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ORIGINAL ARTICLE

Comparative Efficacy of Diclofenac Sodium and Gabapentin against Post-Operative Pain as Pre-Emptive Analgesia in Laparotomy

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ABSTRACT

Background: To assess the relative effectiveness of diclofenac sodium and gabapentin as preventive analgesics for post-operative pain management in patients having laparotomy.

Study Design: Present study was a comparative controlled trial conducted at random.

Methodology: Current comparative controlled trial was conducted at random fashion in different surgical and pharmacology departments of Pakistan from December 2022 to June 2023. There were a total of 100 individuals having laparotomy therefore 600 mg capsule of Gabapentin and 100 mg sustain released combination therapy was given to the every patient one hour before to going into the procedure room under doctors direct supervision. All patients were put to sleep using the conventional general anesthetic approach. The patient was moved to the recovery area next to the operating theater once the procedure and extraction were finished and their pain was measured 1to 31 minutes. Finally, all patients were shifted to the ward where the intensity of their pain were measured 60, 121, 241 and 361 minutes respectively. The intermediate time of admission and operation were noted regularly. The bio-statistic version SPSS 2020 were applied for the description of raw data.

Results: The mean standard deviation levels of age, gender, BMI, surgery duration and average anesthesia time in both Group-X and Group-Y individuals with gabapentin and diclofenac sodium were (57.18±18.04, 58.21±1.03), (67.11±01.02, 67.11±01.01), (33.10±01.04, 33.10±01.04), (28.10 ± 1.01), (27.11 ±1.01), (118.01±01.01), **(**128.01±02.02) showed a significant (P≤ 0.05) change. The pain ratings for gabapentin was (9.01±04.01) and diclofenac sodium was (15.25±02.03) for the 361-minute interval. 12-hour period or 721 minutes Compared to Diclofenac sodium, which exhibits a pain intensity of (14.61±04.05), gabapentin showed a considerable decline in pain.

Conclusion: The study's findings showed that administering a single oral dosage of gabapentin as a preventive analgesic to patients having major abdominal operations is beneficial for managing post-operative pain since the medication's effects linger longer and decrease the need for rescue analgesics.

Keywords: Gabapentin, Laparotomy, Anticonvulsants, glycopyrrolate, analgesics, surgery, abdominal, gynecological.

INTRODUCTION

Among all surgical procedures, abdominal operations are thought to be among the most excruciating. Approximately 70% of patients who underwent abdominal surgery had excruciating agony following their procedures, particularly those involving the gynecological system[1]. The two main factors contributing to a protracted convalescence after abdominal surgery are this discomfort and exhaustion. The current standard strategy to multimodal postoperative analgesia, which relies largely on a mix of opioids, non-steroidal anti-inflammatory medications (NSAIDs), paracetamol, and perioperative local anesthetic injection, is used to reduce pain and weariness[2]. Gabapentin is belong to anticonvulsants group of medicine it control nerve pain and syndrome of leg restless. Particularly if you already have a respiratory condition or use other medications that might make you sleepy or delay your breathing, gabapentin can cause potentially fatal breathing issues. If extremely sluggish breathing, faced then get immediate medical help[3,4].

Anesthesia and surgical recovery are impacted by postoperative pain. Although for the treatment of such pain diclofenac sodium and Gabapentin molecules are used extensively. To maximize the benefits and minimize the drawbacks of opioids, combination regimens involving both opioid and non-opioid medications are employed[5]. Opioids considered latest salt in analgesics. It is well established that non-steroidal anti-inflammatory medications (NSAIDs) work via varying degrees of inhibition of the COX-1 and COX-2 isoenzymes. The main cause of toxicity is unwanted inhibition at these enzyme locations. Gabapentin is voltage-dependent calcium channels medication lowers reactivity to neural inputs and releases amino acids into the spinal cord's dorsal horn, which lessens or stabilizes the activity of the injured neurons[6].

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The utility and efficiency of gabapentin for treating postoperative pain and reducing brain excitability were investigated in recent investigations. According to a research, giving patients 1200 mg of gabapentin two hours before to surgery decreased pain and opiate use while also accelerating their recovery[7]. Both surgical stimulation and neurogenic variables, such as visceral tissue edema, are responsible for post-operative pain. Different analgesic medications with distinct modes of action are used in the treatment of pain nowadays[8]. Although gabapentin is typically prescribed as an anticonvulsant, new research indicates that it also possesses antihyperalgesic properties[9]. Pain following a laparoscopy might prolong recuperation and postpone patient release. The goal of this study was to evaluate the effectiveness of diclofenac in the treatment of post-laparoscopy pain, whereas other research has concentrated on issues related to nausea and vomiting[10]. According to these results, diclofenac may lessen the need for postoperative analgesics and post-laparoscopy discomfort. In this study the mode of action of both different medicine was tested against postoperative surgical pain in patient with abdomen surgery. Diclofenac inhibits the generation of inflammatory mediators, whereas gabapentin relieves pain that is connected to nerves. The findings of current study will suggest the efficacy and individualized pain management techniques of both salts. While the objective of current study to assess the relative effectiveness of diclofenac sodium and gabapentin as preventive analgesics for post-operative pain management in patients having laparotomy.

