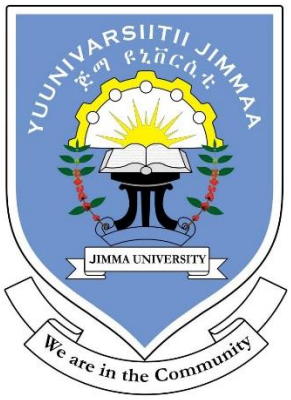

INSTITUTE OF HEALTH

FACULTY OF MEDICAL SCIENCES

DEPARTMENT OF ANESTHESIA,

CRITICAL CARE AND PAIN MEDICINE

EFFECTIVENESS OF INTRAOPERATIVE INTRAVENOUS LIDOCAINE INFUSION AS PART OF POSTOPERATIVE ANALGESIA FOR PATIENTS UNDERGOING ABDOMINAL SURGERY UNDER GENERAL ANESTHESIA PROSPECTIVE COHORT STUDY IN JIMMA UNIVERSITY MEDICAL CENTER, SOUTHWEST ETHIOPIA, 2023.

BY: DR. YONATHAN TADESSE (MD)

A RESEARCH PAPER SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH SCIENCES, DEPARTMENT OF ANESTHESIA, CRITICAL CARE AND PAIN MEDICINE FOR PARTIAL FULFILLMENT SPECIALTY IN ANESTHESIA, CRITICAL CARE, AND PAIN MEDICINE.

February, 2023

JIMMA, ETHIOPIA

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Abstract

Introduction: An increasing amount of evidence suggest that intraoperative intravenous lidocaine infusion can influence pain severity, postoperative analgesic requirement and decrease opioid side effects in a patient with abdominal surgery. Postoperative pain might be due to the damage of muscles and tissues. The importance of pain relief is well-recognized, but it is most often seen that pain control is inadequate. Results of previous study shows the opioid consumption is 70% after abdominal surgery, so that multimodal approach for managing pain will decrease opioid consumption.

Objective: To assess analgesic effectiveness of intraoperative intravenous lidocaine infusion as part of postoperative analgesia for patients undergoing abdominal surgery under general anesthesia in Jimma university medical center.

Methods: Institutional based prospective cohort study conducted in 38 patients with American Society of Anesthesiologist (ASA) class I and II, age ≥ 18 and elective abdominal patients in which they undergone abdominal surgery and grouped into exposed and non-exposed group based on lidocaine infusion (1mg/kg/hr.) or not. Consecutive sampling was employed to recruit study subjects. Data was entered to Epidata v 4.6 and exported to SPSS V26 for analysis. The Shapiro-Wilk test with a p value <0.05 for non-normally distributed data and a histogram with bell-shaped were used to test for normal distributions of data. The comparison of numerical variables between study groups was done using the unpaired student t-test and Mann-Whitney U test based on normally distributed data and non-normally distributed data, respectively. Box and whisker plot were used to show a median pain score differences between groups.

Result: Demographic characteristics were comparable between the groups, p>0.05. Twenty-four-hour median VAS score (0 to 10 cm) at 3rd, and 6th hour showing lower median pain score, with p<0.05. The median time to first analgesia request in minutes were longer (242.11 minutes) in exposed group compared to 91.5 minutes in non-exposed group (p= <0.001). The median tramadol consumption within 24 hour is 100mg in exposed group compared to 150 mg in non-exposed group(p<0.001).

Conclusion and recommendation: Intraoperative lidocaine infusion decreases postoperative pain score, total analgesia consumption and prolongs time to first analgesia request for abdominal surgery done under general anesthesia. Based on these we recommend use of 1 mg/kg/hr of 2% lidocaine infusion is an effect postoperative analgesia.

Key words: lidocaine, Pain, abdominal surgery, infusion, Visual analogue score, Jimma university medical center.

Acronyms And Abbreviations

ASA	American Society of Anesthesiologist
HR	Heart Rate
IM	Intramuscular
IVLI	Intra Venous Lidocaine Infusion
IV	Intra Venous
MAP	Mean Arterial Pressure
NSAIDS	Non-Steroidal Anti-Inflammatory Drugs
OR	Operation Room
PACU	Post Anesthesia Care Unite
PCA	Patient Controlled Analgesia
PONV	Post-Operative Nausea and Vomiting
VAS	Visual Analogue Scale
Vs	Vital sign

Table of contents

Acknowledgement iii
Abstract iv
Acronyms And Abbreviations vi
List of tables x
List of figures x
1. Introduction 1
1.1. Background 1
1.2. Statement of the Problem 3
1.3. Significance of the study 4
2. Literature Review 4
2.1. Hypothesis 8
3. Objectives 9
3.1. General objective 9
3.2. Specific objectives 9
4. Methods and materials 10
4.1. Study Area and Period 10
4.2. Study Design 10
4.3. Population 10
4.3.1. Source population 10
4.3.2. Study population 10
4.4. Eligibility criteria 10
4.4.1. Inclusion criteria 10
4.4.2. Exclusion criteria 10
4.5. Sample size determination 11
4.6. Sampling procedures and method 11
4.7. Study variables 12
4.8. Operational Definition 12
4.9. Data Collection Tool and Procedure 13
4.10. Data Quality Assurance 14
4.11. Data Analysis and Processing 14
4.12. Ethical Approval 15

5. Results 16
5.1. Demographic and perioperative characteristics of elective abdominal surgeries 16
5.2. Effectiveness of lidocaine infusion 17
5.2.1. Postoperative pain comparison between two groups 17
5.2.2. Comparison of Time to First Analgesia Request and Total Analgesia Consumption between Groups. 18
5.2.3. Comparison of side effects (incidence of Nausea and Vomiting) between exposed and non-exposed group. 20
5.2.4. Comparison of HR and MAP before induction, after intubation and 24-hour postoperative period between the two groups. 20
6. Discussion 21
7. Limitation and Strength 25
7.1. Limitation of the Study 25
7.2. Strength 25
8. Conclusion and Recommendation 26
8.1. Conclusion 26
8.2. Recommendation 26
Reference 28
Annexes 33
Annex 1: Information sheet 33
Annex 2: Informed consent form Afan Oromo version 34
Annex 3: Informed consent form Amharic version 35
Annex 4: Data collection tool 36

List of tables

Table 1: Demographic and perioperative characteristics of elective abdominal surgeries in JUMC, from September 1- November 30, 2022,. (n=38) 16
Table 2:Comparison of postoperative pain severity using median (IQR) VAS score (0-10cm) at 3hrs, 6hrs 12hrs and 24hrs postoperative time in patients undergoing abdominal surgeries in JUMC, from September 1- November 30, 2022. Using Mann Whitney U test (median and IQR). 17
Table 3 :Comparison of median time to first analgesia request in minutes and median total analgesia consumption between two groups in the first 24-hour Postoperative periods in patients undergoing abdominal surgeries in JUMC, from. September 1- November 30, 202218
Table 4: Comparison of HR and MAP before induction, after intubation and 24-hour postoperative period between the two groups in patients undergoing abdominal surgeries in JUMC, from September 1- November 30, 2022. 21

List of figures

Figure 1: Simple boxplot of 24hrs VAS score by lidocaine infusion and control groups 18
Figure 2 : Simple boxplot of diclofenac 24hr consumption by lidocaine infusion and control groups 19
Figure 3: Simple boxplot of tramadol 24hr consumption by lidocaine infusion and control groups 19
Figure 4: Incidence of nausea and vomiting between two groups in patients undergoing abdominal surgeries in in JUMC, from September 1- November 30, 2022 20

1. Introduction

1.1. Background

Abdominal surgery involves a surgical operation on organs inside the abdomen. This may include surgery on the stomach, gallbladder, small intestine, or large intestine (colon), liver, pancreas, spleen, esophagus, and appendix. Some reasons for abdominal surgery include infection, obstruction, tumors, or inflammatory bowel disease (1)

General or regional anesthesia can be appropriate for patients undergoing abdominal surgery. In common practice, balanced anesthesia with inhalational anesthetics, opioids and neuromuscular blockers are used in general anesthesia for abdominal surgical procedures. Abdominal wall incision is the major origin of pain experienced by patients after abdominal surgery. Through systematically administered opiates and central neuraxial techniques cause considerable adverse effect, they remain the mainstay analgesic after abdominal surgery. The mean postoperative pain score of 6.5cm were reported on 10cm Visual Analog Scale (VAS). It has been also reported that the morphine consumptions in the first postoperative day is 70%. The proportions of patient with pain score greater than 3cm is 60% on VAS score (2, 3).

