

A clinical study of the effects of neonatal weight gain and breastfeeding following lower segment cesarean section under general or spinal anaesthesia with or without post-operative continuous epidural infusion of bupivacaine

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Abstract

Aim and Objective: We investigated the effect of continuous epidural infusion of bupivacaine following lower segment cesarean section under general or spinal anesthesia on breastfeeding and neonatal weight gain.

Methods: The study enrolling 80 female patients of ASA grade I or II, age between 19-35 years were randomly allocated into 4 groups of 20 each. Group I received general anesthesia (Thiopentone sodium) + IM diclofenac 75 mg every 8 hours, post-operatively for three days. Group II received general anesthesia (Thiopentone sodium) + post-operative epidural analgesia (3-4 ml/hour of 0.125% bupivacaine for 3 days). Group III received spinal anesthesia (2.5 ml of 0.5% bupivacaine) + IM diclofenac 75 mg every 8 hours, post-operatively for three day. Group IV received spinal anesthesia (2.5 ml of 0.5% bupivacaine) + post-operative epidural analgesia (3-4 ml/hour of 0.125% bupivacaine for 3 days). The effects of anesthesia on the neonatal outcome, amount of breastfeeding and the infant weight were measured for 10 days after cesarean section.

Results: The parturients who received epidural bupivacaine after the cesarean section initiated breastfeeding earlier as compared to those who received intramuscular diclofenac. The neonatal outcome was significantly better in the groups that received regional anesthesia (group III and IV) as compared to the groups that received general anesthesia. In group II and IV, the visual analog pain score after surgery was significantly lower and both the weight of milk fed by breast and the infant weight during the study were significantly more than the respective values in the group I and III.

Conclusion: It is concluded that the groups that received post-cesarean analgesia with continuous epidural bupivacaine provided satisfactory pain relief which leads to increase in the frequency of breastfeeding and neonatal weight gain.

Keywords: Epidural infusion, Bupivacaine, Thiopentone sodium, Diclofenac, Lower Segment Cesarean Section, L. S. C.S., Postoperative analgesia.

1. Introduction

In India the incidence of cesarean section has skyrocketed over the last decade with a 2-3 fold rise from the initial state of about 10%. Therefore many women are subjected to a cesarean and at the same time are also trying to care for their newborn children [1]. One area which cesarean affects significantly is breastfeeding. Breastfeeding advocates have long promoted the idea that women who have had a cesarean need extra support and help to establish breast feeding. For most women, breastfeeding difficulties are resolvable with timely help, emotional support, patience, diligence and most importantly satisfactory post-operative pain relief. However, many researcher shows that breastfeeding helps women return to their pre-pregnancy weight levels faster than those who do not. Cesarean mother is less active owing to the restrictions on mobility, pain from

the incision, anemia from blood loss, adhesions from surgery etc. therefore breastfeeding is particularly helpful for losing pregnancy weight [2,3].

The infant's sucking of the nipple results in afferent impulses to the mother's hypothalamus and then to the anterior pituitary from which prolactin is secreted, stimulating milk secretion. Sucking or psychological stimuli also lead to the secretion of oxytocin by the posterior pituitary [4]. Catecholamines inhibit oxytocin-induced milk ejection [5]. Therefore, sympathetic stimuli induced by post-operative pain can reduce milk secretion. Breast milk is the most suitable food for the newborn infant [6]. However, pain suppresses breast milk production after delivery [4-7], and narcotics and sedatives can interfere with breast feeding [8]. Epidural analgesia after cesarean section provides satisfactory postoperative analgesia [9,10] and epidural

bupivacaine has less effect on the neurobehavioral state of infants than do other local anesthetics or narcotics[11-13]. Therefore, perhaps postoperative analgesia with continuous epidural infusion of bupivacaine may cause effective depression of plasma catecholamine levels and may improve breast feeding and infant growth after cesarean section. Also, the positive feedback from neonatal weight gain may further increase the breastfeeding.

To evaluate this hypothesis, we investigated the effect of continuous epidural infusion of bupivacaine post-operative for three days following lower segment cesarean section under general or spinal anesthesia on breastfeeding and neonatal weight gain for ten days.

