Original Article

A randomized controlled trial of rectal diclofenac sodium and intramuscular pentazocine versus intramuscular pentazocine, diclofenac, and paracetamol analgesics for pain relief in the first 48 h after cesarean section

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ABSTRACT

Background: Cesarean section is one of the most commonly performed operations in obstetric practice. A multimodal approach to post-cesarean pain management has been shown to be more effective than a unimodal approach, though the most effective combination and preferred route of administration are still unknown.

Aim: To compare the effectiveness of rectal diclofenac sodium and intramuscular pentazocine versus intramuscular pentazocine, paracetamol, and diclofenac analgesics for pain relief in the first 48 h after cesarean section at Federal Medical Centre, Katsina.

Methods: This was a prospective single-blind, randomized controlled trial, in which 120 booked women planned for cesarean section were recruited and randomly allocated to the study or control group. The study group received 100 mg rectal diclofenac sodium 12 h and intramuscular pentazocine 60 mg 6 h, while the control group received intramuscular diclofenac 75 mg 12 h, pentazocine 60 mg 6 h, and paracetamol 600 mg 8 h for the first 48 h postoperatively. Pain perception, maternal satisfaction, and preferred route of drug administration were compared between the two groups.

Results: The study group had significantly lower mean visual analog scale pain scores and higher maternal satisfaction in the first 48 h ($P < 0.05$). There were no significant differences in the maternal and newborn side effects of the analgesics. The rectal route of drug administration was more preferred ($P < 0.05$).

Conclusion: The study showed that rectal diclofenac sodium and intramuscular pentazocine post-cesarean section analgesic efficacy and maternal satisfaction were superior to that of intramuscular pentazocine, diclofenac, and paracetamol.

Key words: Cesarean section; intramuscular pentazocine; postoperative pain relief; rectal diclofenac sodium.

Introduction

Cesarean section (CS) is a very common obstetric surgery performed worldwide which has saved the lives of many mothers and infants.[1] CS commonly induces moderate to severe pain in the immediate 48 h.[2] Pain is an unpleasant sensory and emotional experience associated with actual

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or potential tissue damage or described in terms of such damage. Postoperative pain is one of the main postoperative adverse outcomes causing distress to patients. Pain perception is multifactorial; it begins with tissue damage which triggers chains of neuronal activities.[3] Postoperative pain after CS consists of two different pain sensations: first, the somatic pain from the wound, and second, the visceral pain from the uterine contractions. The somatic pain is well localized while the visceral pain is a more diffused pain. The somatic pain wanes within 1–2 days, while the visceral lasts a few days longer.[4] Postoperative pain leads to patient's discomfort and suffering, decreased level of satisfaction, prolonged recovery and hospital stay, higher health care costs, and increased risk of developing chronic persistent pain.[5] The postoperative pain is worst in obstetric patients where it interferes with ambulation, breastfeeding, and early maternal bonding with the infant. Postoperative pain might lead to thromboembolic events due to its limitation of patient mobility, uterine sub-involution, and postpartum hemorrhage as well as stress on the health care system.[6]

An ideal method of pain relief after CS should be cost-effective, safe for the mother, require minimal monitoring, and use of drugs that are not secreted into breast milk. The mother should not be sedated or hampered by equipment that prevents her from moving freely and caring for her baby. Drug availability, maternal health conditions, patient preferences, and availability of medical expertise and trained support staff also play a role in the choice of analgesic method.[7] Though the multimodal approach of using an opioid and a nonsteroidal anti-inflammatory drug (NSAID) has been proposed to give more efficient pain relief and fewer side effects, there still remains the challenge of the choice of route for administration considering patient's comfort and satisfaction and the medical expertise available. The route of administration in most centers depends on the surgeon's preference and departmental protocols. The departmental protocol at F.M.C Katsina is the use of a multimodal approach of three intramuscular medications comprising an opioid (pentazocine) and two non-opioids (diclofenac and paracetamol). This multimodal approach involves the administration of 18 intramuscular injections in 48 h and though provides better relief than the unimodal approach, has the limitation of inflicting additional pain and discomfort to patients thereby interfering with the aim of postoperative pain management, which is geared at making the patient more comfortable, early mobilization, infant breastfeeding, and early mother-infant bonding. There may also be an increased risk of injection site abscess, necrotizing fasciitis, and anaphylactic reactions.[8] This is why research for a safer and more patient-friendly route of drug administration was necessary without compromising analgesic efficacy. The use of rectal diclofenac sodium and intramuscular pentazocine will reduce the number of intramuscular injections to 8 within 48 h. It will also reduce the stress on the available limited number of trained personnel, as this could be given by junior staff with less training or even the patient if need be.

