Med & Health Aug 2024; 19(2): 537-546 https://doi.org/10.17576/MH.2024.1902.14

ORIGINAL ARTICLE

The Effects of Labour Neuraxial Analgesia Used on Maternal and Neonatal Outcomes

CYENA CK[1], CHOONG YJ[1], ABDUL RAZAK SR[1], AHMAD RYZAL ANA[1], FITRI HAMZAH MD[1], ABDUL RAZAK DN[1], WAN MAT WR[2], MD. ZAIN J[2]

[1]Faculty of Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia
[2]Department of Anaesthesiology and Intensive Care, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

Received: 30 Jan 2024 / Accepted: 27 Feb 2024

ABSTRAK

Kesan jenis teknik sentral neuraksial (CN) yang digunakan semasa bersalin terhadap cara kelahiran ibu (MOD) dan skor 'Appearance, Pulse, Grimace, Activity and Respiration' (APGAR) neonatal telah dinilai. Data daripada 1378 ibu bersalin yang berumur ≥18 dengan kehamilan tunggal pada tempoh matang (≥37 dan ≤42 minggu kehamilan) dan menerima analgesia CN ketika bersalin telah dikaji secara retrospektif. Data demografi, jenis teknik CN yang digunakan, MOD ibu dan skor APGAR neonatal telah direkodkan. Teknik CN digunakan dalam 19.36% ibu ketika bersalin dan kebanyakannya adalah teknik epidural (16.76%). Ibu yang menggunakan teknik gabungan spinal epidural (CSE) untuk analgesia semasa bersalin mempunyai lebih banyak kelahiran instrumental (IDs) berbanding dengan menggunakan teknik epidural (22 (22.4%) berbanding 76 (77.6%), p=0.011). Ibu yang menggunakan teknik CSE untuk analgesia semasa bersalin mempunyai kemungkinan peningkatan ID sebanyak 2.044 (95% CI 1.186-3.253, p=0.01) dan risiko parturient yang nulipara meningkat sebanyak 2.110 (95% CI 1.299 3.249, p=0.03). Jenis teknik CN yang digunakan ketika bersalin tidak mempengaruhi skor APGAR neonatal (skor APGAR: Baik [epidural 1182 (99.6%) berbanding CSE 189 (99%) dan Buruk [epidural 5 (0.4%) vs. CSE 2 (1.0%)], p=0.252). Kesimpulannya, jenis teknik CN yang digunakan ketika bersalin mempengaruhi MOD ibu tanpa memberi kesan pada neonatal.

Kata kunci: Analgesia semasa bersalin; epidural; gabungan spinal epidural

Address for correspondence and reprint requests: Associate Professor Dato' Dr. Wan Rahiza Wan Mat. Department of Anaesthesiology and Intensive Care, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia. Tel: +60192787493 Email: docaweng@yahoo.com

ABSTRACT

The effect of types of labour central neuraxial (CN) technique used on maternal mode of delivery (MOD) and neonatal Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score were evaluated. Data of 1378 parturients who were aged ≥18 with singleton pregnancy at term (≥37 and ≤42 weeks' gestation) and received labour CN analgesia were retrospectively reviewed. Their demographic data, types of CN technique used, maternal MOD and neonatal APGAR score were recorded. Labour CN techniques were performed in 19.36% parturients which mostly was epidural technique (16.76%). Parturients who used combined spinal epidural (CSE) technique for labour analgesia had more instrumental deliveries (IDs) compared to using epidural technique (22 (22.4%) vs. 76 (77.6%), p=0.011). Parturients who used CSE technique for labour analgesia had an increased likelihood of IDs by 2.044 (95% CI 1.186-3.253, p=0.01) and parturients who were nulliparous had higher risk by 2.110 (95% CI 1.299-3.249, p=0.03). The types of labour CN technique used did not affect the neonatal APGAR scores (APGAR score: Good [epidural 1182 (99.6%) vs. CSE 189 (99%) and Bad [epidural 5 (0.4%) vs. CSE 2 (1.0%)], p=0.252). In conclusion, the types of labour CN technique used affected the maternal MOD without affecting the neonatal outcome.

