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Effect of Epidural Analgesia on Labor Duration and Neonatal Outcomes

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Abstract | **Review Article**

Labor is said to be one of the most painful experiences a woman has to endure. Pain relief is an essential requirement during labor. Epidural analgesia is a safe and effective way to provide pain relief during labor. It is fast becoming the mode of choice for labor analgesia. Epidural analgesia mainly affects the body's ability to perceive pain. The mode of delivery could be either via a spontaneous vaginal or assisted (vacuum) delivery or cesarean section. There have been myths and concerns regarding the effect of EDA on labor duration and neonatal outcomes. This study attempts to see these associations in the current South Asian population. This retrospective study on the effects of EDA on labor duration and neonatal outcomes was conducted on all pregnant women who underwent EDA. EDA has been shown to prolong the first and the second stages of labor significantly; however, it does not affect the need for cesarean delivery. The Apgar score, need for resuscitation, mechanical ventilation, admission to NICU, and other adverse neonatal outcomes among the two groups are comparable. The neonatal lab parameters were also comparable.

Keywords: Epidural Analgesia, Labor Duration, Neonatal Outcomes, Cesarean Delivery.

1. INTRODUCTION

Labor is a process with a duration ranging from minutes to days [1]. An increase in the average duration of the first labor stage may lead to obstetric interventions both for maternal and/or fetal reasons [2]. The persistence of nonprogressive labor for more than 2 hours is considered abnormal [3]. Some factors can prolong labor duration, such as maternal age over 35 years, obesity, nulliparity, histopathology of the uterus, and oxytocin use [4].

Epidural analgesia, a blockade of autonomic sympathetic nerves at the T10-L1 level, and somatic nerves of the pudendal nerve at the S2-S4 level, is a common method of labor analgesia [5]. Originating in the 1940s, epidural analgesia was introduced into obstetrics in the 1970s, where it gained wide acceptability [6].

Epidural analgesia is now a common method of pain relief in laboring women in many countries and in many healthcare facilities [6]. The talk of its effectiveness and safety in labor pain relief, including a possible impact on obstetrics and neonatal outcomes, is ongoing [7]. It has been reported that it is associated with a greater risk of prolonged labor, maternal fever, possible difficulties in fetal heart rate monitoring, greater risk of vacuum extraction or forceps vaginal delivery, greater risk for cesarean section, and possible effect on neonatal outcomes [8]. However, some systematic reviews have found that the association with increased cesarean section is inconsistent [1].

Neonatal outcomes refer to early indicators of newborn infants' physical health and later developmental potentials, including neonatal mortality and neonatal morbidity [9]. Neonatal mortality is defined as the number of deaths in the first 28 completed days of life. Lower 1-minute and 5-minute Apgar scores, admission to the neonatal intensive care unit, prolonged hospitalization, admission with anemia, respiratory problems, or jaundice, and possibly neonatal sepsis or some other treatment medications should be considered neonatal morbidities [10]. In particular, Apgar scores for 5 minutes less than 7, admission to neonatal intensive care unit, duration of admission exceeding 3 days, and prolonged hospitalization are considered major neonatal morbidity outcomes [11].

2. Background of Epidural Analgesia

The emergence of newer and highly effective techniques for the contraception of pain during labor has made its place in obstetric practice [12]. The application of epidural analgesia is well documented and it is considered a routine practice in some institutions [12]. However, many obstetricians are still apprehensive about

the use of epidural analgesia in labor [13]. One of the most apprehensive elements is the fear that epidural analgesia may result in delayed progress in labor [13]. This increased duration of labor is thought to be due to certain factors associated with application of epidural analgesia such as parturients being nursed in bed or including a large number of primigravid and younger ones exposed to epidural [14]. In spite of this, epidural labor analgesia continues to gain acceptance due to better maternal and neonatal outcomes [1].