The aim was to compare the efficacy of rectal diclofenac sodium combined with intramuscular pentazocine, versus the combination of intramuscular diclofenac, paracetamol, and pentazocine for post-CS pain relief. The objectives were to compare post-CS pain relief of women that received rectal diclofenac sodium and intramuscular pentazocine, versus intramuscular diclofenac, paracetamol and pentazocine combination, to compare patient's satisfaction with post-CS pain relief of women in the two groups, to compare patient's preferred route of drug administration between women in the two groups, and to compare their maternal and newborn analgesic side effects.

Methods

This study was carried out among consenting pregnant women booked for ANC going for CS at Federal Medical Centre, Katsina following approval of the hospital research ethics committee from September 2018 to January 2019. It was a prospective single-blind, randomized controlled trial. The sample size was calculated using the formula for sample size calculation in randomized controlled trials with a quantitative outcome,[9] 10% was added for attrition and a sample size of 60 patients was calculated for each group. The inclusion criteria were to have 120 consenting parturients of ASA (American Society of Anesthesiologists' classification) I and II status scheduled for either emergency or elective CS under spinal or general anesthesia during the period of study. The exclusion criteria were: allergy to Pentazocine or Diclofenac or Paracetamol, peptic ulcer disease or asthma, bleeding disorders, psychiatric illness, known sickle cell anemia, declined consent, unconscious patients, preexisting opioid dependency, unbooked patients for emergency CS.

Eligible pregnant women were recruited consecutively from the antenatal clinic, antenatal ward and from labor ward for the booked patients going for emergency CS until the desired sample size was reached. Patients were assigned to one of the two groups using simple randomization. The patients were randomly allocated with concealed envelopes to either group A or B preoperatively. Two sets of 60 opaque envelopes containing pieces of paper labeled as A or B were prepared by a research assistant who did not participate in data collection. All 120 envelopes were mixed thoroughly then numbered 1–120 and placed in a box in the operation

theatre. An envelope was given to each consecutive patient who consented and satisfied the inclusion criteria. Group A, the study group were given rectal diclofenac sodium and intramuscular pentazocine, while Group B, the control group were given intramuscular diclofenac, pentazocine, and paracetamol as pain relief after CS. Both groups received drugs made by the same pharmaceutical company (Bliss GVS Pharma Ltd) and standard postoperative care.

The choice of anesthesia, either general or spinal anesthesia was determined by the anesthesiologist using anesthetic considerations. Intravenous metoclopramide 10 mg and intravenous ranitidine 50 mg were given (45–60 min to the time of surgery) to patients going for emergency CS. Patients for elective CS were given oral metoclopramide 10 mg and oral ranitidine 150 mg with a sip of water the morning of surgery (2–3 h to the time of surgery) in order to prevent aspiration of acidic gastric contents due to full stomach. Patients who developed epigastric pain were treated with intravenous ranitidine 50 mg. Nausea and vomiting were treated with intravenous metoclopramide 10 mg and patients with SPO_2 (saturated partial pressure of oxygen) <92% were given supplemental oxygen.