Keywords: Combined spinal epidural; epidural; labour analgesia

INTRODUCTION

Parturients in labour experience visceral pain during the first stage and somatic pain during the second stage of labour. Labour pain is intensified with greater cervical dilatation that is accompanied by the increased intensity, duration and frequency of uterine contractions (Labor & Maguire 2008). Hence, the need for analgesia during childbirth. The use of central neuraxial (CN) technique was described as early as in the 1930s (CLELA~CD 1933). A review article which explained that labour pain was a recurrent intense pain experienced by parturients which required the use of CN to ease the labour pain and reduced the side effects for both the mother and newborn (Hawkins 2010). Additionally, the use of CN was found to provide a lower pain score with increasing maternal satisfaction which made CN technique the gold standard for intrapartum labour analgesia (Anim-Somuah et al. 2018; Cambic & Wong 2010).

Controversies still exist concerning the use of labour CN technique effects specifically pertaining to the progress and outcome of labour for both the mother and newborn. Epidural labour analgesia resulted in longer durations of labour, more instrumental deliveries (ID), and emergency lower segment caesarean sections (EMLSCS) (McGrady & Litchfield 2004). Nevertheless, there

was also increasing evidence that refuted these claims (Shatil & Smiley 2020).

A study revealed longer labour analgesia duration in the parturients that received combined spinal epidural (CSE) compared to those that received epidural analgesia (Nakamura et al. 2009), which then reaffirmed in a retrospective cohort study assessing the effects of CSE analgesia in labour (Yamamoto et al. 2023). They also detected more use of oxytocin infusion to augment the deliveries ($p<0.01$), increased rate of ID, blood loss volume during vaginal delivery ($p<0.01$), meconium-stained amniotic fluid and APGAR score less than 7 at 1 minute (Yamamoto et al. 2023).

Most of the studies compared groups that received labour analgesia using CN technique, including epidural analgesia and CSE analgesia, with parturients that did not receive CN labour analgesia. However, there were fewer studies that compared the association between the different types of CN techniques used in labour with maternal and neonatal outcomes. The aim of this study was to determine the prevalence of CN used among parturients and its effects on maternal and neonatal outcomes in a tertiary teaching hospital.

MATERIALS AND METHODS

After obtaining our institution's Research Ethics Committee's approval, a retrospective cohort study was conducted by collecting parturients' data from medical records of the Labour Analgesia Service Registry between the period of January 2020 to December 2021. We included data from parturients who received labour analgesia with an epidural or CSE technique during the study period. These parturients were of any gravidity at term (≥37 and ≤42 weeks period of gestation) and aged 18 years old. Parturients with a history of recurrent miscarriages (≥3) and who were planned for elective lower-segment caesarean section were excluded.

In our institution, the CN techniques were performed by anaesthetists on duty in the labour room when parturients were in the active phase of labour. The types of CN that were used were decided by the attending anaesthetists (epidural or CSE). The CN procedures were administered in the lumbar interspace L3/L4 or L4/L5. In our setting, a standardised drug regime was used. For epidural technique, a 2 mL test dose of 2% lignocaine was injected followed by an epidural admixture of 5 mL levobupivacaine 0.1% with fentanyl 2 g/mL was then administered through the epidural catheter using fixed continuous epidural infusion at a 5 mL/hr and patient-controlled epidural analgesia (PCEA), a bolus of 5 mL with a 15-minute lockout interval using the analgesia pump. For CSE technique, the spinal admixture bolus of 1 mL levobupivacaine 0.1% with fentanyl 25 g/mL was administered in the subarachnoid space followed by the same epidural admixture bolus and infusion regime and PCEA regime as epidural technique. The labour CN analgesia was continued until delivery and the duration of epidural analgesia

was recorded.