2. Material and Method

The present study was undertaken at a teaching institute after obtaining due clearance by the ethical committee of the hospital and after obtaining written valid informed consent from all the patients. Total 80 parturients of ASA grade I or II, age between 19-35 years with full term uncomplicated pregnancy carrying a singleton normal fetus were scheduled for elective L.S.C.S. All the patients were randomly allocated into four groups of twenty each. Indications for cesarean section included previous history of L. S. C. S., breech presentation, predicted cephalopelvic disproportion, abnormal lie- compound, transverse, uterine inertia. The patients having multiple pregnancy, antepartum hemorrhage, intra uterine growth retardation, pregnancy induced hypertension, patients with diabetes mellitus, thyroid dysfunction, coagulation disorders, spine deformity, hypersensitivity to the local anesthetics, bad obstetric history, and any fetal abnormality were excluded from the study. Neonates with apgar scores of 7-10 at 5 minutes were selected for the study and neonates excluded from the study were those with a low birth weight i.e. < 2500 gms.

Preoperative assessment of each patient was done. The standard monitors were applied to the each patient and baseline parameters like pulse rate, blood pressure, respiratory rate were recorded. Fetal heart rate was recorded by the fetal heart Doppler. Patient's NBM status was confirmed and intravenous access was established in the operation theatre. All the patients were premedicated with titrated minimal dose of midazolam starting from 0.01 mg/kg.

In group I (Control group) general anesthesia was induced with thiopentone sodium (5-7 mg/kg). After having confirmed ventilation, the patient was paralyzed with either short acting depolarizing muscle relaxant like succinylcholine (1-2 mg/kg) or long acting non-depolarizing muscle relaxant pancuronium (0.08-0.12 mg/kg) or vecuronium (0.08-0.12 mg/kg), depending upon the case. Patient was then intubated with the appropriate sized oral, red rubber cuffed endotracheal tube. The cuff was inflated with adequate volume of air after confirming equal air entry bilaterally. Maintenance of anesthesia was achieved with

oxygen, nitrous oxide and halothane. As per the case, IV methergin or pitocin was started after the delivery of the baby and the placenta. Whenever non depolarizing muscle relaxants were used, patient was reversed with IV neostigmine 0.04-0.06 mg/kg and IV glycopyrrolate 0.008 mg/kg. After confirming adequate reversal of neuromuscular blockade and after thorough oral and endotracheal tube suctioning, patient was extubated. Post operative analgesia was performed with IM diclofenac 75 mg 8 hourly.

In group II (Study group) patient's general anesthesia was administered in a similar manner as mentioned above in group I. Post operative analgesia was performed after extubation. Patient was given left lateral position. A 16G epidural catheter was introduced in the L3-L4 interspace and directed cephalad at a distance of 3-4 cm in the epidural space. The catheter was fixed at that site and confirmed to be in situ after negative aspiration of blood and CSF. Post-operatively each patient was given a bolus dose with 4 ml of injection 0.25% bupivacaine. Continuous infusion of 0.125% bupivacaine was then connected to the epidural catheter through the infusion pump via an extension line of 100 cms. This infusion was continued for 3 days following L.S.C.S. by allowing the mother to carry out her routine activities.

Group III (Control group) patients received spinal anesthesia. Patients were pre loaded with crystalloids 10 ml/kg. The patient was given left lateral position. A 23 or 25 G spinal needle was introduced into the L2-L3 interspace and after confirming free flow of clear CSF, 2.5 ml of 0.5% bupivacaine was given intrathecally. The surgery was begun after confirming the dermatomal level of loss of pinprick sensation at T6. As per the case, IV methergin or pitocin was started after the delivery of the baby and the placenta. Post operative analgesia was performed with IM diclofenac 75 mg 8 hourly.

Group IV (Study group) patients received spinal anesthesia as mentioned above. Postoperative analgesia was administered through the epidural catheter similar to the patient in group II.

Maternal parameters like pulse, blood pressure, respiratory rate of the parturient were monitored at the initiation of the epidural bolus of injection of bupivacaine and thereafter every three hourly till the infusion continued for 3 days. Quality of analgesia in the parturient was assessed by using the simple verbal scale (0: No pain, 1: Mild pain, 2: Moderate pain, 3: Severe pain, 4: extremely severe and intolerable pain). Reduction of the pain intensity at the operative site was assessed at the initiation of breastfeeding and twice a day thereafter for 3 days by using the visual analogue pain scale. VAPS is a 10 cm linear scale with 0 cm indicating "no pain at all" and 10 cm indicating "worst pain ever". Analgesia evaluation includes- No analgesia: pain almost unchanged, Moderate analgesia: pain relief 30-60%, Good analgesia: pain relief 60-90%, Excellent

analgesia: pain relief >90%. Time of initiation of breastfeeding following L.S.C.S. was recorded.

