Journal of Gynecology and Obstetrics
2024, Vol. 12, No. 6, pp. 140-149
https://doi.org/10.11648/j.jgo.20241206.13

Research Article

The Effects of Intra-Operative Lidocaine Infusion on Post Operative Pain and Morphine Consumption Following Major Gynaecological Surgeries Under General Anaesthesia

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Abstract

Introduction: Major gynaecological surgeries are associated with considerable postoperative pain, which remains a challenge for many practitioners. Multimodal forms of analgesia significantly reduce the requirement of opioids for pain management. Despite its local anaesthetic effects, lidocaine infusion improves postoperative pain and morphine consumption following gynaecological surgeries. *Materials and methods*: Sixty patients were assigned randomly into 2 groups (A and B) with 30 patients per group. Group A received intravenous lidocaine 1.5 mg/kg at induction via a bolus injection and 1.5 mg/kg/hr in normal saline infusion from onset of surgery to the end of surgery, while the control group (Group B) received equal volume of normal saline at the same timelines. Pain scores were assessed postoperatively using the numerical rating scale and the cumulative morphine consumed postoperatively were also measured. *Results*: The mean pain scores were significantly higher in the Saline Group than in the Lidocaine group. The cumulative morphine consumption after 48 hours was significantly reduced in the study group 4.87 ±1.80 mg vs 14.13 ± 4.10 mg (P<0.0001). Conclusion: The administration of a bolus dose (1.5 mg/kg) of intravenous lidocaine at induction and a continuous intravenous infusion of 1.5 mg/kg/hr from onset of surgery till skin closure reduced the postoperative pain intensity and morphine consumption in patients undergoing major gynaecological surgeries under general anaesthesia.

Keywords

Lidocaine, Morphine, Pain, Gynaecological Surgeries, General Anaesthesia

1. Introduction

Major gynaecological surgeries are associated with considerable postoperative pain. In spite of recent advances in the understanding of the physiology of acute pain, the development of new opioids, non-opioid analgesics, novel methods of drug delivery and widespread use of pain-reducing minimally invasive surgical techniques, management of postoperative pain remains a challenge for many practitioners [1].

Common problems observed during the postoperative period include postoperative pain, nausea, vomiting, ileus, hypercoagulation and postoperative cognitive dysfunction with evidence suggesting that pain and ileus prolongs hospital stay [2]. This invariably increases the cost of treatment both to the hospital and the patient. This is a major motivator in designing new methods to manage pain during the postoperative period.

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Received: 1 October 2024; **Accepted:** 22 October 2024; **Published:** 12 November 2024

Lidocaine, an amide local anaesthetic initially used as an anti-arrhythmic agent and topical anaesthetic agent, has been discovered to have many other desirable uses when administered intravenously such as reduction of postoperative pain and postoperative opioid consumption. Other effects include reduction of the minimum alveolar concentration (MAC) of volatile anaesthetics, suppression of pressor responses to laryngoscopy, reduction of the duration of ileus, and reduced postoperative risk of thrombosis, cognitive dysfunction and airway irritability in certain population of patients [3, 4].

Therefore, these properties can be used to the benefit of the patient as lidocaine is relatively cheap, readily available, affordable and not controlled.

Opioid medications given either intravenously (systemic analgesics) or via epidural catheters (epidural analgesia) to reduce postoperative pain can provoke side effects such as drowsiness, lethargy, nausea, vomiting, respiratory depression, ileus, urinary retention, dry mouth, loss of appetite, pruritus, dry skin, which slows postoperative recovery [2]. In addition, they are controlled, not readily available and not cost effective, making its use out of reach to the poor in the society.

Therefore, alternative therapeutic interventions for optimal perioperative pain care are desirable and may add to the existing analgesic collection.

Also, this study is relevant to anaesthesia in the sense that reduced postoperative morphine consumption and improvement in the intensity of pain postoperatively in patients who undergo gynaecological surgeries under general anaesthesia will lead to improved outcomes. Also, intraoperative lidocaine infusion provides a novel dimension in perioperative multimodal analgesia.

