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Assessing Maternal and Fetal Outcomes in Labor Analgesia Utilizing Epidural Techniques: A Prospective Observational Study at Tertiary Care Teaching Hospital, Gujarat

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ABSTRACT

Childbirth, while a natural physiological process, is often accompanied by intense pain. Epidural analgesia is a well-established method for managing labor pain, offering effective relief without prolonging labor or increasing the risk of caesarean delivery. This study aims to explore the impact of epidural analgesia on maternal and fetal outcomes during labor induction, evaluating its influence on neuraxial rates and delivery modes. Present study was conducted at Civil Hospital, Ahmedabad, India, from March 2016 to October 2017, this prospective observational study included 30 low-risk singleton term pregnancies. Inclusion criteria encompassed women aged 20-36 with gestational age >37 weeks, cephalic presentation and ASA status I or II. Epidural analgesia was administered during active labor and outcomes were recorded. Data included demographic details, labor progression, delivery modes and neonatal outcomes. Among 30 participants, 80% underwent normal delivery, 16.67% had cesarean sections and 3.33% had instrumental deliveries. Epidural analgesia initiation during labor had no significant impact on the duration of the first and second stages. Apgar scores >7 at 5 min were observed in all neonates, with only one neonate having a score <7. Pain scores were significantly lower in the epidural group, indicating its effectiveness. Maternal complications were absent and fetal distress occurred in 6.66% of cases. Neonatal resuscitation was required in 13.33%, with one neonatal death due to other complications. Epidural analgesia emerged as a safe and effective method for labor pain management, offering substantial relief without adverse effects on labor progression or delivery modes. Maternal and neonatal outcomes remained favorable, emphasizing the viability of epidural analgesia as a valuable obstetric intervention.

INTRODUCTION

Labour pain, ranked highest among all experiential pains[1] is an inherent facet of the physiological process of childbirth[2]. It serves as a symptomatic indicator prompting expecting mothers to solicit timely delivery assistance. Despite the normalcy attributed to the physiological trajectory of labor and birth the associated pain can be significant, necessitating judicious pain management strategies[3]. As the labor process advances the intensification of pain is compounded by factors such as anxiety, fear and ignorance. Predominant effects stemming from labor pain include hypercarbia, loss of consciousness and diminished uterine blood flow[4]. The concomitant release of adrenaline due to pain and anxiety contributes to prolonged labor, with a subsequent 25% elevation in noradrenaline levels and a 50% reduction in uterine blood flow. This cascade effect extends to heightened maternal cardiac output, systemic vascular resistance and oxygen demand[5].

Sufficient analgesia administered during labor is advantageous for both the mother and the unborn child, exerting a favorable impact throughout the delivery process and postpartum period. Consequently, intrapartum analgesia is regarded as an indispensable element of optimal obstetric care. The quintessential labor analgesia is defined by its capacity to furnish effective pain relief without adversely influencing the progression of labor or the chosen mode of delivery. Additionally, it should refrain from instigating neonatal complications while concurrently affording the mother a positive and memorable experiential encounter[6].

Labor epidural analgesia constitutes a central nerve blockade approach entailing the administration of a local anesthetic into the epidural space. This intervention effectively obstructs the transmission of painful impulses originating from the contracting uterus during the labor process[7]. Predominantly employed for intrapartum relief in contemporary clinical practice, labor epidural analgesia has been a longstanding and efficacious method for pain management[8]. Notwithstanding its widespread application in modern obstetric practice, concerns persist regarding potential side effects associated with labor epidural analgesia[6-9].

Within our nation, a pronounced deficiency in awareness concerning labor analgesia exists, coupled with a conspicuous absence of national acceptance regarding pain-alleviating choices for women during labor. This investigation endeavors to elucidate the repercussions of epidural analgesia on both maternal and fetal outcomes among women undergoing labor induction. Additionally, we aim to scrutinize the impact of epidural analgesia on neuraxial rates and delivery modes in parturient women. Employing the visual analogue scale the study encompasses an evaluation of the efficacy of epidural analgesia in mitigating pain during labor. Furthermore, an examination of the influence of epidural analgesia on the temporal aspects of various stages of labor is undertaken, concomitant with an assessment of fetal outcomes utilizing the APGAR score. A secondary objective involves the comparative analysis of these outcomes with those derived from women abstaining from the utilization of epidural analgesia. This research endeavours to furnish discerning insights into the ramifications of labor analgesia, addressing the extant insufficiency in awareness and acceptance within our nation.