Poorly controlled acute pain remains one of the most undesirable consequences after surgery. Despite increased awareness and widespread efforts to address this, reports continue to estimate that a significant number of patients undergoing surgery experience moderate to severe pain, with a majority of them expressing dissatisfaction with their pain management (4).

Postoperative pain is acute pain due to surgical trauma with an inflammatory reaction and initiation of an afferent neuronal barrage, result in several unpleasant sensory, emotional and mental experience precipitated by the surgical trauma and associated with autonomic, endocrine-metabolic, physiological and behavioral responses (5).

The benefit of pain relief is well-known but it is still managed poorly The role of a well-planned pain management strategy in the immediate postoperative period is important to decrease postoperative cognitive impairment, enhanced quality of life, reduced risk of chronic or persistent post-surgical pain and morbidity after abdominal surgery, aided by the availability of multitude of drugs, dosages and routes of administration (5-7)..

The common reason for prolonging hospital stay includes Pain and side-effects of opioid analgesics, such as postoperative nausea and vomiting (PONV), sedation and delayed return of bowel function an (paralytic ileus), urinary retention and development of acute tolerance. Multiple evidence suggest that perioperative intravenous lidocaine can influence pain severity, postoperative anti-pain requirement, early return of bowel function and the length of hospital stay, without having significant side effects than analgesics alone (7, 11, 12).

The skin and fascia of the anterior abdominal wall overlie the four muscles which help support the abdominal contents and the trunk, with the main nerve supply lying in a plane between the internal oblique and transversus abdominis. This plane contains the anterior rami of the lower six thoracic nerves (T7 to T12) and first lumbar nerve (L1), supplying the skin, muscles, and parietal peritoneum. At the costal margins, the thoracic nerves T7 to T11 enter this neurovascular plane of the abdominal wall, travelling along this plane to pierce the posterior wall of the rectus sheath as anterior cutaneous branches supplying the overlying skin. The nerves T7 to T9 emerge to supply the skin superior to the umbilicus and the iliohypogastric nerve, and the ilioinguinal nerve supply the skin inferior to the umbilicus (13, 14).

The pathophysiology of postoperative pain is multifactorial, and commonly of inflammatory nature from skin incision and tissue damage. Many mechanisms have been described to account for the anti-pain effect of systemic lidocaine including suppression of neuronal excitability, suppression of central sensitization, inhibition of spinal viscera-motor neurons, anti-inflammatory effects, decreased neural response by blockade or inhibition of nerve conduction and decreased N-methyl D-aspartate receptor activity. In addition to the above-mentioned mechanisms iv lidocaine infusion decreases pain by inhibiting nerves through the blockade of sodium channels. It is also thought to block spontaneous impulse generation arising from injured nerve fibers and the dorsal root ganglion, and by suppressing primary afferent reflexes in the spinal cord (7, 11, 15).

Intravenous lidocaine is effective for treating visceral pain and may also improve postoperative bowel function. lidocaine infusion administered with 1.5 mg/kg as slow intravenous bolus injection followed by a continuous infusion of 1 mg /kg/hr will decrease anesthesia and analgesic requirements and yields a stable operative and hemodynamic conditions compared to general

anesthesia alone (16, 17). Therefore, IV lidocaine may be an effective measure in the treatment of acute pain in adult patients due to its analgesic and anti-inflammatory properties.

1.2. Statement of the Problem

The current International Association for the Study of Pain (IASP) definition of pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" is updated in 2020. In recent years, some in the field have reasoned that advances in our understanding of pain warrant a reevaluation of the definition and have proposed modifications. Therefore, the committee ultimately recommended that the definition of pain be revised to "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage," and that the accompanying notes be updated to a bulleted list that included the etymology. The revised definition and notes were unanimously accepted by the IASP Council (18).

Untreated postoperative pain has dangerous consequences, ranging from prolonged duration of the hospital stay to more severe complications, such as chronic pain, atelectasis, respiratory infection, myocardial infarction [40, 41], and even death [42]. Several risk factors have been identified for severe postoperative pain, but epidemiological studies often have conflicting results about the relevance of such risk factors [43]. Furthermore, almost all investigations related to the topic were conducted in well-resourced settings.

According to Winfried Meissner study, poor management of post-operative acute pain may lead to the development of chronic pain; this occurs in 10%–50% of patients after various common abdominal operations and 2%–13% are still experiencing pain two years after some operations (13).

In Ethiopia, a study conducted by the Ethiopian Public Health Association in 2005 showed that health care providers believes that pain was undertreated due to unstandardized practice, absence of medications and poor knowledge and attitude among professionals. It has been repeatedly confirmed by studies in the past 3 to 4 decades that 20 to 80% of patients undergoing surgery suffer from inadequately treated pain and pain is classified as a serious public health problem both in the developed and in developing countries. Evidence suggests that pain and ileus causing a prolonged hospital stay are major cost drivers after major abdominal surgeries (20).

Many strategies have been implemented to reduce postoperative pain following abdominal surgery, including steroidal anti-inflammatory drugs, administration of opioid, and neuraxial anesthesia. However, most of the time they did not show consistent efficacy. Thus, multimodal analgesia regime was recommended for pain management after abdominal surgery (21). Besides of decreasing cost and side effect of opioids, use of lidocaine infusion also support the principle of multimodal analgesia where a variety of analgesic medication and techniques that target different mechanisms of action in the peripheral or central nervous system might have additive or synergistic effects or alternative analgesia and more effective pain relief compared with single-modality interventions (22-24).

1.3. Significance of the study

An extended hospital stays, and significant postoperative cost drivers are brought on by common complications right after abdominal surgery. It is impossible to use a single medication or treatment method to provide patients with the best pain relief while maintaining normal physiological function. Therefore, after abdominal surgery, postoperative pain treatment is essential. Multimodal analgesia encourages the use of multiple medications and procedures that operate on different sites to maximize analgesic efficacy while limiting the negative effects of single drug treatment. One technique employed by anesthesiology experts as part of multimodal analgesia is the intravenous (IV) infusion of lidocaine. It is also a practical and safe local anesthetic.

Based on the study findings JUMC and other hospitals' operating rooms as use lidocaine an alternative to basic pain management and even as an additive analgesia in the intraoperative and postoperative periods. The zonal and regional health administrators can promote the use of lidocaine infusions in the intraoperative and postoperative periods.

On the other hand, it can be used as a baseline for future researchers interested in conducting research on related topics.

2. Literature Review

Intravenous administration of lidocaine has been shown to have anti pain effect when it is given intravenously in patients with chronic neuropathic pain.it is assumed that Lidocaine decreases

pain by inhibiting sodium channels resulting in inhibitions' of impulse generation arising from injured nerve fibers and the dorsal root ganglion, and by suppressing primary afferent reflexes in the spinal cord. In addition to the above benefits systemic lidocaine is thought to be effective in managing visceral pain and postoperative bowel function (27).

In addition, because of its safety profile preservative free lidocaine has antiarrhythmic properties & can be used for attenuation of hemodynamic changes during laryngoscopy & endotracheal intubation (28). To have improved recovery and a reduced risk of postoperative acute adverse effects (i.e. pulmonary dysfunction), and chronic adverse effect (i.e. delayed recovery and hospital discharge and chronic pain) after various procedures including abdominal surgeries we need to have adequate pain management (10, 30).

Study conducted in Australia reveals the average end-tidal sevoflurane concentration was lower in the lidocaine group compared to saline. In the lidocaine group, the average MAP was 80.3 mmHg compared to 85.1 mmHg in the Saline group . The mean heart rate also lower in the lidocaine group: 74.9 beats/min vs. 81.5 beats/min in the Saline group(31).

