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Research Article

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The Rate of Epidural Analgesia in Labor with Maternal And Neonatal Outcome at Tertiary Hospital in Oman

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Abstract

Objectives: *The primary objective is to determine the epidural analgesia rate and its effect on the mode of delivery. The secondary objectives are to assess patient satisfaction, duration of second stage of labour and incidence of maternal, fetal and neonatal outcomes.*

Methods: *A retrospective cohort design utilized in this study, involving all pregnant women received epidural analgesia in labour at Sultan Qaboos University Hospital over 3 years period (March 2020 to March 2023). All data is collected from the delivery register at Delivery ward, SQUH track care system, and epidural record chart. Women's information remained confidential. All entered data in the SPSS program is stored in a password-protected computer.*

Results: *There was a total of 7076 deliveries, out of which 389 received epidural analgesia, with a rate of 5.0% (95% CI: 5.0 – 6.0). Out of 389 deliveries, around half were nulliparous and the other half were multiparous. The rate of spontaneous vaginal delivery constituted 60.7%. On the other hand, instrumental deliveries and LSCS constituted 14.9% and 24.4% respectively. The median and mean (±SD) period of 2nd stage were 24.0 and 38.3±40.1. Only 1% of all included patients had prolonged second stage of labor. The rate of oxytocin use was 54.5%, and around 52.4% of it was among nulliparous. 148 patients (52.5%) reported full benefit from epidural analgesia use, compared to 6% who reported no benefit. In addition, 12.7% of CTG showed fetal distress and post-partum hemorrhage constituted 6.7% among delivered ladies. The study showed that 10.0% of included ladies suffered one or more of post-partum complications, including fever (n 13, 3.3%), headache (n 10, 2.6%), backache (n 3, 0.8%), hypotension (n 9, 2.3%), urine retention (n 3, 0.8%), pruritus (n 1, 0.3%), and nausea and vomiting (n 1, 0.3%). 6.2% was the rate of NICU admissions among the newborns.*

Conclusions: *The study revealed that 5% was the rate of epidural analgesia usage and spontaneous vaginal delivery was the main mode of delivery. However, the indications for delivery by cesarean section or instruments were not related to epidural analgesia in labour. In addition, there was no significant adverse effect on maternal, fetal and neonatal outcome. Based on that, we need to elaborate more on epidural analgesia awareness and usage in order to be offered. Although some previous reviewed studies reported adverse effects of epidural analgesia on labour outcome. Future researches are recommended including prospective design study, bigger sample size, wider variation and multicenter studies.*

Keywords: Epidural Analgesia, Oxytocin, APGAR Score, Spontaneous Vaginal Delivery , Lower Segment Cesarean Section, Cardiotocography.

Introduction

Labor identified as being one of the most painful experiences a human being can handle. Labor pain not only considered unpleasant experience physically, but it can have other impact if not controlled well, as it can increases the sympathetic activity leading to higher level of free fatty acid, hyperglycemia and maternal metabolic acidosis leading to fetal metabolic acidosis, not only this, but also it can cause hyperventilation and respiratory alkalosis leading to uterine vasoconstriction, reducing placental flow and ultimately leading to fetal hypoxia [1]. There for controlling pain is an important aspect when treating a woman in labor. Pain is a subjective experience and it differ from one woman to another, there has been different scales established to assess the severity of pain, such as the visual analogue scale (VAS), numerical rating scale (NRS) and the verbal numerical rating scale (v-NRS). In case of the VAS, women are asked to express their pain with tow anchor statements, for example no pain when the intensity is low, and worst imaginable pain, and it is considered the gold standard in clinical research, but the most used is the NRS where the patient is asked to rate her pain from 0 to 10 [2].

There have been different modalities invented to help laboring women to tolerate pain, including pharmacological and non-pharmacological measures. The nonpharmacological includes breathing techniques, changes in position, manual techniques such as massage, warm and cold packs as well as using birth balls. In regard to pharmacological intervention, one of the commonly used is the inhaled N2O, it is usually used as a combination of 50% of N2O and 50% of O2, as a self-administered facial mask. It is considered a safe drug, as it is eliminated rapidly from both mother and fetus circulation, it also does not affect the progress of labor nor the mode of delivery. On the other hand, the side effects of such drug, reported as follows: nausea, dizziness, and drowsiness, it also reported to be less effective in terms of pain relive compared to other medications. Another used medication is acetaminophen, it is considered a safe option, and do not require any special monitoring. Opioids are another effective option for labour analgesia, such as pethidine and morphine, which are commonly used during labor, but they are associated with more side effects compared to the previously mentioned drugs, there side effects on the mother might include nausea, vomiting, sedation, respiratory depression, on the other side, they cross the placenta and might cause reduction on the fetal heart rate variability and depress the neonatal respiratory system . Remifentanil is another opioid that is given intravenously as a patient- controlled analgesic, it is ultra drug short with a half-life of three minutes and it is considered saver when compared to pethidine.