MATERIALS AND METHODS

Current comparative controlled trial was conducted at random fashion in different surgical and pharmacology departments of Pakistan from December 2022 to June 2023. Present research was carried out with institutional ethical approval certificate from the ethical review committee, all ethical considerations were followed and declaration of Hilinski was followed, privacy of each

individual was maintained. Adult patients between the ages of 18 and 60 usually comprise the group most likely to have a laparotomy. All patients, including those who pose no health hazards. Individuals who do not have a history of Diclofenac or Gabapentin allergies, guaranteeing medication safety. Patients on long-term analgesic medication or those with a history of chronic pain may experience drastically different baseline pain perception. Basic demographic data such as age, gender, etc. was collected with the patient's agreement. Following admission of patients through the outpatient department (OPD) and meeting the inclusion criteria, all patients undergoing abdominal surgery were randomly assigned using computer-generated randomization. Stratified random sampling technique was followed for current study.

They were then split into Group X, (gabapentin) and Group Y, (diclofenac sodium) and each group has 50 patients. Each patient in both groups received education regarding the medications that will be used in the trial prior to the administration of medication. Physicians gave them advice on the advantages and disadvantages of the medications. Every patient in the two groups received Gabapentin tablets, 600 mg. 100 mg of Diclofenac sodium. When patients were moved to the operating room, all patient monitoring protocols were followed, including standard one and standard two monitoring. IV protocol 2 mg/kg was used to produce general anesthesia, and then an injection of atracurium 0.5 mg/kg was administered to aid in endotracheal intubation. An IV bolus of nalbufen 0.1 mg/kg was administered for intraoperative analgesia. 50% oxygen and 50% nitrous oxide was o (2 volume %) was used to maintain anesthesia, with sporadic injections of 10 mg atracurium as needed.

The first skin closure involved the discontinuation of isoflurane. IV neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg) were used to reverse neuromuscular blockade at the completion of surgery, following the onset of spontaneous respiration. After measuring the patient's discomfort at 0 and 30 minutes, the patient were sent to a ward and monitored for 12 hours. Visual Analogue Scale (VAS) was used to measure in-ward pain every 60 minutes for the first hour following surgery, then every 120, 240, 360, and 720 minutes after surgery. The statistical application SPSS 20.0 version was used to examine the data. The results were presented as mean ± standard deviation for quantitative data, such as age, gender and pain (VAS scale). Whereas in case of a significant difference between the independent and outcome variables, the chi-square and Fisher's exact tests were used. Considered (p-value < 0.05) as significant value.

RESULTS

In table-1 the mean age of Group-X and Group-Y, (57.18±18.04, 58.21±1.03) individuals were measured. Whereas regarding gender mean standard deviation levels of male (67.11±01.02, 67.11±01.01) and female (33.10±01.04, 33.10±01.04) were included respectively. The mean BMI of those using gabapentin is 28.10 (±1.01), whereas that of diclofenac sodium users is 27.11 (±1.01); a statistically significant (P≤ 0.05) difference is shown by a p-value of 0.01. Mean surgery duration for Gabapentin users (95.01 ± 04.01) minutes versus (98.01 ± 02.02) minutes for Diclofenac sodium users, with a significant (P≤ 0.05) (p-value of 0.02). The average anesthesia time in both Group-X and Group-Y with gabapentin and diclofenac sodium was (118.01±01.01), **(**128.01±02.02) minutes respectively showed a significant (P≤ 0.05) changes.

In table-2 at very early stage, the Gabapentin group reports a pain intensity of (16.18±10.01) compared to the Diclofenac sodium group's (10.07±05.04), showing a substantial (p≤0.05) reduced pain intensity for Diclofenac sodium. After 31-Min of intervals the Pain intensity increases to (15.00±01.02) for Gabapentin users and climbs significantly to (25.00±05.01) for Diclofenac sodium users at this period. The p-value for Diclofenac sodium is 0.02, indicating a significant (p≤ 0.05) increase in pain intensity. At, 61-Min the Gabapentin users have a pain intensity of (12.75±02.04), which is lower than the (16.64±04.02) reported for Diclofenac sodium users. The p-value of 0.01 indicates a significant difference favoring Gabapentin.