MATERIALS AND METHODS

This prospective observational investigation was executed within the Department of Obstetrics and Gynaecology at Civil Hospital, Ahmedabad, Gujarat, India, spanning from March 2016 to October 2017. The study population comprised pregnant women admitted to the labor room at Civil Hospital, Ahmedabad, Gujarat, India, during the specified timeframe. The research adhered to ethical standards delineated in the Declaration of Helsinki. Approval for the study was procured from the Institutional Ethics Committee at B. J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India.

Inclusion criteria: Low-risk singleton term pregnant individuals undergoing either spontaneous labor or labor induction, with gestational age surpassing 37 weeks, featuring a singular fetus in cephalic presentation and with clinically ruled out cephalopelvic disproportion (CPD). This cohort is anticipated to achieve vaginal delivery and includes patients classified as American Society of Anaesthesiologists (ASA) status I and II.

Exclusion criteria: Exclusion criteria encompassed individuals below 20 or above 36 years of age, gestational age falling below 36 or exceeding 42 weeks, indications of probable cephalopelvic disproportion or malpresentation upon pelvic examination, instances of multiple or preterm gestation, cervical dilatation measuring less than 3 cm the presence of medical complications such as preeclampsia, eclampsia, diabetes, among others. Additionally, patients exhibiting contraindications for epidural analgesia, including coagulopathy, marked hypovolemia, neurological disorders, allergies to local anesthetics, were excluded. The refusal or inability of patients to cooperate with epidural analgesia also constituted exclusion criteria.

A convenient sample comprising 30 consecutive patients meeting the specified inclusion and exclusion

criteria during the designated study period was enrolled. The objectives, aims, and procedural details of the study were articulated in the local language (Gujarati) to the eligible participants. Prior to their inclusion in the study, written informed consent was obtained from both the patients and their immediate relatives. All participants were required to be in the active phase of labor, characterized by cervical dilation exceeding 3 cm, well-effaced cervix, a frequency of sustained contractions at 03 per 10 min, with each contraction lasting between 35-45 sec. Additional criteria included the presence of a well-engaged fetal head in primigravidae and the absence of cephalopelvic disproportion (CPD) in multigravida. Eligibility confirmation was accomplished through ultrasonography (USG). Epidural analgesia was administered when cervical dilation reached or exceeded 3 cm. A comprehensive assessment, involving the collection of a detailed medical history, general, systemic and obstetric examinations, was conducted for each participant Following procedural elucidation, intravenous access was established and a preload of 500 mL Ringer Lactate was administered. Pre-medication involved intravenous administration of Inj. glycopyrrolate 0.2 mg and Inj. ondansetron 4 mg. Patients assumed a left lateral position with hips and knees fully flexed, followed by the application of sterile draping and painting of the back. A Tuohy epidural needle (18G) was inserted into the L2–L3 or L3–L4 interspinous space and the epidural space was identified using the loss of resistance technique. Subsequently, a multi-orifice epidural catheter was threaded through the needle, advanced cephalad until approximately 3-4 cm remained within the epidural space.

A preliminary 3 mL test dose of local anesthetic solution (2% lignocaine with adrenaline) was administered to confirm the absence of intrathecal or intravenous catheter placement. Following a 5-min observation period without complications, a total of 15 mL of 0.2% ropivacaine with 2 micrograms mL^{-1} of fentanyl was delivered as the initial dose. Monitoring parameters, including pulse, blood pressure, respiratory rate and fetal heart rate, were assessed at 5-min intervals during the initial 15 min and subsequently at half-hourly intervals.