Epidural analgesia is considered the most effective modality in treating labor pain. Epidural analgesia is a central nerve blockade technique, which involves the injection of a local anesthetic into the epidural space of the lower region of the spine. Epidural analgesia performed by an expert anesthetist. Pre-procedure check includes detailed history and examination, blood tests including normal platelets count and check thromboprophylaxis status. Others include, obtaining informed consent, at least 20 minutes normal Cardiotocography (CTG), ensure the patient is in well hydrated status with good IV access. The patient positioned, skin prepared, local given and then the catheter introduced into the proper space. An epidural analgesia chart is to be carefully filled in, recording blood pressure, sensory level of block, dosages of drugs administered and any new onset of motor block in case of which anesthetist should be alerted. Opioid forms and register need to be filled when opioids are used for the procedure. Previous studies showed controversy regarding the effect of epidural on the progress of labor, mode of delivery and subsequent effects on the fetus and neonate [3].

There has been a lot of studies aiming to identify the impact of epidural on both mother and the baby. One recent study of the effect of Epidural Analgesia on Maternal and Early Neonatal Outcomes in Qatar State aimed to describe the maternal and neonatal morbidities associated with labor epidural analgesia. The study included 7721 singleton vaginal births at 24 weeks and above conducted in Woman's hospital between January 2017 and April 2018, Women who had epidural analgesia compared to women with no epidural analgesia during labor [3]. The study concluded that epidural analgesia was associated with many maternal and neonatal-perinatal risks. It may prolong all stages of labor, precipitate instrumental delivery need, increase NICU admission for different risk factors including respiratory distress and rule out sepsis.

Similarly, a recent retrospective cohort study conducted in China from January 1, 2020 to September 30, 2020. It aimed to investigate the impact of epidural analgesia on the stages of labor and maternal and neonatal outcomes [4]. The study concluded that labor analgesia may prolong the 1st and 2nd stages of labor , However the study showed increases the incidence of intrapartum fever, without increasing the rate of transit to caesarean section and postpartum hemorrhage, it also concluded that labor analgesia does not negatively affect the Apgar score or increase the neonatal asphyxia rate.

In the contrary a study was conducted in China, aimed to compare the outcomes of labor among primigravida with and without epidural analgesia. The study found that women who received epidural has a shorter duration of first stage of labor and lower risk of postpartum hemorrhage with higher risk of urinary retention ($P< 0.05$) compared to the control group, but no significant difference in the neonatal outcome between the two groups.

Equivalent results were found in another study that was conducted in Poland. The aim of the study was to study the effect of epidural analgesia on labor duration and mode of delivery. The study found that both first and second stage of labor were prolonged in those who received epidural analgesia. Moreover, the rate of instrumental deliveries and longer hospital stay were also higher among those

patients. However, there was no association between epidural and postpartum hemorrhage neither admission to the NICU or APGAR < 7 [5].

Although different studies were conducted around the world aiming to identify the rate of epidural analgesia usage, effectiveness, and outcome but no such study was conducted in Oman. Our study will be beneficial for both physician and patients, it will provide us information on how much this service is utilized and knowledge about outcome in relation to epidural analgesia use in Oman. Moreover, patient satisfaction is valuable tool to assess quality of care provided to the patient, therefore this study will help us to find out the level of patient's satisfaction through the epidural chart.

The objectives behind our study are as follow

1. Primary objective: To estimate the rate of epidural analgesia usage among ladies who received epidural analgesia during the period of March 2020 to March 2023 at SQUH

2. Secondary objectives:

a) To assess incidence of maternal and fetal outcomes among ladies who received epidural analgesia during the period of March 2020 to March 2023 at SQUH.

b) To assess patient's satisfaction from the same sample.

Methods

The design utilized in this study was a retrospective cohort design. Estimation of the epidural rate demanded the involvement of all pregnant women who received epidural analgesia in labor at Sultan Qaboos University Hospital over three years (March 2020 to March 2023).

Ethical approval for this study was obtained from the Medical Research Ethics Committee (MREC) at Sultan Qaboos University Hospital. Due to the study's retrospective design, the informed consent for this study has been waived. The data of this study was Obtained from the medical record, patient electrical record, and epidural record form. During the data collection, women's information remained confidential.