Pain severity was assessed by the researcher and four well-trained research assistants using pain rating scale visual analog scale (VAS) at the first 6, 12, 24, and 48 h post-operation. The patient's satisfaction was assessed using a Likert scale with pain relief ranging from very satisfied to very dissatisfied within 2 h after the last dose of analgesia. Rescue analgesia, intramuscular pentazocine 30 mg was given if the VAS score was greater than 30 mm. Maternal side effects (nausea and vomiting, epigastric pain, drowsiness, anal discomfort and diarrhea, injection site soreness) and newborn side effects (excessive sleep, poor breast milk suckling, the preferred route of drug administration (intramuscular or rectal) were assessed by direct questioning of the patient using the questionnaire.

The researcher and four trained assistants (resident doctors in the department of obstetrics and gynecology), were blinded to the drug administered to the patient. To ensure that the researcher and research assistants were blinded to the patient's group, the patient operated by or in the team of the researcher/research assistants was not assessed by that person. The researcher confirmed the surgeon and the team which the patient belonged to and then assigned the other assistants to do the assessment. The nurses in the post-natal ward were not blinded to the study group of the patients and the medications to serve. The patients were also aware of their study group because of the difference in the route of administration. The assessment was done through close observation, measurement, and interrogation with the VAS, Likert scale on the questionnaire. The patient's group was obtained from the record book after assessment and recorded on her questionnaire before data analysis.

Data obtained was entered into a predesigned sheet and analyzed using SPSS version 21 (SPSS Inc., Chicago, IL). Categorical data were analyzed using the Chi-square test or Fisher's exact test. Mean and standard deviation (SD) or median and interquartile range were calculated for quantitative variables and the differences between two independent groups were compared using student's *t*-test or Mann-Whitney u test, respectively. The level of statistical significance was considered at $P < 0.05$. Ethical approval was obtained from the research ethics committee in the center before the commencement of the study.

Results

Table 1 shows the sociodemographic characteristics of the two groups comprising their mean age, major tribe, predominant religion, occupation, educational status, parity, mean gestational age, previous CS, mean weight, and mean height. All the characteristics have a *P* value of more than 0.05.

Table 2 gives a summary of the operative characteristics of the two groups, with the commonest indication for CS being cephalopelvic disproportion, a greater percentage of the women had emergency CS, over 90% of both groups had spinal anesthesia, and the mean duration of surgery had a $P = 0.003$.

The mean VAS scores at 6, 12, 24, and 48 h post-operation had *P* values 0.039, 0.001, <0.001, <0.001, respectively. 60% of the control group were somewhat satisfied, whereas 71.0% of the study group were very satisfied with a *P* value of < 0.001 as shown in Table 3.

The maternal and newborn side effects between the two groups showed no difference. 96% of the study group and 51.7% of the control group preferred the rectal route for drug administration ($P = 0.001$) as shown in Table 4.

Discussion

In this study, the difference in the pain perception following administration of the analgesics within the first 48 h after CS between the two groups was statistically significant as shown in Table 3 with statistically significant *P* values and mean VAS scores at 6, 12, 24, and 48 h, respectively. This

Table 1: Sociodemographic characteristics

Variables	Group A *n*=60	Group B *n*=60	Test	*P*
Mean Age±SD (years)	28.4±6.35	27.70±6.07	t=0.57	0.568
Tribe				
Hausa/Fulani	41 (68.3%)	50 (83.4%)	X^2=5.37	0.147
Yoruba	1 (1.7%)	2 (3.3%)		
Igbo	9 (15.0%)	5 (8.3%)		
Others*	9 (15.0%)	3 (5.0%)		
Religion				
Islam	42 (70.0%)	51 (85.0%)	X^2=3.87	0.079
Christianity	18 (30.0%)	9 (15.0%)		
Occupation				
Housewife	41 (68.3%)	43 (71.7%)	X^2=1.20	0.752
Civil servant	12 (20.0%)	11 (18.3%)		
Business	4 (6.7%)	5 (8.3%)		
Others **	3 (5.0%)	1 (1.7%)		
Educational status				
None	5 (8.3%)	4 (6.7%)	X^2=0.91	0.924
Quranic	5 (8.3%)	4 (6.7%)		
Primary	8 (13.3%)	10 (16.7%)		
Secondary	14 (23.4%)	17 (28.3%)		
Tertiary	28 (46.7%)	25 (41.6%)		
Parity				
0, Null	32 (53.3%)	25 (41.7%)	X^2=2.88	0.237
1-4, low parity	22 (36.7%)	23 (38.3%)		
≥5, high parity	6 (10.0%)	12 (20.0%)		
Mean GA (weeks)±SD				
Previous CS	38.3±2.02	38.2±2.23	t=0.30	0.765
0	38 (63.3%)	46 (76.7%)	X^2=4.86	0.182
1	12 (20.0%)	6 (10.0%)		
2	7 (11.7%)	3 (5.0%)	t=1.48	0.141
3	3 (5.0%)	5 (8.3%)	t=1.44	0.153
Mean weight (kg)±SD	78.9±17.39	74.5±15.03		
Mean height (cm)±SD	160.2±6.38	158.2±9.03		