The data collected were demographic characteristics, medical and obstetric histories, and information regarding the course of the index pregnancy and perinatal outcomes. Parturients that gave medical histories of gestational diabetes mellitus, gestational hypertension, anaemia, hypothyroidism, asthma & obesity were grouped as parturient with medical conditions. Data from the CN provided were also recorded. Study outcome measures recorded were the maternal mode of deliveries and neonatal APGAR scores. Maternal mode deliveries that were recorded were spontaneous vaginal delivery (SVD), ID, and EMLSCS. APGAR scores were recorded as good (≥7) and bad (<7). The chart of the data collection process was shown in Figure 1.

Statistical Analysis

Sample size was calculated by detecting the difference between two proportions. The calculation used the following formula for the sample size, n:

$$n = \frac{P_1(1-P_1) + P_2(1-P_2)\,(Z_\alpha + Z_\beta)^2}{(P_1-P_2)^2}$$

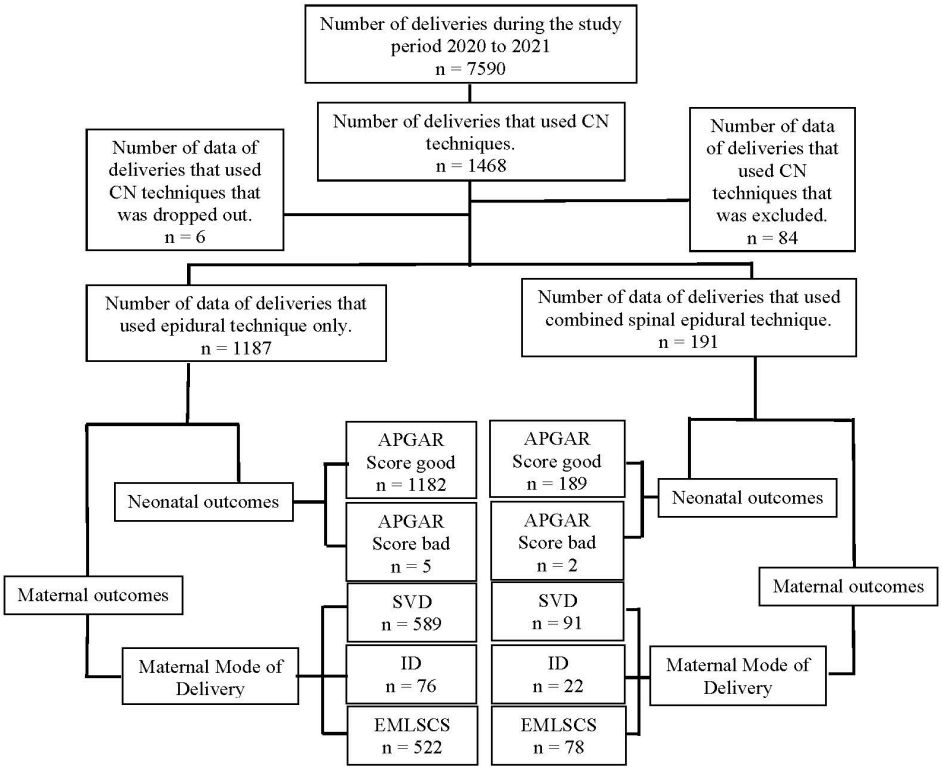

FIGURE 1: Overview of data collection process. CN: Central Neuraxial; SVD: Spontaneous Vaginal Delivery; ID: Instrumental Delivery; EMLSCS: Emergency Lower Segment Caesarean Section

Where,
n = required sample size
P_1 = was prevalence of parenteral opioids from previous study (Leighton et al. 2002)
P_2 = was prevalence of epidural analgesia from previous study (Leighton et al. 2002)
Z_α = critical value of the Normal distribution at α
Z_β = critical value of the Normal distribution at β
Therefore,

$P_1 = 0.08$, $P_2 = 0.07$
Z_α is 1.96 for confidence level of 95% for $\alpha = 0.05$ (two-tailed)
$Z_\beta = 0.84$ for 80% power

$$= \frac{0.08(1-0.08)+0.07(1-0.07)\,(1.96+0.84)^2}{(0.08-0.07)^2}$$

= 109 per group

n = (109 x 2) + 15% dropout rate
= 251 parturients

The first proportion was the prevalence of parenteral opioids, and the second proportion was the prevalence of epidural analgesia. The sample size calculation was based on a systematic review of the effect of epidural analgesia on labour, maternal and neonatal outcomes (Leighton et al. 2002). The outcomes sought were similar to our study. Our dropout rate for this research would be 15% due to incomplete medical records. In conclusion, a minimum sample size of 251 parturients are needed to be recruited with 80% power of the study, 95% confidence interval, and anticipation of a 15% dropout rate.