The study included all women with singleton, term gestation equal to or above 37 weeks who had epidural in labor during the study period. Exclusion criteria comprise all fetuses with significant congenital anomalies, intrauterine fetal death, preterm <37 weeks, postdate >41+6 weeks, and Multiple gestation.

The primary objective is to determine the epidural analgesia rate and its effect on the mode of delivery, which is categorized as spontaneous vaginal delivery, instrumental delivery for by cesarean section. The secondary objectives are to evaluate patient satisfaction (obtained from epidural record and categorized into No benefit, some benefit, fair benefit and full benefit), duration of the second stage of labor, described by a period of more than three hours for nulliparous and more than two hours for multiparous. The neonatal outcome, manifested with APGAR score system that assesses five newborn parameters comprises appearance, pulse rate, grimace, activity, and respiration immediately after birth. The score calculated in one and five minutes from birth, and 2 points given to each one of the previous parameters (score of =<3 points, 4 to 6 points, and =>7 points classified as critically low, relatively low and generally accepted score respectively). The maternal consequences are collected from the epidural charts, such as complaints of headache, backache, hypotension, urine retention, pruritus, and nausea & vomiting.

The statistical program for data analysis was SPSS-29. The categorized variables were depicted in percentages and frequencies, while continuous variables were represented in mean/SD, median, and interquartile range. The calculation of the epidural analgesia rate was manifested as a percentage with a 95% confidence interval. All the data entered were on a password-protected computer.

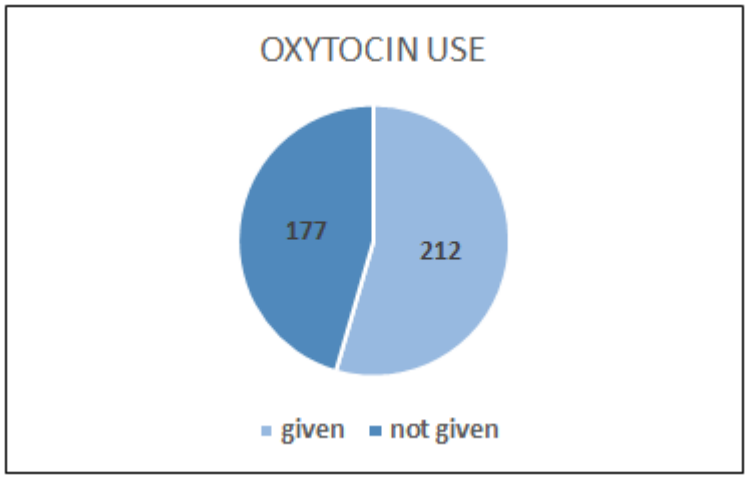
Results

In the study period, there was a total of 7076 deliveries, out of which, 389 received epidural analgesia, with a rate of 5.0% (95% CI: 5.0 – 6.0). Out of total of 389 patients who received epidural analgesia, around half were nulliparous and the other half were multiparous. The mean (±standard deviation (SD)) gestational age of included sample was 38.5±1.1 weeks, with median of 38.4. Table 1 details patient characteristics and outcome distributions.

Characteristics/outcomes	Subgroups	n (%)
Parity (n 388)	Nulliparous	192 (49.5%)
	Multiparous	196 (50.5)
Gestational age (n 389)	Median 38.4 & IQR 37.5 – 39.4 Mean ± SD 38.5±1.1, Min 35.3, Max 41.1	
Oxytocin (n 389)	Given	212 (54.5)
	Not given	177 (45.5)
2nd stage period (n 293)	Median 24.0 & IQR 11.0 – 49.5 Mean ±SD 38.3±40.1, Min 1, Max 236	
2nd stage period categories (293)	Prolonged	3 (1.0)
	Not prolonged	290 (99)
Fetal distress (387)	Present	49 (12.7)
	Absent	338 (87.3)
Mode of delivery (n 389)	SVD	236 (60.7)
	Instrumental	58 (14.9)
	LSC	95 (24.4)
Indications for LSC (n 95)	Abnormal CTG	58 (61.1)
	Non-progress 1st stage	24 (25.3)
	Prolonged 2nd stage	7 (7.4)
	Others	6 (6.3)
Indications for instrumental (n 58)	Abnormal CTG	45 (77.6)
	Non-progress 1st stage	0 (0)
	Prolonged 2nd stage	10 (17.2)
	Others	3 (5.2)
APGAR1 (n 389)	Critically low	1 (.3)
	Fairley low	22 (5.7)
	Normal	366 (94.1)
APGAR5 (n 389)	Critically low	0 (0)
	Fairley low	2 (0.5)
	Normal	387 (99.5)
NICU admission (n388)	Yes	24 (6.2)
	No	364 (93.8)
Post-partum hemorrhage (n 389)	Present	27 (6.9)
	Absent	362 (93.1)
Other maternal complaints (n 389) (fever, headache, backache, hypotension, urine retention, pruritus, nausea & vomiting)	Present	39 (10.0)
	Absent	350 (90.0)