Others*=Ebira, Nupe, Baju, Igala, Idoma. Others**=Tailors, hairdressers, students

shows that the efficacy of intramuscular pentazocine and rectal diclofenac sodium for pain relief after CS is superior to that of intramuscular pentazocine, diclofenac, and paracetamol combination in providing pain relief. Generally, there is a paucity of studies in which these two methods of multimodal analgesia were compared for pain relief after CS. However, other studies have compared the analgesic efficacy of the multimodal agents (intramuscular pentazocine-rectal diclofenac or intramuscular pentazocine-diclofenac) to a unimodal agent (intramuscular pentazocine) for post-CS analgesia and the multimodal agents were found to be superior to the single agents being compared.[10,11] In one of those studies, conducted in Kano, the analgesic efficacy of intramuscular diclofenac and pentazocine was compared to that of intramuscular pentazocine alone for pain relief after CS as measured by the VAS scores. They found that the median VAS scores were significantly lower in the multimodal analgesia group than in the single analgesia group, and they concluded that intramuscular diclofenac and pentazocine is more effective than intramuscular pentazocine alone in relieving pain after CS.[10] In another study at Ile-Ife, the analgesic efficacy of rectal diclofenac and intramuscular pentazocine was compared to that of intramuscular pentazocine alone, and they found that the analgesic efficacy of the rectal diclofenac group was superior to that of intramuscular pentazocine alone group.[11] The addition of diclofenac suppository to parenteral pentazocine in their study accounted for a lower VAS and fewer patients

Table 2: Operative characteristics

Variable	Group A *n*=60	Group B *n*=60	Test	*P*
Indication for CS				
-Fetal malpresentation	4 (6.7%)	10 (16.7%)	X^2=15.34	0.701
-2 previous CS	7 (11.7%)	5 (8.3%)		
-Severe preeclampsia	8 (13.3%)	6 (10.0%)		
-3 previous CS	3 (5.0%)	4 (6.7%)		
-Fetal distress	2 (3.3%)	2 (3.3%)		
-Antepartum hemorrhage	5 (8.3%)	4 (6.7%)		
-Bad obstetrics history	5 (8.3%)	2 (3.3%)		
-Cephalopelvic disproportion	12 (20.0%)	19 (31.6%)		
-Failed VBAC	10 (16.7%)	6 (10.0%)		
-Elderly primigravida	3 (5.0%)	1 (1.7%)		
-Monochorionic monoamniotic twins	1 (1.7%)	1 (1.7%)		
Type of surgery				
-Elective CS	29 (48.3%)	20 (33.3%)	X^2=2.79	0.137
-Emergency CS	31 (51.7%)	40 (66.7%)		
Type of anesthesia				
-General	4 (6.7%)	3 (5.0%)	X^2=0.15	>0.90
-Spinal	56 (93.3%)	57 (95.0%)		
Type of abdominal incision				
-Pfannenstiel	35 (58.3%)	38 (63.3%)	X^2=1.16	0.561
-Joel-Cohen	15 (25.0%)	16 (26.7%)		
-Mid-line	10 (16.7%)	6 (10.0%)		
Mean duration of surgery±SD (minutes)	61.1±16.24	52.8±12.90	t=3.08	0.003*
Median EBL (IQR) mL	400 (300-500)	375 (300- 450)	Mann-Whitney U test	0.234