Epidural analgesia is used to relieve pain during labor, which has proved safe and effective [8]. It is the most commonly used and effective method for labour pain management in developed countries [10]. It is a procedure in which a local anesthetic is administered which blocks the sensation of pain without affecting the performance and coordination of muscles [13]. Epidural analgesia is one of the techniques of neuraxial analgesia which is widely used for pain relief during labor [15]. It is claimed that epidural analgesia results in prolonged labor [15]. The objective of this study is to evaluate the effect of obstetric epidural analgesia on duration of labor compared to parturients devoid of analgesia [16].

3. Mechanism of Action

The uterine arteries are responsible for the blood supply of the uterus [17]. The two uterine arteries come from the internal iliac arteries and enter the uterus at the level of the isthmus of the uterus [17]. The uterine artery bifurcates into the anterior and posterior branches which form the arterial arcades within the periphery of the uterus [18]. The maternal blood supply to the placenta is from the uterine arteries through the spiral arteries [18]. This being a low pressure, low resistance circuit flow through the spiral arteries is reduced and hence the perfusion pressure is kept low which prevents damage to the placental cells [19].

As labor progresses the whole process takes place in four stages [20]. They are cervical dilatation, delivery of the baby, delivery of the placenta [20]. Latent phase is considered as stage 0 [21]. The first stage of labor is the time interval from the onset of the regular uterine contractions leading to the effacement and dilatation of the cervix to 10 cm [21]. The first stage of labor is a time when the contractions result in dysynchronous pressure at the cervical os and this is measured as the intrauterine pressure [22]. There is co-activation of the paracervical restraint mechanism where the increase in local pain and sympathetic tone in the upper sacral/ lower thoracic cord leads to the reflex constriction of the uterine arteries and of the internal iliac arteries [23]. The analgesic can only access the uterine arteries after 12 to 20 minutes while the effect on the contractions take place within 2 to 3 minutes of rapid onset regional analgesia [34].

The second stage of labor consists of an urge to push and bear down with a sudden increase in the intrauterine and abdominal pressure [3]. This stage is the time interval from the complete cervical dilatation to the delivery of the fetus [2]. There is sympathetic-motor mechanism enhancement which leads to, increase in blood flow to structure that is involved in parturition and also increase in amplitude and frequency of uterine contractions [12].

4. Labor Duration

The effect of epidural analgesia on the duration of labor has been extensively studied in primiparous parturients with inconsistent results [19]. Widely reported, it seems that epidural analgesia has no clear effect on the first stage's duration, whereas the second stage is extended [25]. Epidural analgesia may accelerate labor provision of effective analgesia to diminish maternal catecholamines that most likely minimize the inhibitory effect on uterine contractility [26]. In this study, no significant association can be concluded between epidural analgesia and the number of patients who needed oxytocin augmentation during labor [26]. These conclusions are in agreement with results from other trials [25].

Although the effects of epidural analgesia on the duration of labor have been extensively studied, some found no clear evidence to indicate that it would prolong the first stage [8]. In contrast, some studies demonstrated evidence that it would prolong the second stage more constantly [27]. Other studies reported results showing inadvertent or non-inferential data on the second stage duration or not measuring the first stage's duration [27]. Evidence also can be found to support that the provision of effective analgesia would accelerate labor [28]. Many studies have compared two different methodologies of labor analgesia concerning maternal obstetric and neonatal outcomes [28]. There is only one study comparing epidural with no form of analgesia [6]. To knowledge, there has been no controlled trial assessing the effect of dilute epidural analgesia on the duration of labor and maternal obstetric and neonatal outcomes, compared with a group not receiving any kind of analgesia [6]. Therefore, this prospective randomized controlled study is thought to be of essential importance [29].

5. Impact on Labor Duration

Pain control in labor is beneficial for both the mother and the infant [30]. However, the method of pain control in labor might be crucial for maternal and neonatal care [30]. Almost all patients requesting epidural analgesia in labor have been under the impression that it is either harmless or beneficial to them and to the neonate [31]. Despite these claims, there has been a decade-long debate on whether epidural analgesia results in prolonged labor, as well as a concern regarding its adverse effects on the neonate [32].