2. Materials and Methods

2.1. Study Design

After approval from the Ethical review committee of Federal Medical Centre Lokoja, Kogi state, Nigeria, this study was conducted on 60 patients aged between 18-75, ASA I and ASA II patients scheduled for elective major gynaecological surgeries (Myomectomies, hysterectomies and ovarian cystectomies) under general anaesthesia, as a double blind randomized clinical study.

Patients who were unwilling to participate in the study, patients who had severe hepatic, renal, cardiac, respiratory or endocrine diseases or who had allergies to local anaesthetic agents were excluded from the study. Also, patients who had been on any pain medications within a week of this study or who had psychiatric illnesses were excluded from this study. Consent was obtained with forms filled.

2.1.1. Randomization

On the morning of surgery, each patient was randomly allocated using a simple random technique into two groups by randomly picking a piece of paper marked A or B from an envelope. Group A (Lidocaine group) received lidocaine in normal saline infusion via an infusion pump (HCE Epump 500) with a bolus injection of 1, 5 mg/kg at induction and maintained with a continuous infusion of 1.5 mg/kg/hr till skin closure. Group B (Saline Group) received an equal volume of saline bolus and infusion via same infusion pump till the end of surgery.

2.1.2. Preoperative Preparation

A thorough preoperative assessment was carried out a day before surgery, patients were advised to fast for six (6) to eight (8) hours for solid foods, four (4) hours for semi-solid foods and two (2) hours for clear fluids. The patients were educated by the investigator on the possible side effects of lidocaine toxicity such as metallic taste, numbness of the tongue, light headedness, ringing sensation in the ears, visual disturbances and muscle twitching. They were taught how to use the Numerical Rating Scale (NRS) to assess pain post operatively.

Prior to the patients' arrival to the theatre, the anaesthetic workstation and airway equipments were checked and a fully equipped resuscitation cart consisting of facemasks of different sizes, oropharyngeal airways of different sizes, functioning suction catheters, laryngeal mask airway (LMA), oxygen cylinder, Magill's forceps, tracheal tubes of different sizes, stylets, laryngoscope blade and handles of different sizes, adhesive tape, nasogastric tubes and automated external defibrillator (AED), drugs such as adrenaline, atropine, calcium chloride, hydrocortisone, amiodarone, naloxone, salbutamol nebules, aminophylline, midazolam and frusemide were made available in the operating room and post anaesthetic care unit (PACU). Also, the study drug was prepared before the patients' arrival to the operating room by the researcher. 20 mls of 0.9% saline was withdrawn from a 500 ml bag and replaced with 20 mls of 2% preservative free lidocaine, making it a concentration of 400 mg in 500 mls (0.8 mg/ml) of saline to be administered intravenously at a rate of 1.5 mg/kg/hr. The flow rate is calculated in mls/hr and set on the infusion pump. However, for the saline group, a 500 mls bag of 0.9% saline without additives was set using the same calculated rate of 1.5 mg/kg/hr and converted to mls/hr to be administered intravenously to the patients accordingly.

2.1.3. Intraoperative Management

Upon arrival at the operating room, the patients were placed supine on the operating table with multiparameter monitors attached and baseline vital signs obtained which included heart rate, blood pressure, mean arterial pressure, peripheral oxygen saturation, electrocardiogram using MEDELA PM400 multiparameter monitor (GE medical systems information technology Inc. 8200 W. Tower Ave. Milwaukee USA). The data recorded by the investigator.

Intravenous (IV) access was secured at two sites one for the study and another for fluid maintenance, replacement of deficit, ongoing loss and blood transfusion for patients who lost

20% of their total blood volume during the course of surgery. For the lidocaine group (group A), 1.5 mg/kg bolus IV lidocaine was administered at induction which was followed by a continuous lidocaine infusion via the infusion pump at 1.5 mg/kg/hr, which ran till the end of the surgery. Whereas for the saline group (Group B), an equal volume of saline was given by bolus at induction followed by a continuous infusion through the infusion pump till the end of the surgery. The duration of surgery and total lidocaine consumption was recorded.