The level of analgesia was evaluated using the "Pinprick method," while the degree of pain was assessed using the Numerical Pain Score (NPS), ranging from 0 (no pain) to 10 (worst pain). Adequate analgesia was defined as an NPS <3. Onset of analgesia denoted the time elapsed from the first bolus dose to achieving an NPS <3. Labor progress was documented on a partograph. The patient was positioned in the left lateral posture, with the option to sit as desired. A top-up dose equal to the initial dose was administered when the NPS exceeded 3. Side effects such as hypotension, bradycardia, respiratory depression, nausea, vomiting, and pruritis were meticulously recorded. Motor blockade was evaluated using the modified Bromage Scale. The study concluded upon delivery, with fetal Apgar scores noted at 1 and 5 min. Subsequently, the epidural catheter was removed and assessed for integrity. All neonatal complications occurring during the intra-partum and post-partum periods were meticulously identified and documented. These included intra-partum fetal distress and post-partum Neonatal Intensive Care Unit (NICU) admission extending beyond 24 hrs. Additional parameters recorded encompassed Apgar scores below 7 at 5 min the necessity for ventilator support, and instances of mortality. On the second postpartum day, participants within our study group were queried about their satisfaction with the administered labor analgesia.

RESULTS

In our investigation, the demographic distribution of enrolled patients exhibited variability in age, with the majority (40%) falling within the 21-to-25-year age bracket. Meanwhile, 26.67% of patients were categorized in the 16-to-20-year and 26-to-30-year age groups, respectively. Conversely, the age group exceeding 30 years, specifically 31-35 years, accounted for only 3.33% of the participants, with a similar percentage observed in the age group surpassing 35 years. This distinctive distribution underscores a prevalent trend in our society, where a substantial proportion of women of childbearing age belong to the 20-to-25-year category, with a notably smaller percentage conceiving beyond the age of 30.

Among the cohort of 30 patients, 22 individuals (73.33%) were elective cases managed by the department, whereas 8 patients (26.67%) presented directly to the labor room. This dataset underscores the prevailing health awareness concerning pregnancy within our society. However, it is noteworthy that 26.67% of patients did not engage in regular antenatal visits, indicating a deficiency in receiving fundamental care during the antenatal period.

Functioning as a tertiary healthcare facility, our center attracted patients from both rural and urban regions within the locality. Among the study participants, 11 individuals (36.67%) hailed from rural areas, while 19 patients (63.33%) originated from urban localities. This demographic distribution indicates a notable inclination toward the acceptance of the concept of labor analgesia among patients residing in urban areas. Furthermore, 93.33% of the patients were educated, in contrast to 6.67% who were uneducated. This trend suggests a proclivity for accepting the idea of labor analgesia in the educated

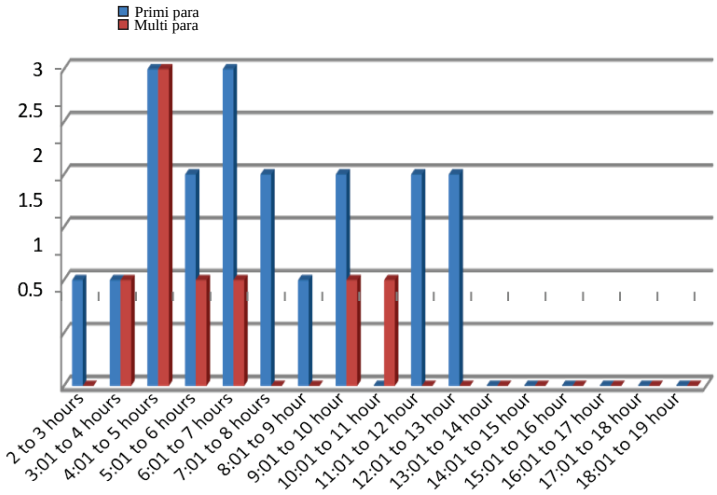

Fig. 1: Duration of first stage of labor

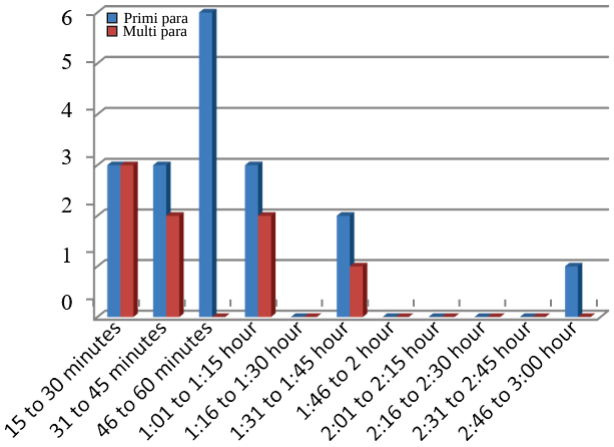

Fig. 2: Second Stage of Labor

patient demographic.