In the study done in Germany they suggested that systemic lidocaine has proven antipain effects for chronic pain, especially for neuropathic pain states ,but conflicting results have been achieved in acute pain, such as postoperative pain . When IV lidocaine was administered during surgery at doses large, enough to induce toxic side effects (5 ug/mL), direct analgesic and morphine-sparing effects were observed. To minimize adverse reactions, Cassuto et al. administered lidocaine in a small-dose regimen (2 mg/min) starting 30 minutes before surgery and continuing for 24 hours after surgery. They found significant relief of postoperative pain and a decrease in opioid consumption during the first and second postoperative days. In contrast, if a small-dose lidocaine infusion was established in the postoperative period only, lidocaine failed to produce analgesic effects. Although the observation period was limited to the early postoperative phase, the results suggest that lidocaine might have its best effects when administered during surgery, i.e., during the presence of significant nociceptive input (32).

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Another study conducted in China showed that the percentage of patients requiring analgesia and postoperative comfort score of Lidocaine group was significantly higher than that of control group ,patient's return of flatus, bowl movement, hospitalization days, and hospitalization

expenses in group L were significantly lower than those in group C .There were no difference of adverse events between the 2 groups (33).

Meta-analysis of 45 prospective studies suggested that lidocaine reduced postoperative pain (visual analogue scale, 0 to 10 cm) at 1–4 h and at 24 h after surgery, but not at 48h (6).

According to a randomized control trial done in Nepal sixty patients undergoing major upper abdominal surgery were selected and half of the patients received lidocaine 2.0% (intravenous bolus 1.5 mg/kg followed by an infusion of 1.5mg/kg/h), and the other half received normal saline according to randomization. The pain intensity of the patients were evaluated at rest and movement as well as the total postoperative analgesic (morphine) requirement, it showed that all parameters were significantly lower in lidocaine group. In addition the time requirement for the first dose of analgesic was longer in lidocaine group, so the study concluded that perioperative lidocaine infusion decreases the intensity of postoperative pain, reduces the postoperative analgesic consumption, without causing significant adverse effects in patients undergoing upper abdominal surgery (16).

A study done in Korea indicated that intraoperative lidocaine infusion reduced by 5% the amount of sevoflurane required at similar bispectral index. even though , there were no significant effects of lidocaine regarding the return of bowel function, postoperative pain intensity, analgesic sparing and level of patient's satisfaction for pain control. Vital signs of the patients always remained stable during the operation and PACU in either group. There was no patients which developed lidocaine associated toxicity intraoperatively and post operatively (27).

A study done by Jun Heum Yon and colleagues concluded that after Pre-emptive intravenous lidocaine infusion, it is not only effective to improve post operative pain in abdominal surgery, but it is also feasible and safe when administered in appropriate dosages(34). But, another study done in Texas concluded that intraoperative IV lidocaine had no effect on postoperative opioid consumption and were unable to demonstrate benefit of postoperative IV lidocaine on pain intensity after laparotomy(35).

According to a study done in Iran, which compared the anti-pain effect of IV lidocaine, and morphine sulfate fractures indicated that, effectiveness of IV lidocaine in relieving the pain caused by extremity fractures was significantly higher than that of morphine sulfate. They conclude from this study; IV lidocaine could be considered as alternative for pain management.

In addition to the above mentioned benefits the study also reported no cases of hypotension, respiratory depression, dysrhythmia and drop desaturation were detected in either group during the initial 30 minutes after drug injection (9).

Another study done in Switzerland showed that systemic lidocaine failed to reduce pain intensity, over all opioid requirement in patients undergoing laparoscopic trans peritoneal renal surgery (12).

There was research which was done in New York Columbia university showed that IV lidocaine has an anti-pain effect that is good in managing pain. Although patient receiving iv lidocaine were given more opioids in comparison with lidocaine epidural infusion, but clinically adverse effects were reduced in IV lidocaine groups (3).

According to studies done in USA and Belgium suggested that no subjects experienced signs or symptoms of lidocaine toxicity (neurologic changes—lightheadedness, dizziness and visual disturbances, and cardiac dysrhythmias (23, 24)

There was a study done in Egypt which concluded that lidocaine (LG) group had lower fentanyl consumptions, prolonged time to first analgesia request and lower VAS score compared with placebo group (30).

A study done in Tunisia regarding IV ketamine and lidocaine infusion after nephrectomy indicated that both reduced significantly morphine consumption and pain scores compared with the control group . Regarding neuropathic pain Lidocaine was effective up to 3 months post operatively unlike ketamine (37).

2.1. Hypothesis

Hypothesis was stated based on the three major outcome variables including pain severity by visual analogue score (VAS), time to first analgesic request in minutes and total 24-hour analgesic consumption in milligram.

(**HO** indicates null hypothesis and **HA** indicates the alternative hypothesis).

HO: There is no significant difference in median VAS score between exposed and non-exposed groups.

HA: There is significant difference in median VAS score between exposed and non-exposed

HO: There is no significant difference in median time to first analgesic request between exposed and non-exposed groups.

HA: There is a significant difference in median time to first analgesic request between exposed and non-exposed groups.

HO: There is no significant difference in median total 24-hour analgesic consumption between exposed and non-exposed groups.

HA: There is a significant difference in median total 24-hour analgesic consumption between exposed and non-exposed groups.

3. Objectives

3.1. General objective

To assess the effectiveness of intra-operative intravenous lidocaine infusion as a part of postoperative analgesia for patients undergoing abdominal surgeries in Jimma University Medical Center from September 1- November 30, 2022 Southwest Ethiopia.

3.2. Specific objectives

To compare pain severity between exposed and non-exposed groups.

To compare time to first analgesic request between exposed and non-exposed groups.

To compare total 24-hour analgesic consumption between exposed and non-exposed groups.

To compare incidence of nausea and vomiting between exposed and non-exposed groups.

4. Methods and materials

4.1. Study Area and Period

The study was conducted at JUMC, which is found in Jimma zone in Oromia region. It is located 352 km's southwest from Addis Ababa. It was established in 1930 E.C by Italian invaders. It is bounded on the south by the Southern Nations, Nationalities and Peoples Region, the northwest by Illubabor, on the north by Misraq Welega, and on the northeast by Mirab Shewa; part of the boundary with Misraq Shewa is defined by the Gibe River. It is one of the oldest hospitals in Ethiopia and it is the only teaching and referral hospital in southwest Ethiopia with total 800 bed capacity and a catchment population of over 15 million people (38). According to DHIS 2 annual hospital report, it gives a service for a total visit of 197026 clients in 2013 E.C. including a total surgical service of 8047 (3718 elective and 4329 emergency) cases.

Data collection was carried out from September 1- November 30, 2022

4.2. Study Design

Institutional based prospective cohort study design was employed from September 1- November 30, 2022 in Jimma University Medical Center.

4.3. Population

4.3.1. Source population

Elective abdominal patients who were scheduled for surgery at Jimma University Medical Center.

4.3.2. Study population

Elective abdominal patients who were undergone surgery at Jimma University Medical Center.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

Patients older greater than 18 years and ASA class I and II, who were undergoing elective abdominal surgery under general anesthesia were included in the study.

4.4.2. Exclusion criteria

- ✓ Allergy for local anesthetics

- ✓ Chronic opioid use
- ✓ Liver dysfunction
- ✓ Renal insufficiency
- ✓ Epilepsy
- ✓ Cardiac rhythm disorders with medication of antiarrhythmic drugs.

4.5. Sample size determination

The sample size was calculated by the following formula for both exposed and non-exposed groups.

$$\mathbf{n_1}=\frac{(\delta 1^2+\delta 2^2)\ (\boldsymbol{Z}a/2+\boldsymbol{Z}\beta)^2}{(\mu 1-\mu 2)^2}$$

n=sample size in each group

$\delta 1^2$=variance in control group

$\delta 2^2$=variance in treatment group

α=conventional multiplier for alpha =0.05, which is 1.96

β = conventional multiplier for power = 0.80, which is 0.84

$\mu_{1=}$mean in control group

$\mu_{2=}$ mean in treatment

From the literature the mean VAS score, μ1=3.5 in control group, μ2=1.6 in treatment group and σ1 = 3.1, σ2 = 2.4 are taken (17).

$$=\frac{(3.1^2+2.4^2)\ (1.96+0.84)^2}{(3.5-1.6)^2}=35$$

n_1=35=$n_{2,}$ using 1:1 ratio between groups a total of 70 patients will be required

With a 10% non-response rate in both groups, the final sample size was 78, but only 38 patients were recruited over three months that fulfill the study criteria.