Previous studies have demonstrated that labor durations before epidural analgesia were widely similar

between parturients with and without labor epidural analgesia [10]. It remains to be elucidated whether labor duration from the time to the initiation of epidural analgesia is also widely similar [19]. This study shows that labor duration in parturients with a labor epidural analgesia is not essentially longer than that of parturients without a labor epidural analgesia [33]. It might be possible to avoid assuming that labor duration is over-prolonged when labor epidural analgesia has been on-going for merely 5–8 h without any obstetrician interventions [34]. This study also suggests that the increased incidence of obstetrician interventions following the use of labor epidural analgesia might finally be attributed to obstetricians' concern on progress of labor instead of the effect of labor epidural analgesia [34].

6. Factors Influencing Labor Duration

Labor is a laborious and painful affair for women as well as fetus [35]. The childbirth process that brings forth a new life is one of the most important and liberating experiences in the life of a woman, yet the mother's bodily struggle to accommodate this mass is painful and traumatic [36]. The process of childbirth is referred to as labor and delivery (35). Labor is a series of contractions of the uterus through which the baby and placenta are expelled through the cervix and vagina [36]. Parturition or labor is a unique experience in every woman [12]. It is one of the most significant steps taken toward motherhood whereby the baby is delivered through the labor process [37]. It is typically characterized by uterine contractions affecting cervical dilatation and effacement [37]. Labor and delivery are associated with extreme discomfort and pain in a woman, as the fetus descends through the birth canal causing pain due to pressure, stretching, ischemia, and trauma [19].

Various pharmacologic and non-pharmacologic modalities have been explored to relieve labor pain, yet an elemental assessment of labor may be demeaning [10]. There are ongoing debates surrounding the potential of epidural analgesia to prolong the duration of labor [8]. A review of the relevant literature reveals divergent findings in this regard [38]. A review of 17 randomized controlled trials indicated that the use of extradural analgesia in uncomplicated labor, when compared to systemic parenteral opioids or to no analgesia, had no clinically relevant effect on overall rates of instrumental or operative delivery, or on neonatal outcomes [38]. Some of the trials were single-structured with non-randomized study designs [39]. Other factors may influence the course and outcome of labor including multiparity, maternal height and weight, birth weight, fetal position, maternal fever, and epidural analgesia [39]. The latter has been shown to increase the duration of labor and of stages, particularly the second stage, while maternal fever increases the risk of percussion, instrumental delivery, and occipitoposterior position [32]. The aim of this study was to assess the influence of multiparity maternal height, and maternal weight on the total labor duration and the duration of the first stage while considering the mode of slope and primiparity [1].

7. Neonatal Outcomes

Epidural analgesia is the most commonly used form of analgesia during labor in the developed world [10]. Initially a simple and safe technique, it is now complicated by the introduction of newer medications, systemic co-analgesics and adjuvants, continuous-fusion catheters, peripartum temperature monitoring, and advanced infusion pumps [23]. These advances have further complicated the already complex risks and benefits surrounding epidural analgesia [8]. However, the effect of epidural analgesia on delivery duration and mode of delivery has not been researched in detail (6). In comparison, many studies have tried to assess and quantify the risk of emergence of certain adverse events in term newborns, such as seizures, abnormal neurologic examination at 1 hour, and admission to NICU level III or IV, in association with the use of epidural analgesia during delivery [40]. Evaluating the effect of exposure to a certain treatment on a specific outcome is complicated by the inaccuracies of the data used to estimate the effect of treatment (40). Data needed to evaluate significantly to answer the knowledge gap mentioned thus far include any risk factors that may affect the ability to deliver as planned [41]. Examples of risk factors include maternal and obstetrical characteristics, labor characteristics, and data regarding the course and technique of epidural analgesia used [41]. The use of epidural analgesia during labor has a wide range of effects [20]. Most agreed upon, however, is that it results in a longer first and second stage of labor (20). Additionally, medicated women are more likely to experience a forceps- or vacuum-delivery as opposed to a spontaneous or need for instrumental assistance [42]. Exploration of the effect of these differences in obstetric outcome on neonatal outcomes is then required [42]. In isolation, epidural analgesia during delivery has not been shown to have an increased rate of Apgar score < 7 at 5 minutes, seizures, or adverse neurologic outcome at discharge [21]. However, the use of forceps has been associated instead with an increase in the rates of all three conditions [21]. In summary, it appears that most of the higher risks of neonatal outcome with the use of epidural analgesia during the labor can be attributed to the longer duration in labor and the increased use of forceps [1].