The parity status of patients serves as a pertinent demographic indicator in the field of obstetrics. Within our cohort of thirty patients, 21 individuals (70%) were nulliparous, experiencing labor pain for the first time without a prior reference for comparison. In contrast, 6 patients (20%) were primiparous (para one) and 3 patients (10%) were multiparous with a second pregnancy (para second). The perception of labor pain differs significantly between nulliparous and multiparous patients, given the emotional and physical novelty of labor pain for the former.

Epidural analgesia was initiated during the latent phase of the first stage of labor in 24 patients (80%) and during the active first stage in 6 patients (20%). The active stage of labor was defined as cervical dilation exceeding 4 cm. Induction of labor was performed for obstetric indications in 80% of patients, while spontaneous labor progression was observed in 20% of patients, as detailed in Table 1. Of the total study population, 24 patients (80%) delivered vaginally, one patient (3.33%) underwent instrumental delivery with a ventouse and 5 patients (16.67%) underwent cesarean section. Among the cesarean sections, 3 cases (10%) were attributed to the failure of labor induction, while 2 cases (6.67%) were due to fetal distress.

In our study group, there was no observed prolongation of the first stage of labor. According to the National Institute for Health and Care Excellence (NICE) guidelines the average duration of the active stage of the first stage of labor is around 8 hrs in nulliparous patients, with a potential extension up to 18 hrs. In multiparous individuals the average duration is around 5 hrs, with a potential extension up to 12 hrs. None of the study patients in our investigation reached the maximum time limits specified by these guidelines. Based on our findings the average duration of the first stage of labor in our study was determined to be 8.3 hrs, as detailed in Table 2.

Within our study, no instances of prolonged second stage of labor were observed. It is acknowledged that epidural analgesia may extend the duration of the second stage by approximately 1 hrs. Therefore, for nulliparous patients the second stage duration is expected to be within 3 hrs and for

multiparous patients, it should be within 2 hrs. Durations exceeding these thresholds are considered indicative of second stage prolongation. Our study's findings indicate that the average duration of the second stage of labor was 60 min, as delineated in Table 3.

No intrapartum or post-partum maternal complications, such as hypotension, respiratory depression, fever, or feeding problems, were identified in our study. Our investigation determined a fetal distress rate of 6.66%, a finding that aligns with the outcomes of a randomized controlled trial reporting a similar rate of 17%. On the fetal side, four neonates were admitted to the Neonatal Intensive Care Unit (NICU). Of these, one neonate received Continuous Positive Airway Pressure (CPAP) for three days but unfortunately succumbed to cardiorespiratory arrest on the fourth day, manifesting complications including early onset septicemia, acute kidney injury, pyogenic meningitis, and primary pulmonary hypertension. The remaining three neonates received treatment in the NICU and were discharged in a healthy condition.

We assessed pain levels in patients utilizing the numerical pain score and categorized them accordingly. Thirteen patients (43.33%) exhibited a pain score ranging from 0-2, while 10 patients (33.33%) reported a score within the range of 3-4. Additionally, 7 patients (23.33%) had a pain score falling between 5 and 6. To evaluate the efficacy of analgesia in terms of pain score, we compared our study patients with another group of normal delivered patients who did not receive epidural analgesia but were comparable in terms of parity to our study group. Patients without labor analgesia depicted higher pain scores, with 9 patients (30%) reporting a range of 7-8 and 21 patients (70%) indicating a pain score within the range of 9-10. This comparison clearly highlighted the effectiveness of epidural analgesia in providing labor pain relief. Furthermore, a noteworthy observation was that 29 patients (96.67%) expressed a preference for epidural analgesia in their subsequent deliveries.

DISCUSSIONS

A total of 30 patients met the inclusion criteria and were enrolled in the study, with a predominant age distribution falling within the range of 20-35 years Within the study population of 30 participants, 24 women (80%) underwent normal vaginal delivery, while 5 women (16.66%) underwent caesarean delivery. Gribble *et al*.[10] in a prior study, found that the availability of on-demand epidural analgesia during labor did not contribute to an increased primary caesarean rate. Furthermore, in a comprehensive review article by Wassen *et al*.[11] it was reported that there was no heightened risk of caesarean delivery or instrumental vaginal delivery for women who received early epidural analgesia at a cervical dilatation of 3 cm or less, as compared to those receiving late epidural analgesia.