4.6. Sampling procedures and method

The research subjects were estimated based on previous data to establish the sampling procedure. According to the data, 90 elective abdominal operations were performed in the previous three

months. As a result, the consecutive sampling approach was used to enroll 38 research participants.

4.7. Study variables

Pain severity by VAS score (0-10cm).

Time to first analgesic request in minutes.

Total Analgesia consumption in milligram in the first 24 hours

Socio demographic: Age, sex, Body Mass Index (BMI)

ASA physical status

Preoperative surgical diagnosis

Induction agent

Maintenance agent

Surgeon experience

Perioperative analgesia

Duration of surgery in minutes

Duration of anesthesia in minutes

4.8. Operational Definition

Postoperative pain: a patient complaining pain and any pain score other than zero within 24 hours.

Post-operative nausea and vomiting: when a patients experience at least one episode of either nausea or vomiting within 24 hours.

Intra-operative hemodynamic changes: change in heart rate (HR) and mean arterial pressure (MAP) during surgery.

Duration of surgery: time in minutes from skin incision to end of surgery.

Duration of anesthesia: a time in minutes it takes from pre oxygenation to a time a patient get response to verbal command.

Time to first analgesia request: a time in minutes from the end of surgery to a first-time analgesia were given.

Total analgesia consumption: total dose of anti-pain medication given in mg within the first 24 hour after end of surgery.

Extubation time: is a time in minutes estimated from closure of halothane vaporizer to extubation of endotracheal tube.

Vital sign before induction: is a base line HR and MAP of a patient before giving any anesthetic drug**.**

Vital sign after intubation: is HR and MAP of a patient after insertion of endotracheal tube.

Visual analogue score (VAS) is a Gold standard pain intensity assessment tool that involves asking patient how severe he or she feels his or her pain state putting a mark (/) on the line from 0-10 cm and would measure the distance from 0 cm to a marked point (39).

ASA status: is a surgical risk stratification validated by American Society of Anesthesiologist; described as follows:

ASA I: a healthy patient with no organic/physiological/psychiatric problems.

ASA II: controlled medical conditions with mild systemic effect and no limitation of functional ability.

ASA III: medical condition with severe systemic effect, limitation in functional capacity.

ASA IV: poorly controlled medical conditions associated with significant impairment in functional ability that is potential threat to life.

ASA V: critical condition, little chance of survival without surgical procedure.

ASA VI: brain dead patient undergoing organ donation.

4.9. Data Collection Tool and Procedure

The questionnaire was prepared in English, and it has three parts. The first section was completed during preoperative and intraoperative times and collected by a trained BSc anesthesiologist; the second was a PACU record that was to be recorded by a PACU nurse; and the third was completed in the ward by a trained ward nurse.

Anesthesia residents, M.Sc., B.Sc., and diploma anesthesia professionals carry out anesthesia management for abdominal surgery in the study hospital. M.Sc. anesthesia professionals, including M.Sc. anesthesia students and some B.Sc. anesthetists, provide lidocaine infusions using a bolus dose of 1.5 mg/kg of lidocaine before induction of anesthesia. Then, immediately

after induction, they continued an IV infusion of 1 mg/kg per hour of lidocaine mixed with 500 mL of 0.9% normal saline using an AeonMed infuser for 60 minutes intraoperatively.

Patients in the PACU were asked to rate their pain on a 0–10 cm VAS scale as soon as they fully responded to a verbal command and regained full cognitive ability. VAS score and other variables were documented at the 3rd hour, 6th hour, 12th hour, and 24th hour in the wards after the end of surgery. A time in minutes from the end of surgery to the first analgesia request was documented, along with the total amount of analgesia consumed in the first 24 hours. In addition, the incidence of postoperative nausea and vomiting was documented when it was reported within 24 hours.

In the postoperative period, patients were transferred to the recovery room and then transferred to the ward when they recovered from anesthesia. In the ward, nurses observed patients, and pain was usually managed by tramadol and diclofenac based on patient complaints and sometimes on physician orders.

4.10. Data Quality Assurance

To ensure the quality of the data, one day of training was given for data collectors on how and what information they should collect from targeted data sources. A pretest was done for one week at Jimma University Medical Center with 5% of the total sample size (two patients in each group) who were not going to be included in the actual study. The completeness, accuracy, and clarity of the data were checked. Incomplete data was not entered into a database prepared on Epidata. Data were cleaned, and cross-checking was done before analysis in SPSS. Regular supervision was done during data collection by the principal investigator, and data was stored in a safe and secured place.

4.11. Data Analysis and Processing

Before data entry, all questionnaires were checked for completeness. After assuring data quality, forms were assigned consecutive numbers (codes) for ease of data entry. Cleaned and coded data were entered using Epi-data version 4.6, then exported to SPSS. Finally, SPSS version 26 was used to analyze the data.

The Shapiro-Wilk test with a p value <0.05 for non-normally distributed data and a histogram with bell-shaped were used to test for normal distributions of data, while homogeneity of variance was assessed using Levene's test for equality of variance. Numeric data was described in terms of mean ± SD for symmetric data like age, BMI, and heart rate (HR) and median

(interquartile range) for asymmetric numeric data like the 24-hour VAS score and total analgesia consumption. The comparison of numerical variables between study groups was done using the unpaired student t-test and Mann-Whitney U test based on normally distributed data and non-normally distributed data, respectively.

Frequency and percentage were used to describe categorical variables. The findings of the study were presented in tables and figures.

4.12. Ethical Approval

Ethical clearance was obtained from the Jimma University Institutional Review Board (JIRB), Faculty of Medical Sciences. Informed consent was obtained from participants. Respondents understood participation was voluntary and that they had full autonomy to withdraw their participation at any time they felt so. Names and other personal information that could compromise the confidentiality of the respondents were not taken or recorded with the utmost respect for the privacy and confidentiality of the patients who were included in the study. Any information was kept confidential and only used for study purposes.

5. Results

5.1. Demographic and perioperative characteristics of elective abdominal surgeries

A total of thirty-eight patients were included in the study. the unpaired t-test was used for continuous variables that were normally distributed; and the Mann-Whitney U test was also used for continuous variables that were not normally distributed. Age distribution among exposed were 37.32 ± 11.67 years vs 38.74 ± 10.20 years. Out of the 38 patients enrolled 21 (55.2%) were males and 17 (47.8%) females. Comparison of general characteristics of the study population of both the groups is given in Table-1. No statistical difference was observed in their age, weight, sex ratio, duration of anesthesia, duration of infusion, ($p > 0.05$).

Table 1: Demographic and perioperative characteristics of elective abdominal surgeries in JUMC, from September 1- November 30, 2022. (n=38)

Variables	Categories	Exposed group (lidocaine infusion) n=19	Non exposed group n=19	Total N %
Age (years) (mean ± SD)		37.32 ± 11.67	38.74 ± 10.20	
BMI (kg/m2) (median and IQR)		23.14 (22.3-24.48)	22.34 (21.6-23.51)	
Sex	Male	9 (47.4%)	12 (63.2%)	21 (55.26%)
	Female	10 (52.6%)	7 (36.8%)	17 (44.74%)
Baseline MAP (mmHg) (median and IQR)		87.00 (80-93)	85 (80-92)	
Baseline HR (beats per min) (mean ± SD)		82.74 ± 11.604	75.42 ± 8.461	
Baseline respiratory rate (breaths per min) (median and IQR)		16 (15-18)	18 (18-20)	
Types of procedures	Cholecystectomy	3 (15.8%)	3 (15.8%)	6 (23.7%)
	Laparotomy	6 (31.6%)	7 (36.8%)	13 (34.2%)
	Colostomy closure	4 (21.1%)	2 (10.5%)	6 (15.78%)
	ovarian tumor resection	4 (21.1%)	3 (15.8%)	7 (18.4%)
	Resection anastomosis	2 (10.5%)	4 (21.1%)	6 (15.78%)
Coexisting disease	Yes	0	1 (5.3%)	1 (2.6%)
	No	19 (100%)	18 (94.7%)	37 (97.4%)
Types of analgesia	Pethidine		0	0
	Morphine	19 (100%)	19 (100%)	100%