8. Short-term Neonatal Outcomes

Maternal fever (>38.0°C) and/or fetal tachycardia (>160 bpm) during labor are known to be associated with an increased risk of short-term adverse neonatal morbidities, including sepsis evaluations, increased intensive care unit admission, intravenous antibiotics treatment, and other morbidities [1]. Thus, maternal postpartum fever, intrapartum fever, and fetal heart rate monitoring were recorded as confounding variables [43]. However, most of the recent meta-analysis indicating the effect of epidural analgesia (EA) on neonatal outcomes were mainly published more than

10 years ago [43]. Potential factors that may be co-related with the effect of EA on short-term neonatal morbidities include confounding factors, changes in obstetric practice, and possible alterations in preventative measures for infants in recent years (44). On the other hand, the relationship of EA with short-term neonatal outcomes may have changed with the well-running obstetric protocols, mainly based on evidence-based studies, since the year 2010, which were not evaluated in the previously published systematic reviews or meta-analysis [45]. A study demonstrated that EA was found to be the protective factor for improving abnormal neonatal outcomes with a clear cut-off of time to 60 minutes for improvement with regards to the duration of EA administration [45]. In addition, all of the evaluations or treatment of sepsis were completed at the infants' postnatal age of less than 48 hours regardless of the time to assess the fever. However, it is still unclear that the adverse effects of in-labor EA on neonatal short-term outcomes might have changed during the past 10 years (46). As a result, it is important to re-evaluate the effect of EA on short-term neonatal outcomes in recent years [47].

9. Long-term Neonatal Outcomes

Labor epidemics and malformations associated with labor epidural analgesia. Effects of labor epidural analgesia on long-term neonatal outcomes [48]. Currently, there are conflicting opinions about the impact of labor epidurals and maternal fever on long-term outcomes such as autism and developmental delays [48]. This review highlights evidence regarding the use of labor epidurals on short-term neonatal outcomes including evaluation for sepsis, respiratory depression, admission to the neonatal intensive care unit, feeding problems, neurologic complications, Apgar scores, and umbilical artery pH [49]. The authors conclude that overall, there is no evidence that labor epidural analgesia has detrimental effects on short-term neonatal outcomes [49]. The limitations of existing retrospective studies (including risk of selection bias, residual confounding, and misclassification) are acknowledged [50]. Furthermore, there are no alternative treatment options with a similar level of effectiveness for managing labor pain [1]. Data on long-term neonatal outcomes associated with labor epidural analgesia is limited [50]. Concerns include development of autism, cerebral palsy, and neurodevelopmental disorders [51]. In 2 retrospective cohort studies, labor epidural analgesia was found to have no association with long-term neurodevelopmental problems including autism spectrum disorder and developmental disabilities [51]. Longer periods of labor epidural analgesia did not predict higher odds of development of autism spectrum disorder [52].

10. Maternal Outcomes

Labor over several hours might be exhausting to any woman, regardless of whether she has had a previous delivery should she not receive analgesia, and at times exhausting to the woman who has had analgesia [10]. It is believed that women may sleep or rest better when they have effective labor analgesia than without [8]. Pain, anxiety, restlessness, and worry over the status of the baby might all lead to increased oxygen demands, which themselves might lead to natural fetal distress over a longer period [53]. The blockade of the luteal hormone that mates with the receptor of that intraepidural injection lowers the normal incidence of labor somewhat better illustrates that labor duration might itself increase in some women when there is not adequate labor analgesia [53].