Table 1: Neonates born were assessed by the apgar scores at 5 minutes.

	0	1	2
Respiratory effort	Absent	Slow, irregular	Good crying
Heart rate	Absent	<100 beats/min	>100 beats/min
Muscle tone	Flaccid	Flexion of extremities	Active body movements
Reflex irritability	No	Grimace	Cough, cry, sneeze
Colour	Blue, pale	Body pink, blue extremities	Completely pink

Scores 0-4: severe depression, 5-7: moderate depression, 8-10: no depression.

Neonatal weight gain was noted for 10 days at a fixed time on each day. Neurobehavioral assessment was done by the neurological and adaptive capacity score (NACS) developed by Amiel Tison and Crookers in 1982. This score can be used to assess the effect of local anesthetic agent i.e. bupivacaine in the present study, on the neonates. The score has two parts,

- a) Neurological evaluation
- b) Behavioral evaluation

Adaptive capacity, passive tone, active tone, primary reflexes and general assessment were done. Each assessment was assigned a score of 0, 1 or 2 based upon whether the response to testing was absent (0), slightly normal (1) or normal (2). The maximal possible score was 40 A score of 35 or greater describes a neurologically vigorous neonate. Cutaneous sensations: dermatomal level of cold discrimination was measured by applying spirit / ether soaked swab before removing the catheter that was kept in

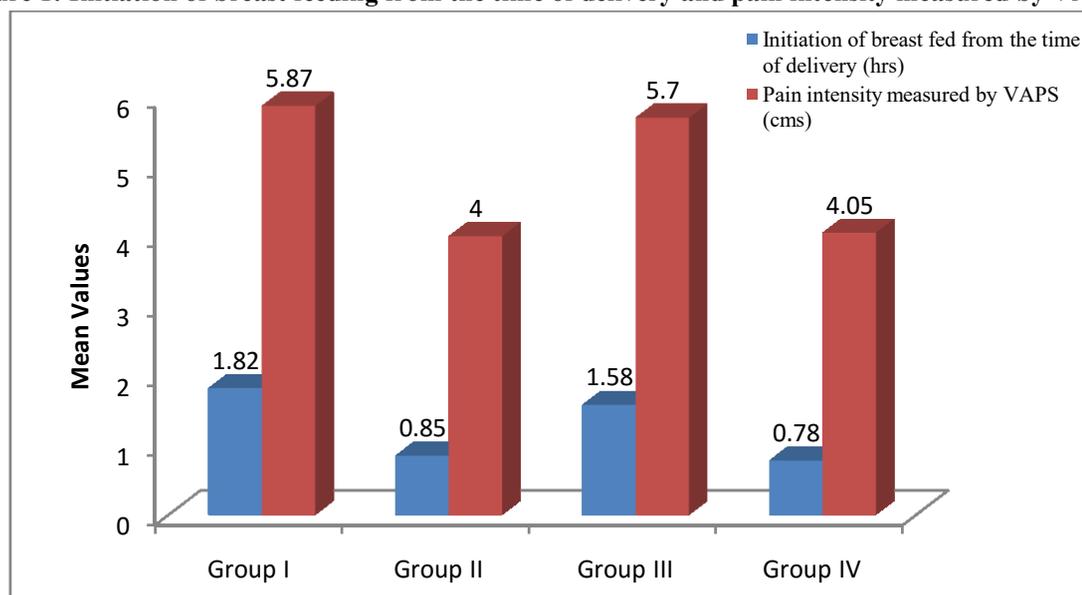
situ for 3 days. Side effects of bupivacaine infusion were noted: Nausea and vomiting, headache, hypotension- a) Mild (<20mm Hg drop in systolic BP), b) Moderate (>20mm Hg and <40 mm Hg drop in systolic BP), (C) Severe (>40mm Hg drop in systolic BP), Urinary retention, sedation, respiratory depression i.e. respiratory rate <10 breaths/min. Epidural catheter complications like local infection, discharge from the catheter insertion site were noted.

3. Results

Eighty parturients who underwent elective lower segment cesarean section under general or spinal anesthesia were selected for the study for observing effects of anesthesia on the neonatal outcome and also the effects on the neonatal weight gain and the amount of breastfeeding following post-operative analgesia in the form of continuous epidural bupivacaine infusion.