Induction agent	Thiopental	6 (31.6%)	6 (31.6%)	12 (31.6%)
	Propofol	13 (68.4%)	13 (68.4%)	26 (68.4%)
Surgery experience	Senior	12 (63.2%)	10 (52.6%)	22 (57.9%)
	Resident	7 (36.8%)	9 (47.4%)	16 (42.1%)
Duration of anesthesia in minutes (mean ± SD)		178.68 ± 49.35	160 ± 42.394	
Duration of surgery in minutes (mean ± SD)		157.68 ± 50.643	139.74 ± 41.044	
Extubation time in minutes (median and IQR)		10 (8-15)	12 (10-15)	

IQR= Interquartile range SD= standard deviation

5.2. Effectiveness of lidocaine infusion

5.2.1. Postoperative pain comparison between two groups

The median VAS scores in lidocaine group remained significantly less than that in controlled group ($p<0.05$) in 3hr post-operative time and 6hr post-operative time VAS score. (Table 2)

Table 2:Comparison of postoperative pain severity using median (IQR) VAS score (0-10cm) at 3hrs, 6hrs 12hrs and 24hrs postoperative time in patients undergoing abdominal surgeries in JUMC, from September 1- November 30, 2022. Using Mann Whitney U test (median and IQR).

Variables expressed as median (IQR) in (cm)	Exposed (Lidocaine infusion) group (n=19)	Non-exposed group (n=19)	P-value
3hr post-operative time VAS score	4 (4-5)	6 (5-6)	**0.0001***
6hr post-operative time VAS score	4 (4-5)	5 (4-6)	**0.046***
12hr post-operative time VAS score	5 (4-6)	6 (5-7)	0.271
24hr post-operative time VAS score	5 (4-6)	5 (4-6)	0.795

*=Statistically significant IQR= Interquartile range VAS= visual analog scale

The lidocaine group and control group both had a 24 h VAS score of 5 (range 4-6). (Figure 1)

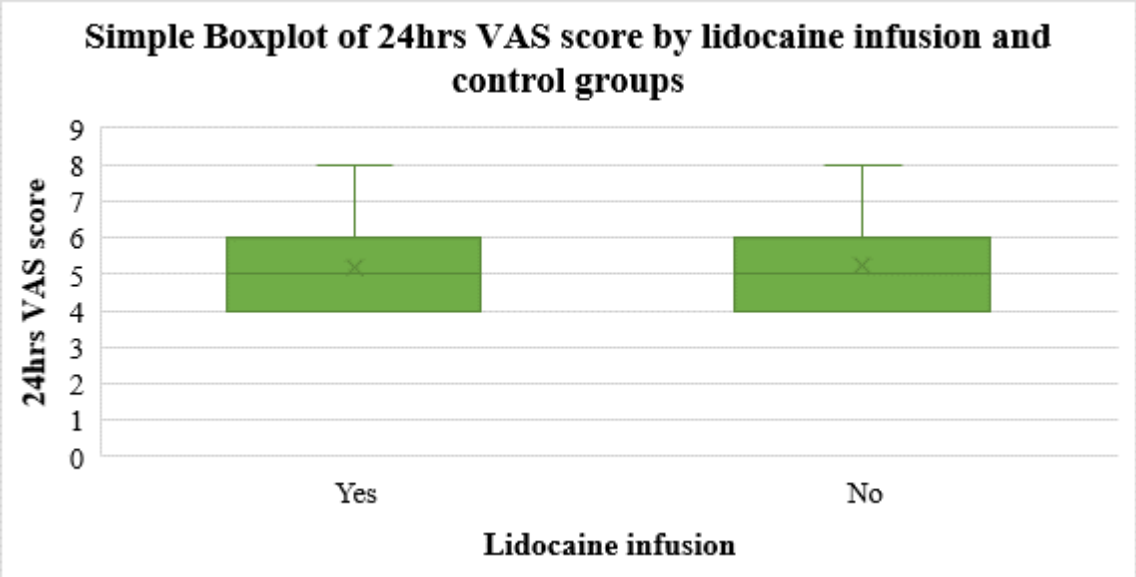

Figure 1: Simple boxplot of 24hrs VAS score by lidocaine infusion and control groups

5.2.2. Comparison of Time to First Analgesia Request and Total Analgesia Consumption between Groups.

The median time in minutes were longer 242 minutes in exposed group compared to 91 minutes non-exposed group, $p<0.001$ using unpaired t-test. There were also statistically significant differences regarding median total tramadol and diclofenac consumption within 24 hours using Mann Whitney U test. (Table 3)

Table 3 :Comparison of median time to first analgesia request in minutes and median total analgesia consumption between two groups in the first 24-hour Postoperative periods in patients undergoing abdominal surgeries in JUMC, from September 1- November 30, 2022.

Variables		Exposed (Lidocaine infusion) group (n=19)	Non-exposed group (n=19)	P-value
Time to first analgesia request in minutes (mean ± SD)		242.11 ± 103.2	91.58 ± 62.2	**0.001***
Total analgesia consumption	Tramadol (IV)	100 (100-100)	150 (100-150)	**0.001***

within 24 hours in mg (median and IQR)	Diclofenac (IM)	100 (75-150)	150 (150-225)	**0.001***

*=Statistically significant IQR= Interquartile range IV= Intravascular IM= Intramuscular SD= standard deviation

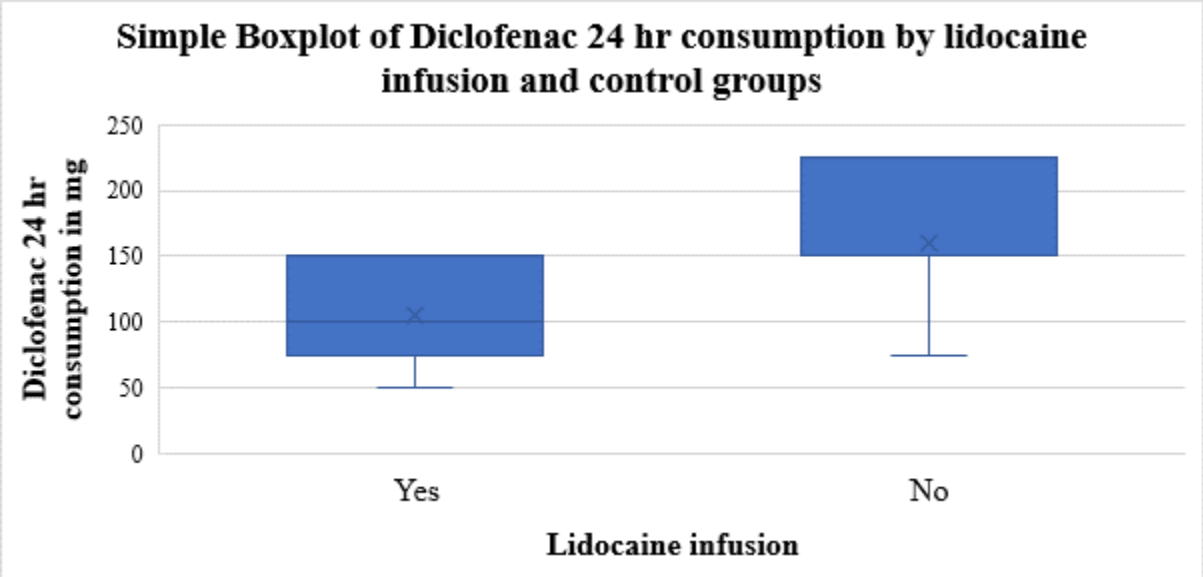

Figure 2 : Simple boxplot of diclofenac 24hr consumption by lidocaine infusion and control groups