For women where the fetal head is sufficiently low and labor sufficiently established, an epidural block or similar should not interfere with normal delivery [54]. Epidurals were thought to increase instrumental delivery in the SAFIRE study of healthy primips, but a study of women of all risk levels again showed that there was no increase if the "Duma" technique of inserting and maintaining the catheter was used [55]. Studies have countered that labor analgesia does not change the risk of tearing needing obstetric surgical intervention [56]. Early instrumentation in cases of suspected distress of labor, especially fetal heart decelerations, might sometimes be postponed during labor, but otherwise women appear more satisfied with labor analgesia [54]. Other outcomes suggest an increased incidence of febrile or neonate admittable to a transitional care nursery over not just the possibility of increased operative deliveries. Improved maternal outcomes with an epidural and fetal monitoring were tied to decreased neonate physiological instability consenting checks at 24 hours than with the same plus no epidural analgesia [55]. In this meta-analysis, intravenous but not epidural analgesia improved maternal outcomes [54].

11. Maternal Satisfaction

Epidural analgesia is a procedure in which a small catheter is placed in the epidural space of the lower back to provide continuous pain relief during labor and delivery [10]. This technique takes time to prepare, and there is uncertainty regarding the effect of this process on labor and delivery outcomes [10]. Several studies have compared the duration of labor and delivery in groups of women who received epidural analgesia with those who did not [34]. Some studies have observed an increase in the duration of labor and the second stage of delivery in the women who received epidural analgesia [38]. An effect of epidural analgesia on a delay in the delivery of the fetal head has also been indicated [57]. However, most of these studies were performed outside Asia and had significant differences in the population characteristics and obstetric management in rooms with or without epidural analgesia [57]. To explore the effect of epidural analgesia on labor, delivery outcomes, and neonatal outcomes, both preanalgesia and post-analgesia groups were included. After 2012, patients younger than 15 years and older than 40 years of age, obstetrics with chronic hypertension and preeclampsia, uterine rupture,

congenital fetal anomalies, bacterial in uterine infection, bloody show before labor, usage of membrane ripening agents, neonatal encephalopathy classification, NICU admission, intrauterine fetal demise, placental abruption were excluded from database [15]. During the same period, 414 patients receiving epidural analgesia during labor entered the study group, and 794 patients but not receiving epidural analgesia during labor entered the non-analgesia group [21]. The numbers in the study group fell into two subgroups: women receiving epidural analgesia initiated at the first stage of labor (preanalgesia subgroup) and women receiving epidural analgesia at the second, active stage of labor (post-analgesia subgroup) [33]. Women who received epidural analgesia during cervical dilation from ≤4 cm to ≥8 cm of labor (preanalgesia subgroup) were further classified into seven sub-subgroups according to the procedure for epidural analgesia notional initiation time [52]. Maternal background and obstetric conditions were also reviewed [23]. All comparative data were analyzed to explore the impact of epidural analgesia use on labor, delivery, and neonatal outcomes [12].