In current study, it was observed that parturients from group II and IV had an earlier mother-baby contact and were able to initiate breastfeeding significantly sooner than those in the other two groups (group I and group III). Amongst the groups I and III, the latter group which received regional anesthesia had an earlier initiation of breastfeeding. The reduction in the pain intensity at the initiation of breastfeeding was observed to be more in the parturients who received epidural bupivacaine for post-operative pain relief (Group II and group IV) than the parturients who received intramuscular diclofenac for the same (Group I and group III). Between the groups I and III, parturients from group III had lesser intensity of pain at the initiation of breastfeeding (Figure 1).

Figure 1: Initiation of breast feeding from the time of delivery and pain intensity measured by VAPS



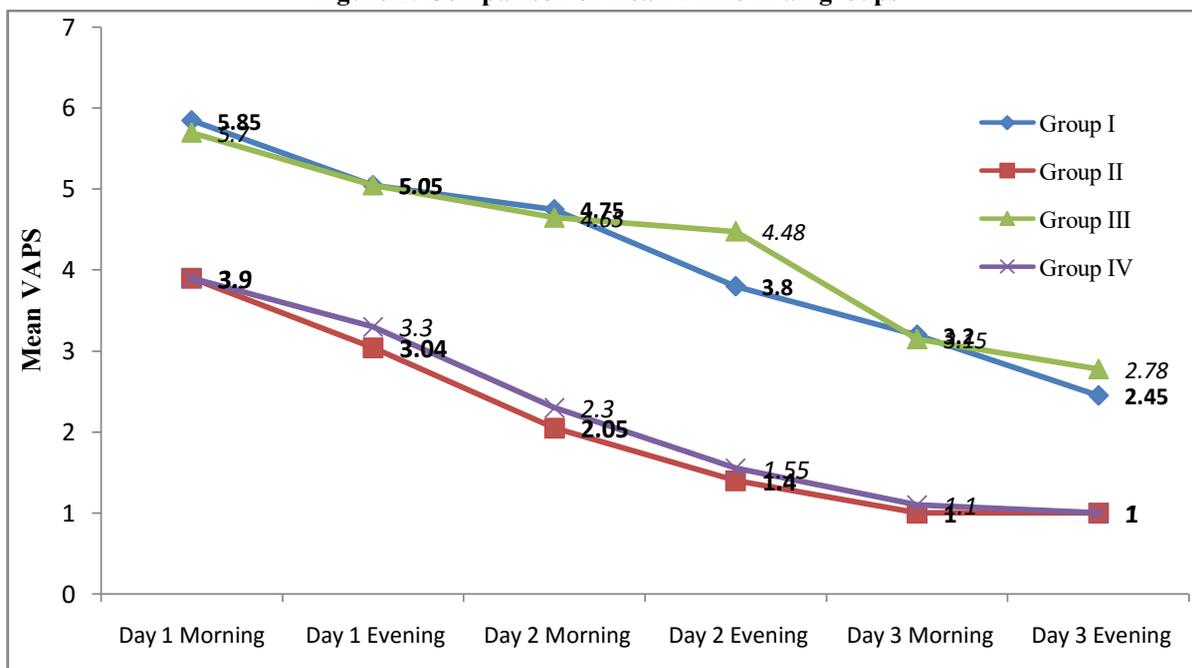
The analgesic efficacy was measured on the three days following the cesarean section by using the VAPS. It was observed that the groups who received post-cesarean

continuous epidural bupivacaine infusion (group II and IV) experienced better pain relief than the ones without it (group I and group III). When groups I and III were compared, it

was found that the parturients who received spinal anesthesia had better pain relief on day 1 than those who received general anesthesia. Similarly the parturients belonging to groups II and IV experienced better satisfaction with pain

relief from the continuous epidural bupivacaine infusion which can be attributed to the more stable depth of analgesia, (Figure 2).

Figure 2: Comparison of mean VAPS in all groups



The neonatal outcome as assessed by the NAACS was significantly better in the groups that received regional anesthesia (group III and IV) for cesarean section as

compared to the groups that received general anesthesia, although scores were within the normal range of 35-40 in all the four groups (Figure 3).