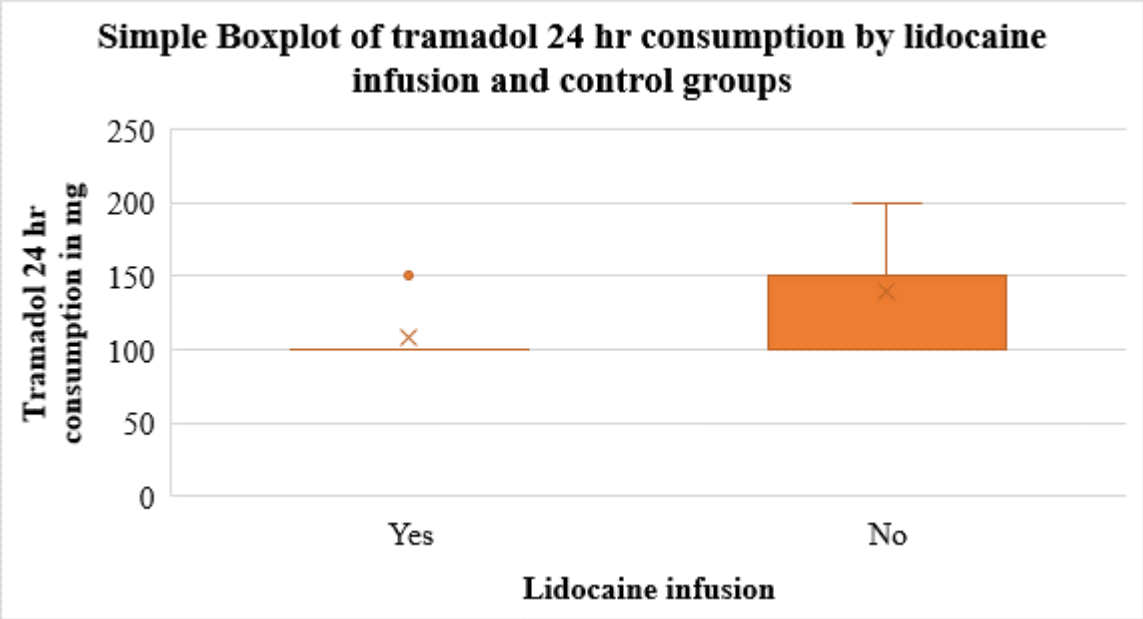

Figure 3: Simple boxplot of tramadol 24hr consumption by lidocaine infusion and control groups

5.2.3. Comparison of side effects (incidence of Nausea and Vomiting) between exposed and non-exposed group.

The incidence of nausea and vomiting over 24 hours is 57.9%. The proportions of patients with nausea and vomiting in exposed group (lidocaine infusion) is (26.32%) and (31.58%) in nonexposed group with (X^2=0.432) and a P-value of 0.511. (Figure 4)

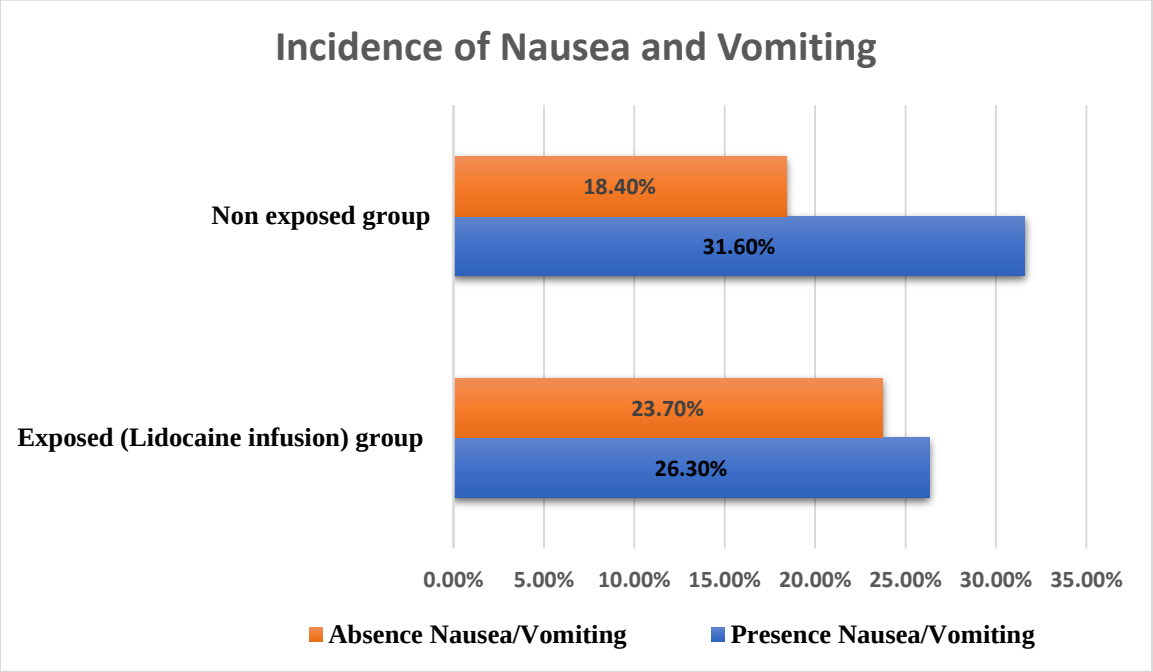

Figure 4: Incidence of nausea and vomiting between two groups in patients undergoing abdominal surgeries in in JUMC, September 1- November 30, 2022 , 2023

5.2.4. Comparison of HR and MAP before induction, after intubation and 24-hour postoperative period between the two groups.

There is statistical significance result was shown between the two groups in HR before induction of anesthesia, P-value <0.05 but there is no statistical significance result shown between the two groups in HR and MAP after intubation with P-value > 0.05. Also there is no statistically significant result was found in HR and MAP between two groups at 3hrs, 6hrs and 24hrs hour's postoperative time, P-value <0.05. (Table 4)

Table 4: Comparison of HR and MAP before induction, after intubation and 24-hour postoperative period between the two groups in patients undergoing abdominal surgeries in JUMC, from September 1- November 30, 2022.

Variables	Categories	Exposed (Lidocaine infusion) group (n=19)	Non-exposed group (n=19)	P-value
Vital sign before Anesthesia induction	Heart rate (mean ± SD)	82.74 ± 11.604	75.42 ± 8.46	**0.033***
	MAP in mmHg (median and IQR)	87 (80-93)	85 (80-92)	0.708
Vital sign after intubation	Heart rate (mean ± SD)	88.16 ± 11.86	84.53 ± 11.72	0.349
	MAP (mean ± SD)	91.68 ± 11.18	90.32 ± 11.07	0.707
Vital sign at 3hrs	Heart rate (mean ± SD)	79.26 ± 8.77	83.32 ± 8.32	0.153
	MAP (mean ± SD)	82.11 ± 5.73	87.16 ± 11.52	0.099
Vital sign at 6hrs	Heart rate (median and IQR)	84 (80-90)	82 (74-88)	0.271
	MAP (mean ± SD)	85.74 ± 6.47	85.58 ± 10.39	0.956
Vital sign at 24hrs	Heart rate (mean ± SD)	78.37± 10.09	79.47± 9.605	0.731
	MAP (median and IQR)	85 (80-87)	85 (82-91)	0.402

*=Statistically significant IQR= Interquartile range MAP= mean arterial pressure SD= standard deviation

N.B. In this study none of the patients experienced lidocaine-related adverse effects.

6. Discussion

The present study which is done in JUMC showed that the median VAS scores in lidocaine group remained significantly less than that in controlled group ($p<0.05$) in 3hr post-operative time and 6hr post-operative time VAS score with statistically significant difference of 0.0001 and 0.046 respectively but there was no statistically significant difference in median VAS score at 12^{th} and 24hr postoperatively. This might be because of earlier request of analgesic medication in non-lidocaine groups. The other reason could be for the sake of safety we did not continue lidocaine infusion post operatively unlike other studies in which they continue for at least 1hr postoperatively.

There was A meta-analysis which was done in China for assessing the efficacy and safety of intravenous infusion of lidocaine for pain management after cholecystectomy concluded that there was statistically significant difference between groups in terms of VAS scores at 24 hours,

p<0.05 and significant difference were found regarding opioid consumption at 24 hours, p=0.009(21).