12. Complications Associated with Epidural Analgesia

Epidural analgesia is associated with both maternal and neonatal complications [58]. In the mother, the common complications include delayed ambulation, fever, susceptibility to urinary tract infections, distressing paresthesia, prolonged second stage of labor, and increased incidence of instrumental delivery [1]. Local anesthetics, particularly bupivacaine, are often used to provide labor analgesia, although they may enter the fetal circulation and cause neonatal side effects, such as increased motor block, lower Apgar scores, and increased odds of required neonatal resuscitation and admission to the neonatal intensive care unit (NICU) [12]. However, lactating mothers receiving labor epidural analgesia do not excrete bupivacaine or its metabolites in breast milk in significant amounts [59]. Currently, few recent studies examine the complications of labor epidural analgesia on the neonate [59]. Some studies report a significant association between its use and motor block [58]. Seven studies investigate the possible association between labor epidural analgesia and prolonged admission to NICU, but only two studies indicate a statistically significant correlation [60]. Recording at least one of the adverse outcome definitions occurs among 48.7% neonates in the labor epidural analgesia group and 39.3% in the control group [60]. No associations are seen between the complications and fentanyl or bupivacaine use [61]. A significant association between labor epidural analgesia and NICU admission due to fever is also seen, with the occurrence in 3.2% neonates in the labor epidural analgesia group and none in the control group [61]. There is contradictory evidence regarding the effect of labor epidural analgesia on pH of umbilical arterial blood cord [61]. A significantly lower base excess is also seen among neonates in the labor epidural analgesia group [62]. No significant association is shown between labor epidural analgesia and Apgar scores at one and five minutes [62]. It is concluded that there are no statistically significant associations between the fetal percentage heart rate change, early deceleration, late deceleration, or prolonged fetal bradycardia and labor epidural analgesia. Fetal bradycardia occurs within 30 minutes of the analgesia [63]. In the first minute, there is a significantly more extended duration of early deceleration and fetal heart rate change and significantly more fetal heart rate change should be performed in the cases [63].

13. Clinical Guidelines for Use

The control of pain during labor is advocated on the grounds that: [1] labor pain has been shown to be the most serious pain that women report, [2] fetuses are known to exhibit physiologic signs of stress response to maternal pain, [3] women's psychological and physical states can be enhanced with effective pain control, and 4) outcomes important to both mothers and infants are improved with adequate pain control [54]. Epidural analgesia (EA) is a popular labor analgesia technique that has been shown in large, adequately powered studies to be effective and safe [59]. Guidelines that advance the use of EA during labor, as well as studies that anticipate complications and adverse outcomes are important to the practicing obstetric anesthesiologist [59].

The goal of this study is to present easy-to-follow clinical guidelines commensurate with an appreciation of the known risks of EA. These guidelines include appropriate site selection for placement, a rational decision tree concerning whether to offer EA or not, performing continuous labor epidural catheterization to full-service capacity, along with analyses of current unresolved medicolegal issues that surround the use of EA (64). A description of common EA complications, how to avoid them, and what to do when complications occur is also followed [65].

The underlying basis for undertaking the above effort is that there continues to be a debate within the obstetric community as to whether the risks of EA outweigh its benefits [66]. Concerns have arisen regarding the reported, if rare, complications of EA including but not limited to: [1] maternal hypotension, [2] inadvertent dural puncture, [3] failure to provide analgesia, [4] incomplete analgesia or high block, [5] rebound pain, [6] localized anesthesia with resultant perineal tear, 7) hypotension-induced fetal compromise, 8) re-hospitalization of mother and infant, [9] transient neurologic events, [10] neurologic injury, and [11] maternal fever, with its sequelae [67]. On the other hand, supporters of labor EA point to studies confirming safety and effectiveness of this technique, as well as to variables closely associated with labor, delivery and neonatal outcomes that are not readily modifiable by adoption of the technique [1].

14. Patient Education and Consent

Since 1980, the prevalence of labor epidural analgesia (EA) for pain management during labor has increased significantly, reaching nearly 80% in some parts of the world [67]. Early studies raising concerns about some adverse effects of labor EA have largely found an evidence-based approach supportive of its safety and efficacy [37]. However, none of these studies assessed its effect on short-term neonatal morbidity [63]. As newer EA medications or techniques are introduced, it is vital to continually evaluate the adverse outcomes of these medications or techniques not only on maternal health but also on infant health [63].

Labor epidural anesthesia (LEA) is now the most effective and widely used technique for the relief of labor pain in developed countries [49]. Its use has been significantly increasing and is greater than 50% in some centers [15]. LEA is considered to be effective, with a high patient satisfaction rate compared to other techniques [31]. The LEA technique can be combined with an intravenous (IV) opioid agonist analgesia for added analgesia and a reduced local anesthetic dosage [59]. There is a perception among healthcare staff that labor epidural analgesia (EA) negatively affects neonatal outcomes, although this perception remains largely unquantified [61]. It is vital to address this topic and provide evidence-based information to this pregnant population to assist in making informed decisions [47].