The SPSS version 26.0 software was used to analyse the collected data. Descriptive statistics were computed to describe the sociodemographic variables by using frequency (percentage for categorical variables), mean and standard deviation for continuous variables. A cross tabulation with Pearson's chi-square test was then computed to determine the association between types of CN technique used with maternal and neonatal outcomes. A multiple logistic regression test was used to analyse factors predicting maternal outcomes. P values were considered significant at $p<0.05$.

RESULTS

A total number of 7590 deliveries were recorded in the centre from the year 2020 to 2021. The prevalence of labour analgesia using CN techniques was 1468 (19.36%). Labour analgesia via epidural technique was provided in 1272 (16.76%) parturients and 196 (2.6%) parturients received CSE analgesia. We analysed data of 1378 parturients that received labour CN analgesia as data of 84 parturients were excluded and 6 data were dropped out from the study. Table 1 showed the groups had comparable demographic, obstetrics and medical characteristics of the parturients based on the types of labour CN analgesia they received.

The comparison between the types of labour CN analgesia and maternal and neonatal outcomes were shown in Table 2. Parturients who had labour CSE analgesia had higher rates of IDs compared to those who used epidural technique. There was no significant

TABLE 1: Comparison of the demographic, obstetrics and medical characteristics between the labour central neuralaxial technique used. Values were expressed as numbers with percentages in parentheses or as mean ± standard deviations when applicable

Characteristic		Central Neuraxial n = 1378	Epidural n = 1187	Combined Spinal Epidural n = 191	P value
	Age, years	30.7 ± 4.4	30.6 ± 4.5	40.0 ± 4.3	0.379
Race	Malay	1105 (80.2)	958 (86.7)	147 (13.3)	0.504
	Chinese	172 (12.5)	142 (82.6)	30 (17.4)	
	Indians	49 (3.6)	43 (87.8)	6 (12.2)	
	Others	52 (3.8)	44 (84.6)	8 (15.4)	
Parity	Nulliparous	660 (47.9)	558 (84.5)	102 (15.5)	0.101
	Multiparous	718 (52.1)	629 (87.6)	89 (12.4)	
Co-morbidities	Parturient with medical condition	616 (44.7)	536 (87.0)	80 (13.0)	0.399
	Parturient without medical condition	762 (55.3)	651 (85.4)	111 (14.6)	

difference between the types of labour CN used and the neonatal APGAR scores.

To determine factors predicting maternal outcomes, further analysis was performed using multiple logistic regression adjusted for the confounding factors of parturients' age, race, parity, period of gestation, medical condition, and types of CN used as presented in Table 3.

DISCUSSION

During the study period, we detected less than a fifth of parturients received labour analgesia using CN techniques. Published data on the rate of CN used

TABLE 2: Comparison between types of labour central neuralaxial technique used and study outcomes. Values were expressed as numbers with percentages in parentheses

		Epidural n = 1187	Combined Spinal Epidural n = 191	P value
Mode of Delivery	SVD	589 (86.6)	91 (13.4)	0.612
	ID	76 (77.6)	22 (22.4)	0.011*
	EMLSCS	522 (87.0)	78 (13.0)	0.433
APGAR Score	GOOD	1182 (99.6)	189 (99.0)	0.252
	BAD	5 (0.4)	2 (1.0)	

SVD: Spontaneous vaginal delivery; ID: Instrumental delivery; EMLSCS: Emergency lower caesarean section
*p-value less than 0.05 was significant

TABLE 3: Multiple logistic regression of factors predicting instrumental deliveries

Variable	AOR (95% CI)	P-value
Nulliparous	2.110 (1.299-3.249)	0.003*
Combined Spinal Epidural	2.044 (1.186-3.253)	0.01*