Figure 3: Comparison of mean NAACS in all groups

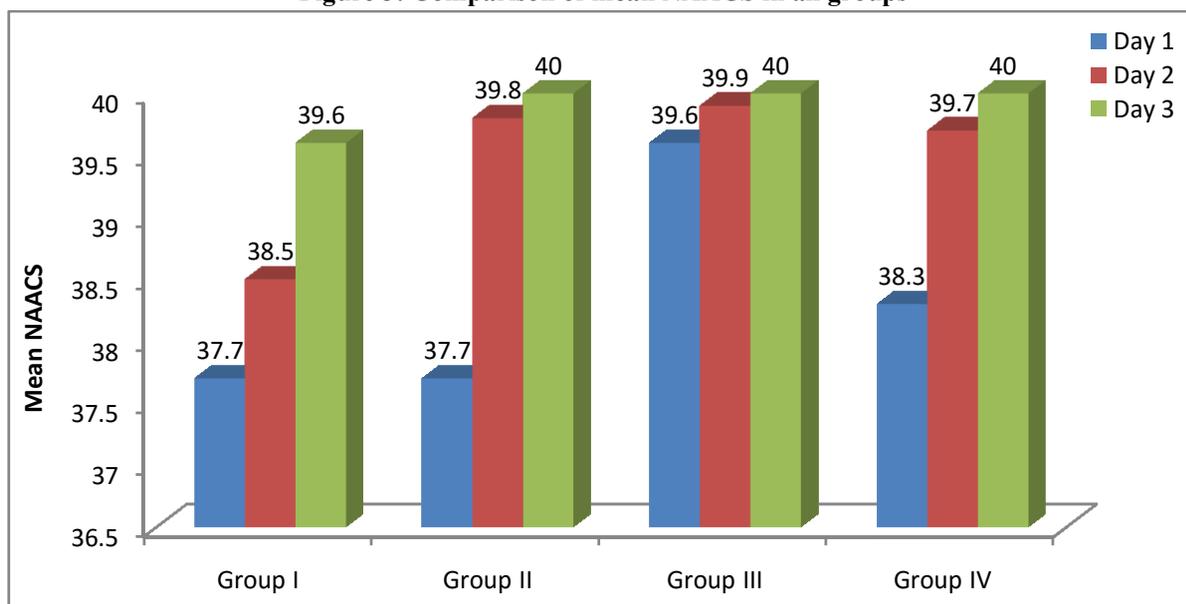


Figure 4 and 5 shows comparison of amount of the breast milk fed and the neonatal weight gain amongst the neonates of the parturients between four groups respectively. In comparison with group I the group II, III and IV showed a statistically significant difference in the amount of breast milk fed and the subsequent neonatal weight gain on all the ten days following the cesarean section. Similarly the

neonates from group III had a significantly lower weight of the breast milk fed and a lower rate of weight gain on the following ten days than those from group II. The neonates from group IV had a significantly higher value for both than the group III. No statistically significant difference was observed between the neonates belonging to the parturients from groups II and IV.

Figure 4: Mean Weight of breast milk fed (gms)

