesarean Section* (review). Copyright C the Cochrane collaboration (John Wiley & Sons Ltd.).
- Ahmadpour-Kacho M, Asnafi N, Javadian J, Hajiahmadi M and Hosseini Taleghani N (2010). Correlation between umbilical cord pH and *Apgar score* in high-risk pregnancy. *Iranian Journal of Pediatrics* 20(4) 401-406.
- Algert CS, Bowen JR, Glies WB, Knoblanché GE, Lain SJ and Roberts CL (2009). Regional block versus general anaesthesia for caesarean section and neonatal outcomes: a population – based study. *BMC Medicine Journal* 7(20) 7.
- Aminzadeh F (2006). The relation between type of caesarean and umbilical cord blood pH in newborns at ayatollah kashani maternity of Kerman city. *Journal of Rafsanjan University of Medical Sciences* 4(5) 235-240 (In Persian).
- Badr Khahan F (2007). The comparison of the effect propofol and thiopental on the *Apgar score* of neonatal on Caesarean section: a comparative study. *Journal of Shahrekord University of Medical Sciences* 9(3) 10-14 (in Persian).
- Bazrafshan MR and Mahmmoudizadeh AR (2009). Effects of pregnant women anxiety on *Apgar* and weight of newborns at delivery. *Scientific Journal of Hamedan Nursery and Midwifery Faculty* 1(17) 58-62 (In Persian).
- Eslami Z and Fallah R (2008). Evaluation of the *Apgar score* and its related factors in neonates born in hospitals of Yazd city. *Journal of University of Medical Science of Shahid Sadoughi Yazdi* 16(5) 40-45 (in Persian).
- Forghani Z, Fazel MR, Salehian R and Ebrahim Soltani AR (2003). Effect of spinal or general anesthesia on newborns *Apgar score*. *Journal of Kashan University of Medical Sciences (Feyz)* 27(7) 64-68 (In Persian).

Research Article

Hoseinian Zhakarya MH, Rismanehi Sadeghi M, Shahedifar N and Shahamfar J (2010). The low Apgar describes the conditions of the newborn infant immediately after birth. *Journal of Tabriz University of Medical Sciences* 32(4) 21-26 (In Persian).

Jafari Javid M, Gol Mohammad Loo C and Ashrafezadeh F (2000). Effect of general anesthesia and spinal anesthesia for neonatal Apgar on the elective caesarean section: a comparative study. *Journal of Urmia University of Medical Sciences* 11(4) 267-274 (In Persian).

Jahazi A, Kordi M and Mazlom SR (2008). The comparison of the effect of early and late block of umbilical cord on newborns Apgar score. *J Med Mate Iran* 11(2) 55-60 (In Persian).

Kale A, Kale E, Erdemoglu M, Akdeniz N, Canoruc N and Yagla M (2006). The effect of general and newborn cortisol levels in elective caesarean deliveries. *Perinatal Journal* 14(3) 141-146.

Kavak ZN, Basgul A and Ceyhan N (2001). Short term outcome of newborn infants; spinal versus general anesthesia for elective caesarean section. A prospective randomized study, *European Journal of Obstetrics & Gynecology and Reproductive Biology* 100(1) 50-54.

Kezri MB and Olad Asgari SH (2005). Comparison of neonate Apgar score in two indication anesthesia techniques with thiopental and propofol in caesarean section. *Journal of Qazvin University of Medical Sciences* 33 49-52 (In Persian).

Kolatat T, Somboonnanon A, Lertakyamanee J, Chinachot T, Tritrakarn T and Muangkaseem J (1999). Effects of general and regional anesthesia on the neonate (a prospective randomized trial). *Journal of the Medical Association of Thailand* 82(1) 40-45.

Laudenbach V, Mereier FJ and Roze JC et al., (2009). Anesthesia mode for caesarean section and mortality in very preterm infants: an epidemiologic study in the EPIPAGE cohort. *International Journal of Obstetric Anesthesia* 18(2) 142-149.

Lucas Bouwman ME, Koen MD, Ter Brugge HG, Rutten CL and Brand PL (2000). Link between indication for caesarean section and need for resuscitation of the neonatal. *Nederlands Tijdschrift voor Geneeskunde* 144(19) 897-900.

Mancuso A, De Vivo A and Giacobbe A et al., (2010). General versus spinal anesthesia for elective caesarean section: Effects on neonatal short-term outcome. A prospective, randomized study, *Journal of Maternal-Fetal and Neonatal Medicine*, Posted on line.

Martin Te, Bell P and Ogunbiyi O (2007). Comparison of general anesthesia and spinal anesthesia for caesarean section in Antigua and Barbuda. *West Indian Medical Journal* 56(4) 330-333.

Nikpour M, Abedian Z, Mokhber N, Ebrahim Zade S and Khani S (2011). Comparison of quantity of life in women after vaginal delivery and caesarean section. *Journal of Babol University of Medical Sciences* 13(1) 44-50 (In Persian).

Norouzi A, Pazooki SH and Darabi M (2007). Comparison of general and spinal anesthesia effects on neonates Apgar score in elective caesarean. *Journal of Arak University of Medical Sciences* (Rahavard Danesh) 2(10) 54-61 (In Persian).

Petropoulos G, Siristatidis C, Salamalekis E and Creatsas G (2003). Spinal and epidural versus general anesthesia for elective caesarean Section at term; effect on the acid-base status of the mother and newborn. *Journal of Maternal-Fetal and Neonatal Medicine* 13(4) 260-266.

Rafati Sh, Borna H, Haji Ebrahim Tehrani F, Jalali Nodoshan MR, Mozafari MH and Eslami M (2006). Neonatal Apgar scores and umbilical blood gas changes in vaginal delivery and caesarean: a comparative study. *Journal of Tehran Faculty of Medicine* 4(64) 61-68 (In Persian).

Rafiee MR, Tabasi Z and Mousavi SGA (2000). The effects of spinal anesthesia on blood pressure in mothers and neonatal Apgar score caesarean section patients with preeclampsia. *Journal of University of Medical Sciences* (Feyz) 9(1) 30 34 (In Persian).

Sultana AG, Masood ZU and Hassan SH (2004). Effects of type of anesthesia on neonatal outcome. *Annals of Abbasi Shaheed Hospital & Karachi Medical & Dental College* 9(2) 552-557.

Tonni G, Frarri B, De Felice C and Ventura A (2007). Fetal acid-base and neonatal Status after general and neuraxial anesthesia for elective caesarean section. *International Journal of Gynecology & Obstetrics* 97(2) 143-146.