ID: Instrumental Delivery; AOR: adjusted odds ratio; CI: confidence interval.
Adjusted for parturient age, race, parity, period of gestation, medical condition, technique of central neuraxial; *p-value less than 0.05 was significant

as labour analgesia in other tertiary institutions within the country had been limited in recent years. In late 1990s, a survey was conducted in 35 hospitals around the country on the practice of labour analgesia revealed that the mean epidural labour analgesia rate was 1.5% (Chan & Ng 2000). Thus, our study showed almost 20-fold increased usage of labour CN analgesia over the span of two decades. This increased use in our centre may be explained by the increased awareness of labour CN analgesia by our parturients via attending the antenatal classes which options of labour analgesia were described, the wider availability of the labour CN analgesia service including after hours and the openness of our midwives to the option of labour CN analgesia especially during their training in reassuring the parturients of the options for labour CN analgesia. Comparatively, the use of epidural labour analgesia varies around the world from 10% and 83% despite epidural labour analgesia is considered the gold standard for labour analgesia by WHO and various factors affects their use (Ashagrie et al. 2020; Halliday et al. 2022; Seijmonsbergen-Schermers et al. 2020).

Our institution's anaesthetists showed preference for labour epidural technique whereas 20 years ago in Canada, 28% of anaesthetists reported already using labour CSE techniques (Breen et al. 2000). The use of labour CSE techniques had been gaining popularity in our country with its introduction as an attempt to possibly reduce the adverse effects related to the only epidural technique (Singh et al. 2016; Simmons et al. 2012). However, labour CSE technique is still less preferred in many other countries such as in Belgium and Spain where CSE is used in only 20% of parturients (Miro et al. 2008; Versyck & Van Houwe 2016).

Instrumental deliveries are associated with several complications and when forceps-assisted vaginal delivery was performed, it had up to 3.4 times more risk in resulting in complications compared to vacuum-assisted vaginal delivery (Biru et al. 2019). Complications of IDs included vaginal laceration, traumatic perineal tear, and cervical tear. Moreover, parturients who underwent IDs had higher post-traumatic stress disorder than those who had SVD (Dekel et al. 2019). Consequently, we postulate that the combinations of these complications could further deteriorate the parturients' labour outcomes, resulting in longer hospital stays

and added financial responsibilities. Despite these findings, as revealed in the first paragraph, there were an increased use of labour CN analgesia in our centre. However, we did not investigate our parturients mental well-being nor physical complications after IDs, which could add more valuable information in evaluating the risks for labour CN analgesia especially when obtaining informed consent from parturients opting for this labour analgesia choice.

We identified a significant association between the types of CN labour analgesia used and maternal MOD. Parturients who had labour CSE analgesia were likely to go through IDs which was similarly detected by a systematic review (Simmons et al. 2012). A few studies that compared epidural labour analgesia and without its use during labour demonstrated that epidural labour analgesia had significantly increased risk for IDs (Antonakou & Papoutsis 2016; Carroll et al. 2003; Penuela et al. 2019). Therefore, parturients' labour progress needs to be monitored diligently when CN techniques are used as labour analgesia.

We identified increased risks for IDs among nulliparous parturients who received labour CSE techniques. A systematic review showed multiple reports indicating labour epidural analgesia prolonged labour that increased rates of IDs (Ashagrie et al. 2020). Our institution used levobupivacaine 0.1% as suggested by the landmark study that showed SVD rates increased when lower concentrations (0.1%) in comparison to high concentrations of local anaesthetics (LA, 0.25%) are used in the epidural infusions (COMET 2001). The lowest concentration of LAs that preserves the motor power of parturition was 0.0625% (Cambic & Wong 2010), yet when we compared between groups (epidural vs. CSE) that used the same concentrations of LAs in the epidural infusions, the determinant of IDs was the use of CSE technique as labour analgesia.