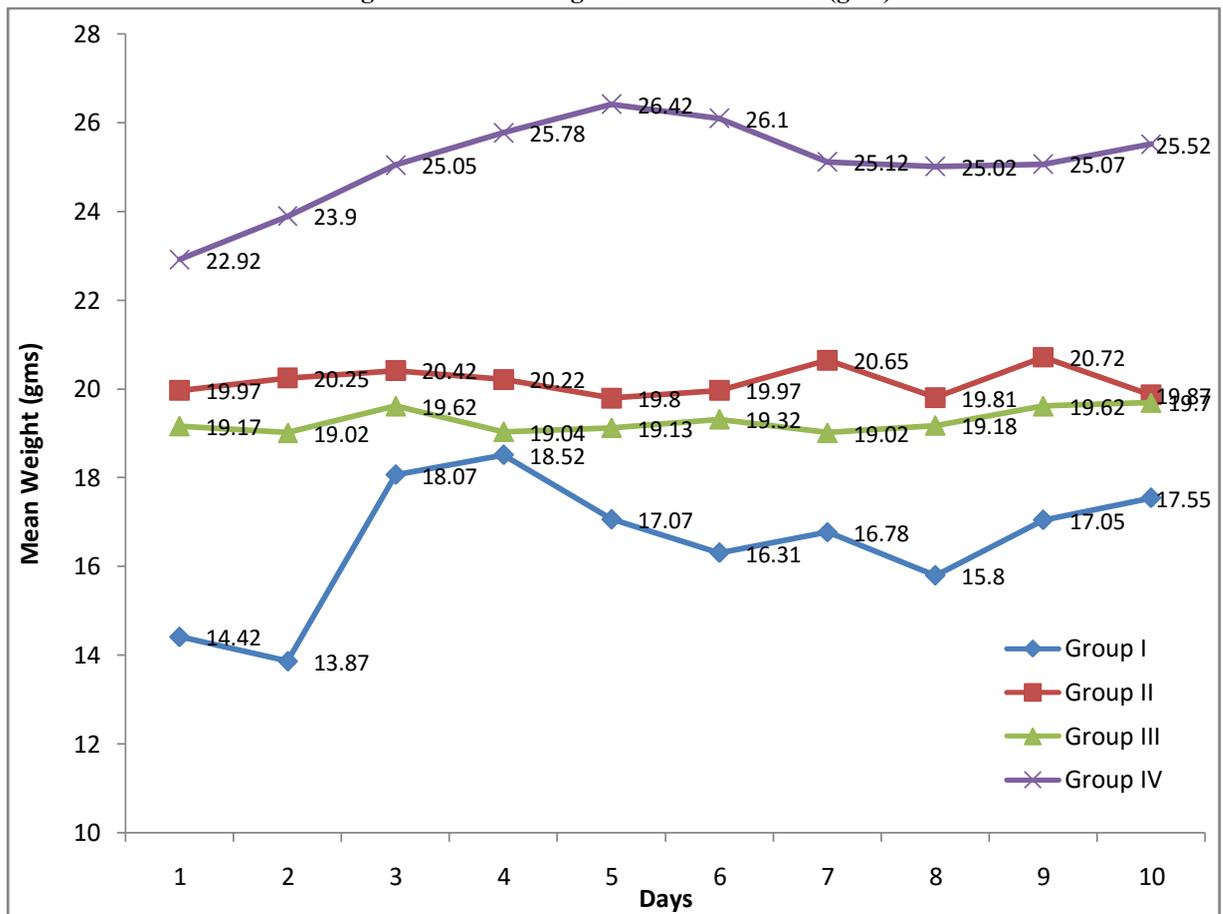
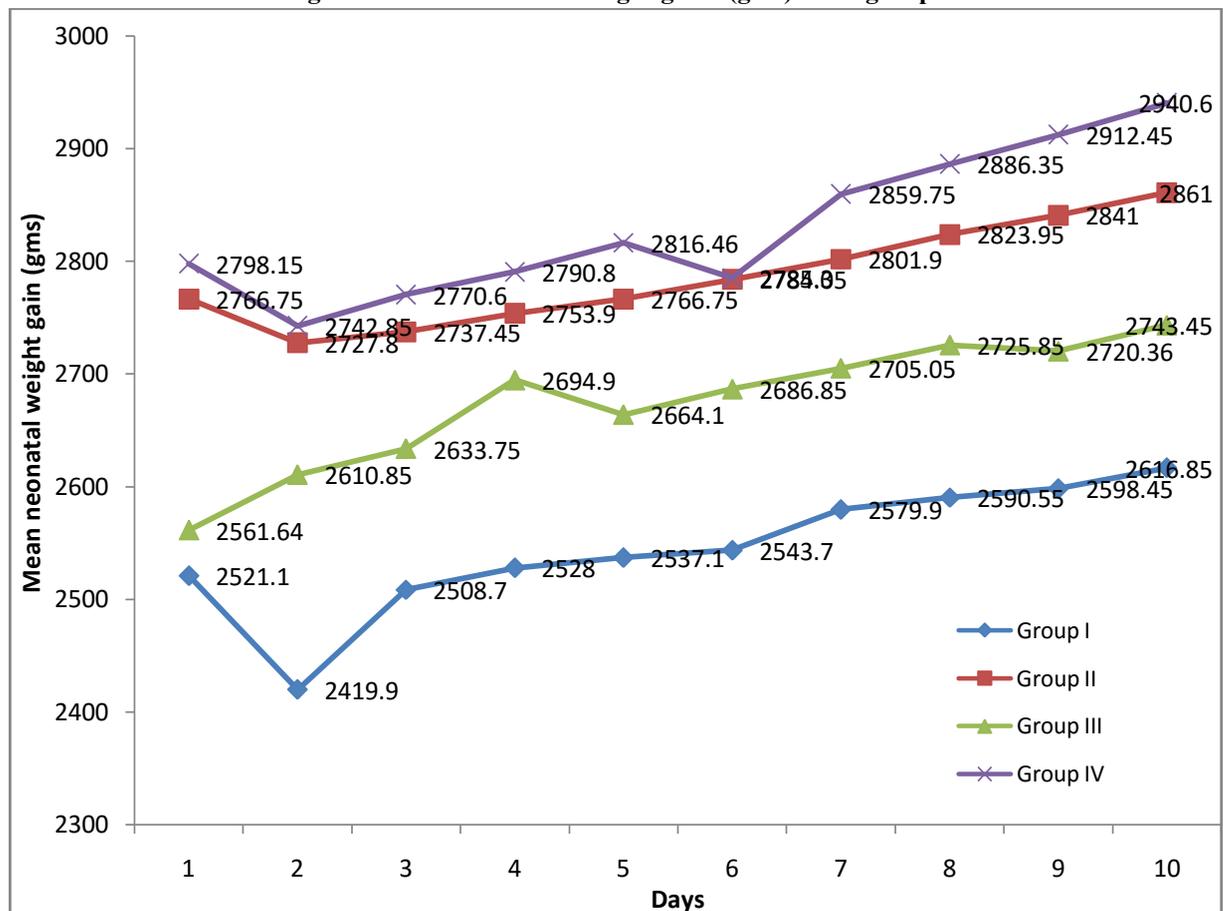