In these studies, the effects of labor epidural analgesia (EA) on neonatal outcomes and the difficulties in establishing such a correlation were reviewed [68]. Although it has been documented that EA affects labor progression, more neonates with complications (such as cephalopelvic disproportion) had labor augmentation with oxytocin, which was thought to account for the lower Apgar scores [22]. Severe hypotension might occur during epidural placement [56]. The intravenous fluid bolus might prevent this hypotension [69]. There is no evidence that the population presenting for labor epidural analgesia is more likely to have a higher severity of illness in terms of the standard obstetric and perinatal risk variables [1].

15. Future Research Directions

Despite their widespread clinical use, there is limited high-quality evidence regarding the effect of epidural analgesia on labor duration and neonatal outcomes [10]. Most studies are observational in nature and include methodologic concerns [61]. The overall conclusion is that although labor epidural analgesia is associated with an increased risk of both prolonged labor and a cesarean delivery, the absolute effect is small [70]. This risk increases considerably only for nulliparous women with a high epidural dose [3].

This association may weaken in more recent studies than it did one or two decades ago, suggesting earlier recognition of progressive labor arrest and treatment with a cesarean delivery before prolonged labor becomes problematic [71]. There is a small risk of instrumental labor delivery with labor epidural analgesia [72]. Epidural analgesia may inhibit upward fetal head rotation in late labor, with a slight increase in the rate of forceps applications in nulliparous women and a shift toward vacuum extraction procedures [73]. There is no evidence that labor epidural affects the risk of obstetric anal sphincter injury for neither vacuum extraction nor forceps application [74].

Labor epidural analgesia is associated with a higher risk of a poor APGAR score at 1 or 5 min postnatally, especially among neonates born of mothers receiving dual SGA general IV analgesia or SGA and labor epidural analgesia [65]. Neonates born to mothers with prolonged exposure to SGA greater than 320 min are also more likely to develop a poor neonatal outcome [12]. There is a small risk of neonatal sepsis evaluation or hospitalization with a labor epidural [10].

16. CONCLUSION

Labor after epidural analgesia in obstetric patients is a challenging situation frequently encountered in obstetric practice; hence, it is important to evaluate the effectiveness and consequences of neuraxial analgesia, especially in regard to the duration of the first and second stages of labor and eventual perinatal outcome [10]. Though the first stage of labor is still longer in the epidural group, it is noteworthy that the second stage of labor is significantly shorter in the group receiving epidural analgesia, together with maternal and neonatal outcomes comparable with that of the control group [75].

Epidural analgesia can have both favorable and unfavorable effects on the labor process [59]. It can have a potentiating effect on ineffective uterine contractions and resultant prolongation of the first stage of labor; nevertheless, it can relieve pain during the eventual effective uterine contractions and maternal voluntary urge leading to reduction of the second stage of labor [76]. Though it is prudent to make all efforts to ensure vaginal delivery, obstetricians, anesthetists, and obstetric nurses should be aware of the facts that epidural analgesia may not worsen the outcome of labor and can be associated with an overall successful progression of labor [65].

Epidural analgesia in labor is used widely owing to its efficacy and safety [10]. However, concerns remain about its possible adverse effects such as prolonged labor, increased instrumental deliveries with increased risk of maternal and neonatal complications, and fever in labor with potential neonatal consequences [62]. On the other hand, neuraxial analgesia is associated with a sympatholytic effect and consequent effects on body temperature, thermoregulation, and fever [11]. Concerning the maternal temperature, a rapidly increased core temperature rather than a steadily increased temperature over the course of labor after

neuraxial analgesia is more directly associated with an adverse outcome of neonatal sepsis evaluation [58].

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