The result of our study also supports the findings of research done in Iran and Nepal showing the lower pain score in treatment group compared to the control group. (16).

Groudine and colleagues randomized patients undergoing open radical prostatectomy to receive placebo or lidocaine (bolus 1.5 mg kg−1 followed by 3 mg min−1 continued until 60 min after skin closure). They confirmed the safety of this regimen by estimating the plasma concentrations to remain within the therapeutic range (1.3–3.7 μg ml−1). They reported a significant reduction in opioid analgesic requirements, decreased pain scores with greater satisfaction, and earlier return of bowel activity in the patient's receiving lidocaine. (6,19)

In contrary to our study a randomized controlled trail done in Switzerland to analyze the effect of perioperative IV lidocaine in laparoscopic renal surgery postoperative pain scores showed there were no significant differences between groups in pain scores over time at rest with analgesic efficacy of lidocaine intraoperative infusion of 1mg/kg/hr. The mean NRS score at 6th hour is 4±2 in lidocaine group compared to 5±1 in control group with 0-10 NRS scale (p=0.71). The possible explanation for this contradictory result is the use of fixed postoperative pain treatment (co-analgesic agents) like administering metamizole and paracetamol (acetaminophen) every 6 hours postoperatively and difference in study design(12).

Our study showed significantly less total postoperative analgesic (tramadol) requirement in lidocaine group than in control group. The median (IQR) tramadol in mg where 100 (50-100) mg in exposed group compared to 150(100-150) mg in non-exposed group p<0.001. We lack similar finding for comparison with the same drug tramadol (weak opioid) since most studies are using strong opioids (morphine) as postoperative pain management protocol and controlling of analgesic agent achieved between groups. The mechanisms of analgesia of this local anesthetic on surgical trauma include neuronal transmission blockage at the place of injury, reducing neurogenic response and systemic anti-inflammatory intrinsic activity. Lidocaine's analgesic property can persist even after the decreasing of its plasma levels, which corroborates the nervous conduction blockage theory (7).

Though different drugs were used, study done in America reveals total postoperative morphine consumption in lidocaine group is lower than that of control group with mean 17±1.5 mg compared to 25±2.7 mg respectively with p <0.0001. Though our study use the weakest opioid, the opioid conversion factor of 1mg tramadol compared or equal to 0.1mg of morphine which estimates 100mg tramadol to 10mg morphine which is comparable and equivalent analgesic effect (18). The scientific explanation for this similar result is when systemic lidocaine is administered during operation it will prevent the induction of central hyperalgesia leading to morphine sparing effects by direct inhibition to N-methyl-D-Aspartate (NMDA) receptor, while peripherally decreasing spontaneous neuronal discharge from A delta and C fibers thus decreasing transmission of nociceptive pain) (2, 10, 24).

A double-blinded study by Saadawy and collaborators in 120 patients submitted to laparoscopic cholecystectomy using the lidocaine infusion for post operative pain management showed that, there was lower need of morphine use at the second postoperative hour. The lidocaine group had lower scores of abdominal pains at rest with 2, 6 and 12 hours postoperative. The scientific reason for result similarity between the studies is that lidocaine and its metabolites interact with peripheral and central voltage-gated sodium channel on intracellular face of membrane blocking the start and conduction of neural impulse potential and morphine sparing effect (7,13).

We also observed statistically significant difference between lidocaine and saline groups in the median (IQR) of total diclofenac consumption within 24 hours which is 100 (75mg-150mg) vs. 150mg (150-225mg) respectively with (p= 0.001). We could not find other research for comparison since almost all studies are using opioids as postoperative pain management protocol and controlling of analgesic agent achieved between groups.

Our study demonstrate the median (IQR) time for the request of the first dose of analgesic was significantly longer in lidocaine group than in control group 242.11 ± 103.2 minutes vs. 91.58 ± 62.2 minutes, p<0.001. Our finding is comparable with study done in Nepal which shows mean time for the first analgesic request time was longer in treatment group compared to control group, 60.97±18.05minutes vs. 15.73±7.46 minutes, respectively, (p<0.001) (16).

The persistence of analgesic effect of lidocaine even after the infusion was discontinued in our study indicates prevention of spinal or peripheral hypersensitivity or both to painful stimuli

reflecting its effects on inhibition of spontaneous impulse generation arising from injured nerve fibers and from dorsal root ganglion neurons proximal to the injured nerve segments and suppression of primary afferent evoked polysynaptic reflexes in the spinal dorsal horn. These effects have been postulated to be mediated by a variety of mechanisms, including sodium channel blockade, as well as inhibition of G protein–coupled receptors, N-methyl-D-aspartate receptor, reduces circulating inflammatory cytokines, and prevents secondary hyperalgesia and central sensitization (23,24,26).

Our finding shows the overall incidence of nausea and vomiting after elective abdominal surgery in the first 24 hours to be 57.9%. This proportion is higher in the control group with incidence of 31.58% compared to 26.32% in the treatment group. Though there is a proportion difference, there is no statistical difference between two groups about decreasing the incidence of nausea and vomiting in the first 24 hours ($p= 0.511$). This shows a proportion difference compared to study by Samimi et al where the incidence of postoperative nausea and vomiting is 26%, $p=0.081$(8). The likely explanation for this incongruity is, Samimi et al had used propofol as standard induction agent which is known for decreasing incidence of nausea and vomiting and also this might be because the total amount of fentanyl which can induce nausea and vomiting, had been significantly lower in lidocaine group in the study and different in type and depth of inhalational anesthetic agent is the other likely explanation.

There is no statistically significant difference between two groups in HR and MAP after intubation, $p<0.05$ but no significance difference between two groups in HR and MAP before induction of anesthesia, $p>0.05$. Attenuation of the sympathetic response (increase in HR and MAP) during laryngoscopy and endotracheal intubation was observed in the lidocaine group. The result of this study is in line with randomized controlled study done in Turkey showed that heart rate after intubation was significantly lower in lidocaine group compared with controlled group ($P<0.05$) (11). The likely scientific explanation for this result is lidocaine affects impulse conduction from Sino-atrial (SA) node of the heart and decreases HR and systolic blood pressure.

7 Limitation and Strength

7.1 Limitation of the Study

The study was conducted on small sample size and single-centered facility-based study due to constraints of time and budget.

Lack of double blinding

7.2 Strength

Study participants were homogenous between the exposed and non-exposed group.

8 Conclusion and Recommendation

8.1 Conclusion

It can be concluded that intraoperative infusion dose of lidocaine 1 mg/kg/hr decreases the intensity of postoperative pain, reduces the postoperative analgesics requirement, prolongs time to first analgesic request and as a part of multimodal approach for post operative analgesia in patients underwent abdominal surgery.

8.2 Recommendation

For Anesthesiologist and Anesthetists:

I recommend that intraoperative intravenous lidocaine infusion(1mg/kg/hr) is an effective postoperative analgesia, prolongs time to first analgesia request and decrease total analgesics consumption after elective abdominal surgery

.

For Researchers:

I also recommend that this study need to be conducted in large sample size and multicentered for generalizing the result.

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Annexes

Annex 1: Information sheet

Introduction

This information sheet is prepared to explain the research project that you are asked to join by a group of research investigators. The research team includes BSc. anesthetist, one senior advisor from Jimma university and two Nurses for data collection from Jimma university medical center.

Name of Principal investigator: Dr. Yonathan Tadesse

Advisor's name: - Dr. Edosa Kejela

Name of organization: - Jimma university, faculty of medical sciences, Anesthesia department

This information sheet is prepared by the above-mentioned investigators.

Risk

There is no any risk or harm that you will face by participating in this research. Any personal information recorded will not be copied and transferred to other bodies. No need of writing participants' name but by a code. Every piece of information will be kept confidentially.

Benefits

There is no incentive or payment to be gained by taking part in this project. The information collected from this research project will be kept confidential and only accessed the researcher and research assistant only. This research project will be reviewed and approved by IRB of the Jimma university. If you want to know more information, you can contact the committee through the address below.