Figure 5: Mean neonatal weight gains (gms) in all groups



Observing parturients from the groups II and IV for the side-effects of epidural infusion of bupivacaine, there were no complications of the epidural catheter such as local infection/inflammation. There was no incidence of nausea, vomiting, hypotension, bradycardia or respiratory depression observed. The parturients from the groups I and III also did not complain after intramuscular diclofenac injections.

4. Discussion

Post-operative pain is an unpleasant experience for the parturient who undergone a cesarean section and is also associated with a number of physiological responses that may hamper breastfeeding and thereby the neonatal weight gain. Reduction of the amount of breastfeeding after cesarean section can be attributed to several maternal factors, such as pain, anxiety, a poor nutritional state, and the use of sedatives or narcotics. Epidural analgesia is not only associated with the attenuation of the surgical stress response but also allows improved mobilization and activity with earlier return to normal functioning which should be the aim of post-operative analgesia in a parturients.

Hence the present study was designed to investigate the effect of satisfactory post-operative pain relief with continuous epidural administration of bupivacaine after cesarean section, under spinal or general anesthesia, on the amount of breast feeding and neonatal weight gain and compared it with unsatisfactory pain relief without the epidural bupivacaine.

It was found that the parturients from group I initiated breastfeeding after a significantly longer interval of time from the delivery as compared to the groups II, III and IV ($p < 0.05$). When the time of initiation of breastfeeding since the delivery was compared between groups III and II, it was observed that the difference was highly significant, ($p < 0.01$), i.e. the parturients in group III started breastfeeding sooner. On the contrary, a similar comparison between group IV and III revealed a highly significant difference ($p < 0.01$), wherein the parturients from group IV initiated breastfeeding earlier. A statistically significant difference was noted in the time of initiation of breastfeeding amongst the groups IV and II ($p < 0.05$). This results of our study revealed that the parturients who received satisfactory post-operative analgesia with epidural bupivacaine after the cesarean section initiated breastfeeding earlier as compared to those who received intramuscular diclofenac at regular intervals. This findings were correlates with several studies [2,14-17].

The pain intensity, following the cesarean section in the parturients, as measured by the VAPS at the initiation of breastfeeding showed a highly significant difference amongst those who received post-operative analgesia with epidural bupivacaine and those without it. On applying the unpaired 't' test, the score of the pain intensity of parturients in group I was found to have a highly significant difference ($p < 0.01$) when compared to those in groups II and IV.