Although our result was not statistically significant, we observed newborn that were delivered with bad APGAR scores, their mothers had shorter mean duration of labour epidural infusion. We believe the shorter duration of epidural infusion was confounded by the indication for the neonate to be delivered urgently regardless of the mode of delivery, hence cutting short the need for labour epidural analgesia. Other reports also had shown the use of epidural labour analgesia either via epidural or CSE techniques did not result in negative outcomes in the neonates (Kearns & Lucas 2023; Simmons et al. 2012; Turner et al. 2020; Wang et al. 2014).

There were several limitations to our study. The labour CN techniques provided and its management for labour analgesia in this study was specific to our institution which may differ from other institutions that provide the same service. Thus, caution will need to be considered when applying the findings of this study. We did not collect any information regarding socio-economic characteristics of the parturients which may affect the prevalence and the use of CN

techniques in labour. A study detected the level of education and income of parturients and the availability of private insurance influenced the use of labour CN analgesia (Hueston et al. 1994). Although the incidence of EMLSCS was not statistically different between the groups, we observed high proportions of parturients that used labour CN analgesia had EMLSCS. Information regarding indications for EMLSCS would be beneficial to investigate for this incidence which we did not collect.

CONCLUSION

In conclusion, the prevalence of labour epidural analgesia use in our centre is low. The types of labour CN technique used affected the maternal MOD without affecting the neonatal outcome.

ACKNOWLEDGEMENT

The authors would like to extend their gratitude to Associate Professor Dr. Rozita Hod, Clinical Lecturer of the Department of Community Health for helping with the calculation of the sample size. The authors were also thankful to Pn. Qurratu 'Aini Binti Musthafa, the Science Officer of the Department of Anaesthesiology and Intensive Care, UKMMC for helping with the statistical analysis. The authors were also grateful to the midwives who gave their logistics assistance in terms of accessing the patient medical records via the labour pain service registry.

REFERENCES

Anim-Somuah, M., Smyth, R.M., Cyna, A.M., Cuthbert, A. 2018. Epidural versus non-epidural or no analgesia for pain management in labour. *Cochrane Database of Syst Rev* **5**(5): CD000331.

Antonakou, A., Papoutsis, D. 2016. The effect of epidural analgesia on the delivery outcome of induced labour: A retrospective case series. *Obstet Gynecol Int* **2016**: 5740534.

Ashagrie, H.E., Fentie, D.Y., Kassahun, H.G. 2020. A review article on epidural analgesia for labor pain management: A systematic review. *Int J Surg Open* **24**(1): 100-4.

Biru, S., Addisu, D., Kassa, S., Animen, S. 2019. Maternal complication related to instrumental delivery at Felege Hiwot Specialized Hospital, Northwest Ethiopia: A retrospective cross-sectional study. *BMC Res Notes* **12**(1):482.

Breen, T.W., McNeil, T., Dierenfield, L. 2000. Obstetric anesthesia practice in *Canada. Can J Anaesth* **47**(12): 1230-42.

Cambic, C.R., Wong, C.A. 2010. Labour analgesia and obstetric outcomes. *BJA* **105**(s1): 150-60.

Carroll T.G., Engelken, M., Mosier, M.C., Nazir, N. 2003. Epidural analgesia and severe perineal laceration in a community-based obstetric practice. *J Am Board Fam Pract* **16**(1): 1-6.

Chan, Y.K., Ng, K.P. 2000. A Survey of the current practice of obstetric anesthesia and analgesia in Malaysia. *J Obstet Gynaecol Res* **26**(2): 137-40.

CLELA~CD, J.S.P. 1933. Paravertebral anaesthesia in obstetrics. *Surg Gynec Obst* **57**:51.

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK. 2001. Effect of low-dose mobile versus traditional epidural techniques on mode of delivery: A randomised controlled trial. *Lancet* **358**(9275):19-23.

Dekel, S., Ein-Dor, T., Berman, Z., Barsoumian, I. S., Agarwal, S., Pitman, R.K. 2019. Delivery mode is associated with maternal mental health following childbirth. *Arch Womens Ment Health* **22**(6): 817-24.

Halliday, L., Nelson, S.M., Kearns, R.J. 2022. Epidural analgesia in labor: A narrative review. *Int J Gynecol Obstet* **159**: 356-64.