Contact information: - Dr. Yonathan Tadesse (MD)

Mobile: -+251 913175269

E-mail**: tadessey822@gmail.com**

Annex 2: Informed consent form Afan Oromo version

Walii galitee

Ani Obboo/addee/Dr _____, miseensa garee qorannoo irra.

Qoranoo Kun kan inni irratti xiyeefatee, waa'ee yaalamtota kutaa namoota gar malee dhibamani itti ciisani kessa yaalaman irratti. kanaafuu qorannoo kana irrattii wanta isin irraa eegamu akka nuufgotan kabajaan isin gaafanna. Kunis ammoo fayyaa yaalamtota garmalee dhukkubsatan irratti fayidaa fi jijjiirama guddaa ni fida. Waliigaltee fi eyyama kessaniin malee iccitii kessan nama biraaf yookin ammoo waajira tokkoofuu akka dabarsinee hin kenninee waadaa isiniif galla.

Yoo qorannoo kana irratti hirmachuu kessan waliigallee, gaaffii waliigalaa irraa isiniif jaliqabna. Deebii kessan kan dhugaa irratti hundahee yoo kennitan fayidaa jijjiirama fayyaatif nuf gargaara. Qorannoon Kun karaa univarsitii Jimma irraa fudhatama argatee jira. Kanafuu qorannoo kanarratti hirmaachuuf fedhii qabduu?

1. naan qaba ……. Deebiin nanqaba yoo jette gaafii itti anutti fufi.

2. Hin qabu …… deebiin hinqabu yoo jette, galatomaa jedhiiti gaafii addaan kuti.

Fedhii qorannoo adeemsisuuf yaada namarraa kan fuudhu.

Maqaa_____

Annex 3: Informed consent form Amharic version

የ ማጠይቅ ፈቃድ

ጂማዩኒቨርሲቲ ጠፍ ሳይንስ ኮሌጅ፣ ህክምና ትምህርት ቤት፣ የአንስቴዥሎጂ ትምህርት ክፍል

የ ማጠይቅ ፈቃደኛነ ት ቅጽ

ስሜ_____ይባላል፡ ፡ እኔ በጂማዩኒቨርሲቲ በአንስቴዥሎጂ ትምህርት ክፍል የ ምርምር ቡድን መስጥ አንድ አባል ነኝ፡ ፡ የ ዚህ ማጠይቅ አላማ እኔ የ ምሰራውጥና ት ሊዶኬን የ ሚለውመድሐኒ ት ከቀዶጥገ ና በሁላ ምን ያክል ህመሞትን ይቀንሳል ወይምአይቀንስምየ ሚል ሲሆን ለ ሚዲረገ ው ምርምር/ጥና ት /መረጃ ለማሰብሰብ ነው፡ ፡እርስዎ አንድ የ ጥና ቱ ክፍል አድርጌ ስመጥ አስፈላጊ የ ሆኑ መረጃዎችን እንደሚሰጠኝ በማሰብ ነው፡ ፡ በጥና ቱ ለመሳተፍ ፈቃደኛ ከሆኑ ከእርስዎ የ ሚ ገኘውማንኛውም መረጃ በሚስጥር ይጠበቃል፡ ፡ ለዚህምሲባል የ እርስዎ ሥም እና አድራሻ አይገ ለጽም፡ ፡ እንዲሁም ከጥና ቱ በኃላ ምጽኑ ህመማን ክፍል ታካሚዎች ወጩ እና ተያያዥምክንያቶችን ለ ሙዎቅ እና ተገ ቢ የ ሆኑ እርምጃዎን ለ መወሰድ ይረዳል፡ ፡

የ ቃል ሥምምነ ት

የ ዚህ ጥና ት ዓላማውገ ብቶኝ በጥና ቱ ለመሣተፍ

ሀ. ፈቃደኛ ሆኛለሁ ለ. ፈቃደኛ አይደለሁም

በጥና ቱ ለመሳተፍ ፈቃደኛ ከሆኑ ቃለ ማጠይቁን መቀጠል ይቻላል፡ ፡

ፈቃደኛ ከሆኑ የ ማጠይቁ መለያ ቁጥር _____ ማጠይቁ የ ተካሄደበት ቀን _____

የ ጠያቂውስምና ፈርማ_____

የ ሱፐርቫይዘር ስምና ፈርማ_____

ጥና ቱን በተመለከተ ማንኛውምአይነ ት ጥያቄ ካላችሁ የ ሚከተለ ውን አድራሻ ተጠቀሙ

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Annex 4: Data collection tool

Pre-operative and intraoperative checklist

Section I: Socio Demographic Data

Card number ---------- Bed no---------- code----------date----------

Ser No	Question	Response	
101	Age		
102	ASA (I/II)	ASA I ASA I	
103	Sex	male female	
104	Weight (kg)	----------	
105	Height (cm)	----------	
106	BMI (kg/m2)	----------	

Section II: Data during preoperative period

Ser No	Question	Response	
201	Baseline heart rate	_____bpm	
202	Baseline mean arterial pressure (MAP)	___/____(_____)	
203	Base line RR	_____Br/m	
204	Spo2	_____**%**	
205	Diagnosis	----------	
206	Surgical procedure	----------	
207	Coexisting disease	Yes No	
208	If yes what is the disease	A. Respiratory B. Cardio Vascular	

		C. Renal D. Liver E. Diabetes Mellitus Otherspecify_____	

Section III: Question related to anesthetic and surgical interventions

Ser No	Question	Response	
301	Does the patient received any analgesic drug before Induction of Anesthesia?	Yes No	
302	If YES specify type and dose		
303	Type of induction agent	1. IV 2. Inhalational 3. Awake	
304	Induction agent type and dose	Thiopental ----------mg Propofol ----------mg Diazepam ----------mg Suxamethonium------mg Vecuronium ----------mg Pancuronium----------mg Halothane -------MAC Isoflurane --------MAC Sevoflurane ------MAC	
305	Does Ketamine used as Induction agent?	Yes No	
306	Time from lidocaine infusion to skin incision in minutes		
307	Vital sign before skin	MAP: _____mmhg Sao2 _____% HR: _____bpm	
308	Vital sign after skin incision	MAP: _____mmhg	

		HR: _____bpm Sao2 _____%	
309	Additional Intraoperative analgesia given?	Yes No	
310	If yes specify type, time and dose of the drug given	_____mg	
311	Maintenance of Anesthesia	Halothane Isoflurane Pancronium _____mg Suxamethonium _____ mg Vecoronium _____ mg	
312	Does the patient extubated in the OR?	Yes No	
313	Extubation time /minute		
314	Experience of the surgeon	Resident Senior	
315	Infusion time/minute		
316	Duration of surgery		
317	Duration of anesthesia		

Section IV: Hemodynamic changes in HR and MAP before induction and after intubation.

Ser No	Time	Hemodynamic change	
		HR(beats/min)	MAP(mmhg)
401	Before induction		
402	After induction		

Section V: Hemodynamic parameters in post-operative period Immediately at Arrival of Recovery Room, 3rd hr, 6th hr, 12th and 24thhr.

Ser No	Vs	Immediately At Arrival of Recovery Room	3rd hr. post op	6th hr. post op	12th hr. post op	24th hour post op
501	Time (local)					
	BP(mmHg) SBP/DBP(MAP)					
	PR (bpm)					
	Respiratory rate					
	SPO2 (%)					
	VAS Score					
	Analgesia given Type and mg					
	Other medication given in mg					

502 502. Does the patient have nausea within the first 24 hours of surgery? A. YES B. NO

503. Does the patient develop vomiting within first 24 hours of surgery? A. YES B. NO

504. Duration in minutes till Initial analgesic requirement after the patient arrived in the recovery

A. Arrived at _____pm/am

B. Analgesic required time _____PM/AM

C. Duration till first analgesic request _____

505. Total and type of analgesic consumption within 24 hours after the patient arrived in recovery/ward_____.

506. Does the patient have any sign of the following clinical signs in 24 hours postoperative time?

Yes no

If yes encircle it? You can encircle more than one.

A. Tinnitus E. Somnolence

B. Perioral numbness F. Dizziness

C. Drowsiness G. Blurred vision

D. Metallic taste H. Confusion J. Others……..