Similarly the parturients from group I scored significantly higher ($p < 0.05$) than the group III. When the pain intensity was compared between the groups III and IV, a highly significant difference ($p < 0.01$) was observed. No significant difference ($p > 0.05$) was found between the groups II and IV. Similar comparisons were made between the pain intensity of the parturients in all the groups on the following three days, twice each day. By using the VAPS, it was observed that the difference between group I and group II was highly significant ($p < 0.01$) on all the three days. The difference between group I and III was significant ($p < 0.05$), group I scoring higher than the group III, only on 1 day. No significant difference was observed on the remaining two days. A higher significant difference was noted between group I and IV, group III and II, and group III and IV on all the three days, the former scoring higher on the VAPS. The difference between the groups II and IV were not found to be statistically significant. It has been well established that satisfactory postoperative pain relief is associated with less physiological derangements. The visual analogue pain scale was used to study the analgesic efficacy following post-cesarean epidural bupivacaine infusion over intramuscular diclofenac. Our findings compare with the result of Hirose M *et al*[18] and Noelle Louise Siew Hua Lim *et al*[19]. A continuous infusion for epidural analgesia in obstetrics was first described in 1957 by Dawkins [20]. It provides a more stable depth of analgesia, which obviously becomes an important part of patient satisfaction. Moreover there is a lower incidence of hypotension because of lower blood concentrations of the local anesthetics and decreased sympathetic blockade. Studies by Sanjay Datta at Boston [1], USA show that the satisfaction scores were better with post-cesarean epidural analgesia. Patient satisfaction of pain relief was assessed by the Simple Verbal Scale and all the 4 groups were compared for the following three days, twice each day. The parturients who received epidural analgesia following the cesarean section experienced more satisfaction through pain relief as compared to those with intramuscular diclofenac. There was a highly significant difference ($p < 0.01$) between the groups I and II, groups I and IV, groups III and II and groups IV and III. The difference between groups I and III were found to be significant ($p < 0.05$), only on day 1. On the following two days the results of comparison were not statistically different. No statistically significant difference ($p > 0.05$) was observed between the two groups with the epidural bupivacaine i.e. II and IV. Thus we can conclude that providing satisfactory pain relief to the parturients after the cesarean section is most essential in making them comfortable and allowing mother – baby bonding to initiate early breastfeeding.

When comparing neurological and adaptive capacity score between group I and II, no statistically significant difference was observed. The neonates born to the parturients in group III had significantly better NACS than

those from group I ($P < 0.01$) on day 1, but on the remaining two days there was no significant difference ($p > 0.05$). The neonates from group I statistically had a highly significant difference in comparison with those from group IV on all the three days whereas the latter did not have significantly different scores when compared with group II. Similarly neonates belonging to group II had a significantly lower score than group III day 1, but on the next two days no statistically significant difference was observed. This results of our study correlates with different studies [21-23].

The present study shows that in comparison with group I the group II, III and IV showed a statistically significant difference in the amount of breast milk fed and the subsequent neonatal weight gain on all the ten days following the cesarean section. Similarly the neonates from group III had a significantly lower weight of the breast milk fed and a lower rate of weight gain on the following ten days than those from group II. The neonates from group IV had a significantly higher value for both than the group III. No statistically significant difference was observed between the neonates belonging to the parturients from groups II and IV. Term neonates initially lose about 5-8% of the birth weight, largely in body water, if breastfed, they regain the weight in ten days and then grow rapidly. Thus it becomes essential to initiate effective breastfeeding at the earliest following the delivery. This is especially necessary after a cesarean section. This is agreement with the several studies [2,18,21,24-29] and these studies reported breastfeeding seems to go easier after regional anesthesia rather than general anesthesia. This is because the mother is able to nurse sooner, with better pain control with epidural bupivacaine infusion and is less under the depressant effects of the drugs. Also the baby is exposed to a lower dosage of drugs in regional anesthesia and thus may suckle more effectively than after general anesthesia.

In the present research total cost analysis was compared between the four groups. As far as the expenditure was concerned, provision of spinal anesthesia for the L. S. C.S. with intramuscular diclofenac turns out to be the most cost-effective. But if we take into consideration the factor of pain relief and comfort of the parturients, spinal anesthesia followed by post-operative epidural analgesia is beneficial, not only to the mother but also to the infant in the long run.

Therefore, according to the above findings, providing spinal anesthesia followed by post-operative epidural infusion is more beneficial to the parturient, when the factor of pain relief is also considered.

5. Conclusion

The present study concluded that the groups that received post-cesarean analgesia with continuous epidural bupivacaine provided satisfactory pain relief which leads to early establishment of breastfeeding, thereby allowing better mother-infant bonding which in turn may lead to an increase in the frequency of breastfeeding and neonatal weight gain
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and even allowed the parturients to ambulate as and when required.

Early, successful breastfeeding can be affected negatively by cesarean section but if the infant is put to the breast within the first two hours following the delivery, the long term success rate of lactation is unaffected. It is recommended that an attempt be made to initiate lactation before the end of the first hour of birth following cesarean delivery by providing adequate and satisfactory post-operative pain relief.

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