As delineated in Table 2 the majority of patients, specifically 73%, exhibited an active phase duration of the first stage of labor ranging from 120-300 min. The mean duration of the active phase of the first stage of labor in our study was 300 min for 73% of women, aligning with findings reported in previous studies (range 159 min to 344 min)[12-16]. The 2011 Cochrane review concurred, indicating that epidural analgesia was linked to a prolonged second stage of labor but did not exhibit a discernible effect on the duration of the first stage[17]. Existing evidence presents conflicting results on the impact of epidural analgesia, with some studies reporting a lengthening[18] and others a shortening[19] of the first stage of labor. In our study, no significant difference was noted in the duration of the first and second stages of labor. However, contrasting results have been reported in other studies, where epidural analgesia was associated with prolonged labor duration[7,20-23].

As illustrated in Table 5, individuals lacking labor analgesia reported pain scores within the range of 7-10. Specifically, 9 patients (30%) indicated a pain score range of 7-8, while 21 patients (70%) reported a pain score range of 9-10. This observation unequivocally underscores the efficacy of epidural analgesia in providing relief during labor. A comparable finding was observed in a study conducted by Sawant where epidural analgesia demonstrated significant pain relief compared to no analgesia during labor. Halvadia *et al*.[24] similarly reported pain relief in the majority of patients (62.5%), with 20% experiencing mild pain, 11.25% moderate pain and 6.25% severe pain after epidural analgesia administration[3].

In the present study, none of the 30 mothers experienced complications. Contrarily, a study by Luo *et al*.[25] reported that early administration of epidural analgesia increased postpartum blood loss. However, in our study population, there were no instances of post-partum hemorrhage, blood transfusion, puerperal complications, or mortality. Solely one neonate within our study exhibited an Apgar score below 7 at 5 min, with all others registering scores surpassing 7. In contrast, Halvadia *et al*.[3] reported Apgar scores of 7 and above in approximately 78.75% and 92.50% of babies at 1 and 5 min, respectively. Their study documented a mean Apgar score of 9.08±1.7 at one min and 9.9±1.3 at 5 min. Notably, the Apgar scores in both studies exhibited a degree of similarity.

CONCLUSION

Epidural analgesia stands as a secure and efficient method during labor, delivering substantial pain relief

and garnering commendable patient satisfaction. Importantly, it does not contribute to the prolongation of the first and second stages of labor. The application of epidural analgesia does not escalate the likelihood of caesarean delivery, and it exerts no adverse effects on maternal and neonatal outcomes.