Hawkins, J.L. 2010. Epidural analgesia for labour and delivery. *N Engl J Med* **362**(16): 1503-10.

Hueston, W.J., McClaflin, R.R., Mansfield, C.J., Rudy, M. 1994. Factors associated with the use of intrapartum epidural analgesia. *Obstet Gynecol* **84**(4): 579-82.

Kearns, R.J., Lucas, D.N. 2023. Neuraxial analgesia in labour and the foetus. *Best Pract Res Clin Anaesthesiol* **37**(1): 73-86.

Labor S, Maguire S. 2008. The Pain of Labour. *Rev Pain* **2**(2): 15-19.

Leighton, B.L. and Halpern, S.H., 2002. The effects of epidural analgesia on labor, maternal, and

neonatal outcomes: A systematic review. *Am J Obstet Gynecol* **186**(5): S69-S77.

McGrady, E., Litchfield, K. 2004. Epidural analgesia in labour. *Cont Educ Anaesth Crit Care Pain* **4**(4): 114-7.

Miro, M., Guasch, E., Gilsanz, F. 2008. Comparison of epidural analgesia with combined spinal-epidural analgesia for labour: A retrospective study of 6497 cases. *Int J Obstet Anesth* **17**(1): 15-9.

Nakamura, G., Ganem, E.M., Rugolo, L.M., Castiglia, Y.M. 2009. Effects on mother and fetus of epidural and combined spinal-epidural techniques for labor analgesia. *Rev Assoc Med Bras* **55**(4): 405-9.

Penuela, I., Isasi-Nebreda, P., Almeida, H., López, M., Gomez-Sanchez, E., Tamayo, E. 2019. Epidural analgesia and its implications in the maternal health in a low parity community. *BMC Pregnancy Childbirth* **19**(1): 52.

Seijmonsbergen-Schermers, A.E., van den Akker, T., Rydahl, E., Beeckman, K., Bogaerts, A., Binfa, L., Frith, L., Gross, M.M., Misselwitz, B., Hálfdánsdóttir, B., Daly, D., Corcoran, P., Calleja-Agius, J., Calleja, N., Gatt, M., Vika Nilsen, A.B., Declercq, E., Gissler, M., Heino, A., Lindgren, H., de Jonge, A. 2020. Variations in use of childbirth interventions in 13 high-income countries: A multinational cross-sectional study. *PLoS Med* 17(5): e1003103.

Shatil, B., Smiley, R. 2020. Neuralaxial analgesia for labour. *BJA Educ* **20**(3): 96-102.

Singh, S.K., Yahya, N., Misiran, K., Masdar, A., Nor, N. M., Yee, L.C. 2016. Combined spinal-epidural analgesia in labour: Its effects on delivery outcome. *Braz J Anesthesiol* **66**(3): 259-64.

Simmons, S.W., Taghizadeh, N., Dennis, A.T., Hughes, D., Cyna, A.M. 2012. Combined spinal-epidural versus epidural analgesia in labour. *Cochrane Database Syst Rev* **10**(10): CD003401.

Turner, J., Flatley, C., Kumar, S. 2020. Epidural use in labour is not associated with an increased risk of maternal or neonatal morbidity when the second stage is prolonged. *Aust N Z J Obstet Gynaecol* **60**(3): 336-43.

Versyck, B., Van Houwe, P. 2016. A survey of obstetric anesthesia practices in Flanders -10-year update. *Acta Anaesthesiol Belg* **67**(67): 101-11.

Wang, K., Cao, L., Deng, Q., Sun, L.Q., Gu, T.Y., Song, J., Qi, D.Y. 2014. The effects of epidural/spinal opioids in labour analgesia on neonatal outcomes: A meta-analysis of randomized controlled trials. *Can J Anaesth* **61**(8): 695-709.

Yamamoto, Y., Umehara, N., Yamashita, Y., Sato, M., Takehara, K., Sago, H. 2023. Labor risk factors for fetal heart rate abnormality after combined spinal-epidural analgesia. *Int J Gynaecol Obstet* **160**(3): 892-9.