CS: cesarean section; VBAC: vaginal birth after cesarean section; EBL: estimated blood loss; IQR: interquartile range *statistically significant

Table 3: Maternal pain perception (VAS), maternal satisfaction with pain relief (Likert) and need for rescue analgesia

Variable	Group A *n*=60	Group B *n*=60	Test	*P*
Mean VAS scores (mm) ±SD				
6 h	21.6±6.94	24.5±8.30	t=-2.09	0.039*
12 h	15.4±5.94	19.6±7.16	t=-3.54	0.001*
24 h	11.7±5.19	15.7±6.24	t=-3.86	<0.001*
48 h	8.1±3.98	11.7±5.92	t=-3.98	<0.001*
Maternal satisfaction				
Very dissatisfied	0 (0.0%)	0 (0.0%)	X^2=21.60	<0.001*
Somewhat dissatisfied	1 (1.7%)	0 (0.0%)		
Neither satisfied nor dissatisfied	1 (1.7%)	5 (8.3%)		
Somewhat satisfied	15 (15.0%))	36 (60.0%)		
Very satisfied	43 (71.0%)	19 (31.7%)		
Need for rescue analgesia	2 (3.3%)	7 (11.7%)	Fisher's exact test	0.163

VAS: visual analog scale *statistically significant

Table 4: Analgesic side effects and preferred route of drug administration

Variable	Group A *n*=60	Group B *n*=60	Test	*P*
Maternal side effects				
Nausea/vomiting	4 (6.7%)	6 (10.0%)	Fisher's exact test	0.743
Epigastric pain	1 (1.7%)	5 (8.3%)		
Drowsiness	15 (25.0%)	21 (35.0%)	Fisher's exact test	0.207
Diarrhea/anal discomfort	0 (0.0%)	0 (0.0%)		
Soreness at injection site	1 (1.7%)	5 (8.3%)	X^2=1.43	0.232
Newborn side effects				
Excessive sleep	1 (1.7%)	4 (6.7%)	Fisher's exact test	0.207
Poor breast milk suckling	3 (5.0%)	1 (1.7%)	Fisher's exact test	0.364
Preferred Route of Administration				
Intramuscular	2 (3.3%)	29 (48.3%)	Fisher's exact test	0.619
Rectal	58 (96.7%)	31 (51.7%)	X^2=31.71	0.001*

*statistically significant

required rescue analgesia compared to the single-agent group. This could be explained by the documented effect of combining the action of two different analgesics that interrupt nociceptive transmission at different levels.

However, the VAS scores of the diclofenac suppository group of this study were slightly higher than that of the multimodal (intramuscular pentazocine-diclofenac) group in another study conducted at Abakiliki, which also compared the multimodal analgesia with a unimodal method (intramuscular Pentazocine).[12] This slight difference could be as a result of the higher average age of the patients used in the study as compared to this study that was conducted in north-western Nigeria with a younger maternal population who were less tolerant to pain. The difference could also be attributed to a higher percentage of elective CS in that study unlike in this study with a higher percentage of emergency CS and cephalopelvic disproportion (CPD) being the commonest indication.

Another unimodal study in Nigeria that compared the efficacy of diclofenac using two different routes (intramuscular or rectal) for post-CS analgesia, found no difference in the pain scores and maternal satisfaction in the first 24 h.[13] However, the study had a smaller sample size (94) compared to this study with a sample size of 120 patients. The blinding method used was not clearly stated and it was not also stated if the rectal diclofenac given to one group and intramuscular diclofenac given to the other, were from the same company. The VAS scores and maternal satisfaction may not be consistent if patients in each group do not receive medication of the same quality.