REFERENCES

1. Agrawal, D., B. Makhija, M. Arora, A. Haritwal and P. Gurha, 2014. The effect of epidural analgesia on labour, mode of delivery and neonatal outcome in nullipara of India, 2011-2014. J. Clin. Diagn. Res., 8: 3-6.
2. Reynolds, F., 2011. Labour analgesia and the baby: Good news is no news. Int. J. Obstetric Anesthesia, 20: 38-50.
3. Halvadia, S.H., H.B. Halvadia, R.M. Joshi and D.P. Upadhyaya, 2013. A study of fetomaternal outcome of epidural analgesia during labor. Natl. J. Med. Rese., 3: 184-186.
4. Boudou, M., F. Teissèdre, V. Walburg and H. Chabrol, 2007. Relation entre l'intensité de la douleur de l'accouchement et celle du postpartum blues. L'Encéphale, 33: 805-810.
5. Mousa, W., R. Al-Metwalli and M. Mostafa, 2012. Epidural analgesia during labor vs no analgesia: A comparative study. Saudi J. Anaesth., 6: 36-40
6. Mehra, R., N. Baweja and S. Mitra, 2019. Outcome of labor with epidural analgesia in primigravida at term. Int. J. Reprod., Contraception, Obstet. Gynecol., 8: 1055-1061.
7. Antonakou, A. and D. Papoutsis, 2016. The effect of epidural analgesia on the delivery outcome of induced labour: A retrospective case series. Obstet. Gynecol. Int., 2016: 1-5.
8. Jones, L., M. Othman, T. Dowswell, Z. Alfirevic and S. Gates *et al*., 2012. Pain management for women in labour: An overview of systematic reviews. Cochrane Database Syst. Rev., Vol. 14. 10.1002/14651858.cd009234.pub2
9. Hincz, P., L. Podciechowskil, M. Grzesiak, W. Horzelski, J. Wilczyflski, 2014. Epidural analgesia during labor: A retrospective cohort study on its effects on labour, delivery and neonatal outcome. Ginekol. Pol., 85: 923-928.
10. Gribble, R.K. and P.R. Meire, 1991. Effect of epidural analgesia on the primary caesarean rate. Obstet. Gynecol., 78: 231-234.
11. Wassen, M., J. Zuijlen, F. Roumen, L. Smits, M. Marcus and J. Nijhuis, 2011. Early versus late epidural analgesia and risk on instrumental delivery in nulliparous women: A systematic review. BJOG: An Int. J. Obstet. Gynaecol., 118: 655-661.
12. Rujuta, 2006. Epidural analgesia during labor-Bupivacaine 0.125%+ fentanyl 20 mcg versus bupivacaine 0.125%+ Butorphanol 1 mg. Red Flower Publication Private Limited, ISBN-9: 2321-1636, Pages: 5339.
13. Ipe, S.M., R. S, S.P. Abraham, S. Ipe and S. Philip, 2020. A randomized controlled double blind study comparing the efficacy of epidural ropivacaine and bupivacaine with fentanyl for labor analgesia. Indian J. Clin. Anaesth., 5: 614-619.
14. Jouppila, R., P. Jouppila, J.M. Karinen and A. Hollmén, 1979. Segmental epidural analgesia in labour: Related to the progress of labour, fetal malposition and instrumental delivery. Acta Obstetricia Gynecologica Scand., 58: 135-139.
15. Bernard, J.M., D.L. Roux, A. Barthe, O. Jourdain, L. Vizquel and C. Michel, 2001. The dose-range effects of sufentanil added to 0.125% bupivacaine on the quality of patient-controlled epidural analgesia during labor. Anesth. Analg., 92: 184-188.
16. Salim, R., Z. Nachum, R. Moscovici, M. Lavee and E. Shalev, 2005. Continuous compared with intermittent epidural infusion on progress of labor and patient satisfaction. Obstet. Gynecol., 106: 301-306.
17. Anim-Somuah, M., R.M. Smyth and L. Jones, 2011. Epidural versus non-epidural or no analgesia in labour. Cochrane Database Syst. Rev., Vol. 7. 10.1002/14651858.cd000331.pub3
18. Hasegawa, J., A. Farina, G. Turchi, Y. Hasegawa, M. Zanello and S. Baroncini, 2012. Effects of epidural analgesia on labor length, instrumental delivery, and neonatal short-term outcome. J. Anesthesia, 27: 43-47.
19. Leighton, B.L., and S.H. Halpern, 2002. The effects of epidural analgesia on labor, maternal, and neonatal outcomes: A systematic review. Am. J. Obstet. Gynecol., 186:
20. Hitzeman, N. and S. Chin, 2012. Epidural analgesia for labor pain. Am. Fam. Physician., 86: 241-243.
21. Ashagrie, H.E., D.Y. Fentie and H.G. Kassahun, 2020. A review article on epidural analgesia for labor pain management: A systematic review. Int. J. Surg. Open, 24: 100-104.
22. Medrzycka-Dabrowska, W., K. Czyz-Szypenbejl and J. Pietrzak, 2018. A review of randomized trials comparisons of epidural with parenteral forms of pain relief during labour and its impact on operative and cesarean delivery rate. Ginekologia Polska, 89: 460-467.
23. Naito, Y., M. Ida, R. Yamamoto, K. Tachibana and K. Kinouchi, 2019. The effect of labor epidural analgesia on labor, delivery, and neonatal outcomes: A propensity score-matched analysis in a single Japanese institute. JA Clin. Rep., Vol. 5. 10.1186/s40981-019-0260-z
24. Sawant, V. and A. Kumbhar, 2018. Labour with low dose epidural analgesia: Maternal perception and fetal outcome. Int. J. Reprod., Contraception, Obstet. Gynecol., 7: 689-694.

25. Luo, S., Z. Chen, X. Wang, C. Zhu and S. Su, 2021. Labor epidural analgesia versus without labor epidural analgesia for multiparous women: A retrospective case control study. BMC Anesthesiol., Vol. 21. 10.1186/s12871-021-01355-0