Table 1: comparison of variables regarding Gabapentin and Diclofenac sodium

Variables		Gabapentin	Diclofenac sodium	P≤ 0.05
Age		57.18±18.04	58.21±1.03	0.02
Gender	M	67.11±01.02	67.11±01.01	0.02
	F	33.10±01.04	33.10±01.04	0.01
BMI		28.10±01.01	27.11±01.01	0.01
Surgery time		95.01±04.01	98.01±02.02	0.02
Anesthesia time		118.01±01.01	128.01±02.02	0.02

(Considering Mean± SD for significant P≤ 0.05 levels were considered respectively)

After passage of 121-Min Gabapentin users see a further decrease in pain intensity to (11.61±05.05), but Diclofenac sodium users experience a considerable increase in pain intensity to (20.74±03.03). With the passage of 241-Min Gabapentin maintains a lower pain score of (10.00±06.01) compared to (12.61±08.04) for Diclofenac sodium, with a p-value of 0.02. With a significant p-value of 0.04, the pain ratings for gabapentin are (9.01±04.01) and diclofenac sodium are (15.25±02.03) for the 361-minute interval. 12-hour period or 721 minutes Compared to Diclofenac sodium, which exhibits a pain intensity of (14.61±04.05), gabapentin shows a considerable decline of (0.61±01.03), showing a near absence of pain.

Table 2: Provides a comparison of pain intensity levels at different Time intervals after administration of two treatments, Gabapentin and Diclofenac sodium.

Time Intervals	Pain Intensity G-X (Gabapentin)	Pain Intensity G-Y (Diclofenac sodium)	P-value (P≤ 0.05)
1-Min	16.18±10.01	10.07±05.04	0.03
31-Min	15.00±01.02	25.00±05.01	0.02
61-Min	12.75±02.04	16.64±04.02	0.01
121-Min	11.61±05.05	20.74±03.03	0.04
241-Min	10.00±06.01	12.61±08.04	0.02
361-Min	9.01±04.01	15.25±02.03	0.03
721-Min	0.61±01.03	14.61±04.05	0.05

Comparative t-test was applied and mean standard deviation were considered)

DISCUSSION

Pre-emptive analgesia is a popular notion, and prior studies have demonstrated the usefulness of certain medications' preemptive effects, including opioids, local anesthetics, and nonsteroidal anti-inflammatory medicines[10]. The postoperative pain levels of the patients in both therapy groups were statistically equal at 0 and 30 minutes in this research. Nevertheless, by the 60-minute mark, Group-X patients' pain management was comparable to that of Group-Y patients[11]. Group-Y had 67% of patients without discomfort and Group- X had 77% (60th min) = 0.032). Group-X experienced considerably lower pain scores from the 240th to the 720th minute compared to Group-Y. Diclofenac sodium and gabapentin were not compared in prior literature searches as preventive analgesics, particularly for patients facing large abdominal procedures[12,13].

The majority of research on gabapentin's effects on postoperative pain state and analgesia requirement has compared it with other medications or, more often, with placebo[14]. Bijalwan et al.(2019) has been observed that gabapentin is a safe, well-tolerated, and effective medication for treating postoperative pain[15] Preemptive use of oral gabapentin 600 mg successfully reduces post-operative pain and lowers the need for analgesics for the patients. Bafna et al., (2014) also demonstrated that in patients undergoing total abdominal hysterectomy, gabapentin given an hour before surgery dramatically reduced post-operative pain ratings and the need for Tramadol[16].

It was discovered that patients using oral pregabalin experienced pain-free intervals for an average of six hours after the first dosage and eight hours after the second[17].

This was in line with research conducted by Kohli et al.(2011) on patients who took preoperative pregabalin orally prior to hysterectomy and by Singla et al.(2015) on patients who had abdominal hysterectomy and compared the analgesic efficacy of preoperative pregabalin orally vs oral gabapentin[18]. It was found out that giving gabapentin before surgery can delay the development of hyperalgesia and alleviate acute pain in a number of procedures. Bearing in mind the nociceptive process, such as central sensitization, the effect of the Pharmaceutical is rather specific[19]. Endeavors have shown that gabapentin interacts with pre-synaptic voltage-gated Ca 2+ channels which in turn inhibits the release of several excitatory neurotransmitters leading to analgesic activity. Because gabapentin has the capacity of calming down hyper excitability of dorsal horn neurons due to tissue injures, it can also relieve central sensitization[20].

CONCLUSION

The findings of current study showed that the use postoperative gabapentin preventive dose orally once in major abdominal surgeries is valuable in the control of post-operative pain since the concentration of the drug remains high and reduces the use of rescue analgesics.

Conflict of interest: No conflict of interest was faced during current research.

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Authors Contribution:

IT: conduction of research, IRB approval, data sampling
AM: data collection, manuscript writing, biochemical mechanism
INM: data collection
SH: manuscript writing, data collection, biochemical mechanism
MZ: data collection
SZ: data collection, conceptualization
AS: manuscript writing, conceptualization, data collection, research conduction.

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