Table 1: Descriptives of participant characteristics and outcomes

The rate of oxytocin use was 54.5%, and around 52.4% of it was among nulliparous. In this regard, 57.8% of nulliparous ladies were given oxytocin, compared to 51.5% of multiparous. Around 47% of SVD applied oxytocin, compared to 65.5% among instrumental, and 66.3% among LSCS deliveries. The median and mean (±SD) period of 2nd stage were 24.0 and 38.3±40.1. Only 1% of all included patients had prolonged 2nd stage of labor. Around 12.7% suffered fetal distress.



Regarding the mode of delivery, the rate of spontaneous vaginal delivery constituted 60.7%. on the other hand, instrumental deliveries and LSCS constituted 14.9% and 24.4% respectively. Around 53.7% and 72% of LSCS and instrumental deliveries respectively were among nulliparous. However, all LSCS and instrumental deliveries were due to well-known specific indications. In this regard, the most common indication for LSCS was abnormal CTG constituting 61.1% of all LSCS, followed by non-progress of 1st stage (25.3%), and prolonged 2nd stage (7.2%). On the other hand, abnormal CTG and prolonged 1st stage constituted 77.6% and 17.2% of all instrumental deliveries. Figure 1 A & B details the indications for LSCS and instrumental deliveries.

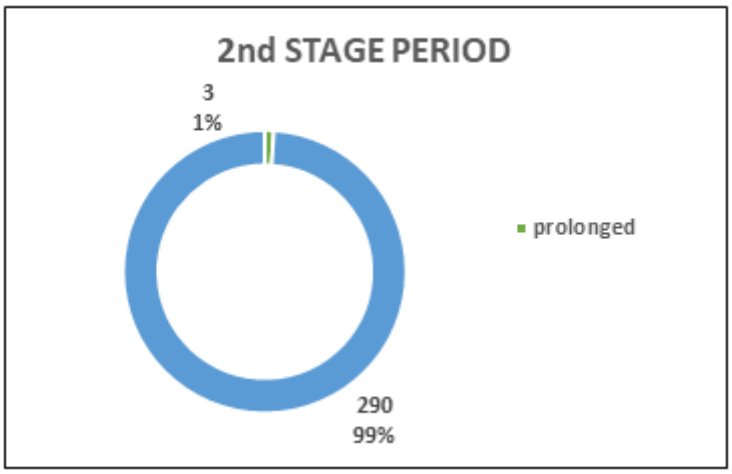


Figure 1: Distribution of indications of LSCS (A) and instrumental deliveries (B).

As for post-delivery outcomes, the median APGAR1 score was 9.0, with mean±SD of 8.7±1.0. In addition, the median APGAR5 score was 10.0 with mean±SD of 9.8±0.63. The rate of NICU admissions among delivered babies was 6.2%, and post-partum hemorrhage constituted 6.7% among delivered ladies. In addition, 10.0% of included ladies suffered one or more post-partum complications, including fever (n 13, 3.3%), headache (n 10, 2.6%), backache (n 3, 0.8%), hypotension (n 9, 2.3%), urine retention (n 3, 0.8%), pruritus (n 1, 0.3%), and nausea and vomiting (n 1, 0.3%).

For patient satisfaction, 52.5% (n 148) reported full benefit from epidural analgesia use, compared to 6% who reported no benefit. Around half (50.7%) of the fully satisfied patients were multiparous and the other half were nulliparous. Full satisfaction rate among nulliparous was 55.7%, compared to 50% among multiparous. Figure 2 illustrates details related to patient satisfaction

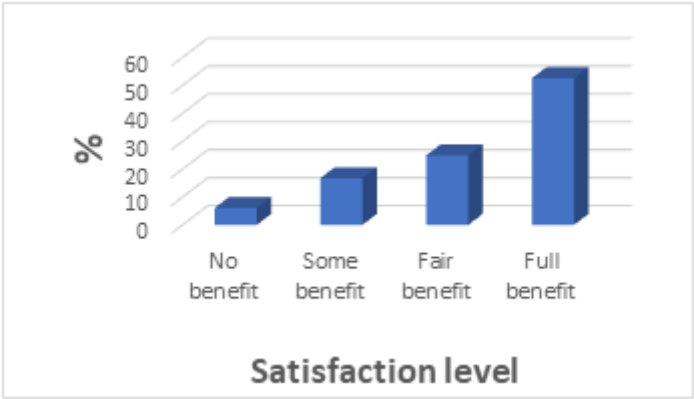


Figure 2: Satisfaction rate of included participants toward epidural analgesic.