The rectal diclofenac group in this study had lower pain perception post-CS compared to the intramuscular triple agent group, as shown from the mean VAS scores at the four specified times of assessment despite having a higher mean duration of surgery which should have predisposed the patients to more intraoperative trauma and more post-operation pain.[14] This further shows that the rectal diclofenac sodium has very good analgesic efficacy.

A very number of patients in this study had rescue analgesia, 3.3% of the rectal diclofenac group and 11.7% of the intramuscular triple agent group. There was no statistically significant difference in the findings. Studies by Dahl *et al*.[15] and Munishankar *et al*.[16] in which 200 mg of rectal diclofenac was used daily, also demonstrated fewer requirements for rescue analgesia.

The significant difference in maternal satisfaction in the two groups obtained in this study means that patient's satisfaction is significantly better in women that received a multimodal regimen of rectal diclofenac sodium and intramuscular pentazocine than those in the intramuscular triple agent group. This finding may be due to the rapid systemic absorption and high analgesic efficacy of rectal diclofenac sodium. The study in Kano recorded a higher maternal satisfaction in the multimodal group than in the single-agent group.[10] The Abakiliki study recorded no difference in the maternal satisfaction between the unimodal and the multimodal group and this was attributed to a higher pain tolerance by the study population.[12]

The preferred route of drug administration was compared between the study and control group on the choice of the rectal or intramuscular route, and there was a significant statistical difference ($P = <0.001$) between the two groups with most patients preferring the rectal route over the intramuscular route. This is similar to the findings of the study at Ile-Ife that compared rectal diclofenac plus intramuscular pentazocine with intramuscular pentazocine alone.

There was no significant difference in the maternal analgesic side effects (nausea/vomiting, epigastric pain, drowsiness, and soreness at the injection site) between both groups. None of the patients in either group developed diarrhea or anal discomfort. The absence of a significant difference was because both groups received multimodal analgesics of similar components (opioids and NSAIDs). There was no significant difference in the injection site soreness despite the multiple injections given in one group compared to the other. This may probably be due to the analgesic effects of the medications administered, which decreased the pain sensation at the injection site, and also the injection site soreness was assessed verbally. The findings of no difference in maternal side effects are similar to the findings in Kano[10] and Ile-Ife.[11] While the study at Abakiliki reported reduced side effect profile in the pentazocine-diclofenac group compared to the pentazocine only group and both groups received medications via the intramuscular route. The difference was likely due to the combination of opioid and NSAID in the multimodal group producing an opioid-sparing effect, which reduced the severity of the side effects. There was no statistically significant difference in the newborn side effects in the two groups due to the fact that the opioid-sparing multimodal analgesia limited the amount of opioid transferred into breast milk. This is similar to the findings in Kano[10] and at Abakiliki.[12]

Conclusion

This study showed that, compared to intramuscular pentazocine, diclofenac, and paracetamol combination for post-CS analgesia, the intramuscular pentazocine, and rectal diclofenac sodium combination have superior analgesic efficacy and had more maternal satisfaction. The preferred route of administration of post-CS analgesia was the rectal route. However, there was no difference in maternal and newborn side effects recorded in both groups.

Recommendations

Based on the findings from this study, it is recommended that:

1. The use of rectal diclofenac sodium and intramuscular pentazocine analgesics will provide more satisfying and efficient pain relief after CS in the department of obstetrics and gynecology at FMC Katsina and other centers.
2. More randomized controlled trials should be carried out comparing different multimodal analgesia for post-CS pain relief for meta-analysis.
3. A prospective multicentered, randomized controlled trial comparing the effectiveness and safety of rectal diclofenac sodium and intramuscular pentazocine is recommended for stronger evidence and generalization.

Limitations

1. Pain perceptions and maternal satisfaction were difficult to measure because they are subjective.
2. The newborn side effects assessments were also subjective
3. Confounding factors such as maternal anxiety, which could have influenced pain perception, could not be controlled.
4. The exclusion of unbooked patients for emergency CS in whom it is also very important to determine the best methods of pain relief.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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