Discussion

This study assessed the rate of usage of epidural analgesia among pregnant women in labour at a tertiary hospital in Oman. The study findings revealed that a total of 7076 deliveries, out of which 389 received epidural analgesia in labour. Although, epidural analgesia is available for women in labour in this setting, where the study was conducted, the results of our study showed that only 5% of women in labour used epidural analgesia to alleviate the pain of childbirth. In contrast, the epidural rate increased in UK and USA , 25% and 66% , respectively [6]. Based on this low rate of epidural usage in the current study, we suggest the need to educate the women antenatally and raise their knowledge and awareness about epidural analgesia in labor.

Regarding the use of oxytocin, our study showed a slight increase in the use of oxytocin. Many studies discussed usage of oxytocin along with epidural analgesia to shorten labor duration and to decrease the incidence of operative deliveries [7]. The judicious use of oxytocin is always recommended. We believed the use of oxytocin is variable between different centers which can be explained by multiple causes, like availability of the expertise from clinicians and nursing staff, availability of the medication/pumps, training

the staff on the medication delivery and monitoring.

The findings of the study showed that 24.4% deliveries received epidural analgesia underwent caesarean section due to obstetric indications such as non-reassuring CTG during the first stage of labour or non-progress of labour in first stage and second stage. In addition, the findings revealed that the rate of instrumental delivery was less than the rate of normal vaginal deliveries , 15% and 60.7 % , respectively. In contrary, a study conducted by Antonakou and Papoutsis in 2016, showed that epidural analgesia was associated increased the rate of instrumental vaginal deliveries [8].

The major maternal and fetal outcome addressed in the study were post-partum hemorrhage, poor Apgar score and admission to NICU. The study showed among 389 deliveries, the incidence of post-partum hemorrhage was 6.9%, while 90% of patients delivered smoothly without any post-partum complications. A retrospective cohort study was conducted in a tertiary hospital for all deliveries from November 2017 to December 2017 in China found that, Epidural analgesia was associated with higher risk of maternal intrapartum fever (relative risk RR = 3.2) but had no influence on the amount of post-partum hemorrhage and poor neonatal outcome [9]. Epidural analgesia does not seem to be detrimental to the neonate [10]. 94.1% and 99.4% of newborns had a normal Apgar score at 1 and 5 minutes respectively. This might be due to the improvement in the intrapartum care and neonatal team assessment. This suggests the epidural analgesia in labor does not associate with adverse neonatal outcome which is agreed with another large cohort study published in 2021 concluded that epidural analgesia in labor was not associated with adverse immediate or longer-term neonatal outcomes [11].

Surprisingly this study showed that the use of epidural analgesia in labour is of no difference between primi and multigravida women, which might reflect their knowledge and awareness of the epidural analgesia in labour. In the other hand, other study was conducted by Almuntashiri and his colleagues in 2022, found that the level of awareness among multigravida women and those with previous experience with epidural analgesia were higher than primigravida women [12]. While Koteles et al, found that multiparous women were less likely to use epidural analgesia and less receptive towards it [13].

Patient satisfaction is a vital patient-centric outcome as it can influence the women and her fetus significantly. Having a positive experience during labour improve the woman's self -esteem and confidence in caring for their child [14]. Our study revealed that among these 389 women, 148(52.5%) women were fully satisfied, and 23 (6%) women were not satisfied. These findings are consistent with study conducted in Tiawan by Cheng et al (2020), reported that the level of satisfaction sored higher with the group of women after receiving information and understanding about epidural analgesia in labour [15].

Up to our knowledge, this is the first study in the country exploring the rate of epidural analgesia in labor and addressing its outcome. The main limitation of this study is retrospective design. Others are conducted in one center with few repetitive and missing data from the patients' records.

Conclusion

Epidural analgesia is an effective method for intrapartum pain control and safer for both mother and the newborn. 5% was the rate of epidural analgesia usage in the study period. Our study showed that spontaneous vaginal delivery was the main mode of delivery. However, the indications for delivery by cesarean section or instruments were not related to epidural analgesia in labour. In addition, there was no significant adverse effect on maternal, fetal and neonatal outcome.

Based on that, we need to elaborate more on epidural analgesia awareness and usage in order to be offered. Although some previous reviewed studies reported adverse effects of epidural analgesia on labour outcome. Future researches are recommended including prospective design study, bigger sample size, wider variation and multicenter studies.

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