Each patient was preoxygenated for 3-5 mins or 4 vital capacity breaths. General anesthesia was induced with IV propofol 2 mg/kg under facemask ventilation with oxygen and endotracheal intubation facilitated with IV suxamethonium 1.5 mg/kg. Anaesthesia was maintained with isoflurane in oxygen at 1-2%. Intraoperatively, analgesia was maintained using iv fentanyl 1 µg/kg boluses per hour with the last dose given 30 mins before the end of surgery. Other analgesics administered were iv paracetamol 15 mg/kg and Nonsteroidal anti-inflammatory drugs (NSAIDS) intramuscular diclofenac at 0.5 mg/kg, given immediately after induction.

Each patient was monitored throughout the surgery with heart rate (HR), blood pressure (BP), peripheral oxygen saturation (SpO_2), electrocardiogram (ECG), end-tidal capnography ($EtCO_2$) at 5 minutes intervals and recorded accordingly. Perioperative fluid was managed with 0.9% saline at a rate of 6-8 ml/kg/hr replacing deficit, ongoing loss and insensible loss, while patients who have lost > 20% of their estimated total blood volume or with Hb conc of <7-8 g/dl with haemodynamic changes were transfused with blood as applicable. Neuromuscular blockade was maintained with IV pancuronium at 0.1 mg/kg with $1/3^{rd}$ of the dose repeated as needed till the end of the surgery. Residual neuromuscular blockade was reversed with iv neostigmine 0.05 mg/kg and iv atropine 0.02 mg/kg with the patient being extubated on full recovery and transferred to the PACU for monitoring before transfer to the ward.

2.1.4. Postoperative Management

The patients were monitored postoperatively with their heart rate (HR), blood pressure (BP), peripheral oxygen saturation (SpO2) and respiratory rate (RR) recorded. The pain scores and the time to first analgesic request was recorded. Then IV morphine 2 mg boluses were administered with a numerical rating score (NRS) ≥ 4. Other analgesics used post operatively included NSAIDS (IM diclofenac 0.5 mg/kg 12 hourly) and IV paracetamol (15 mg/kg 8 hourly). During the time (30 min-1 hour) in the post anaesthetic care unit (PACU), each patient was asked to report any side effects of systemic lidocaine such as light-headedness, drowsiness, metallic taste, peri-oral numbness and visual disturbance.

The investigator assessed the frequency and total dose of extra analgesics, opioids associated side effects such as nausea and vomiting, itching, and respiratory depression. The pain intensity was assessed using the Numerical rating scale (NRS) every 5 minutes for the first 60 minutes in the PACU then hourly for the first 4 hours, then at 8 hours, 12 hours, 18 hours, 24 hours and 48 hours postoperatively. Also, the level of satisfaction of pain control at 48 hours was assessed using the Likert Scale.

2.2. Data Collection

Data was collected using interviewer administered questionnaire to all eligible participants. Categorical variables were presented as numbers (representing frequencies) and percent, while continuous variables were presented as mean, standard deviation (SD), standard error of mean (SE), range (minimum – maximum value), median and Interquartile range [IQR]. Significance of the results was set at the 5% level. The following tests were used: the χ^2-test or Fisher's exact where applicable, Independent Sample's *t*- test was used to compare mean differences between the two studied groups for normally distributed continuous variables; while Mann–Whitney *U*-test was used where variables did not the meet requirement for normality of a variable. Kruskal-Wallis test was used to compare level of patients' satisfaction in the two groups. Kolmogorov-Smirnov test and Q-Q plot were used to test for normality.

3. Results

In this study, 30 patients in the lidocaine group and 30 patients in the saline group were investigated. The demography and anthropometric characteristics of patients across the two groups are shown in Table 1. The mean age, mean body weight and height, in lidocaine group and control group were statistically comparable.

Table 2 shows surgical profile across the study subjects. Majority of patients in both groups underwent myomectomy, while the others had total abdominal hysterectomy and ovarian cystectomy. There was no statistically significant difference between the types of surgical procedures in the two groups P=0.186.

The cumulative mean morphine consumption was significantly more among the group that received Saline than the group that received lidocaine (14.13 ±4.10 mg vs. 4.87 ±1.80 mg; P<0.0001), while the cumulative median IV morphine equivalent consumption at 48 hrs. postoperatively was significantly reduced in the lidocaine group than in the saline group. The median (IQR) lidocaine vs. Saline was 4.00 (4.00-6.00) mg vs. 14.00 (12.00-16.00) mg as shown in Figure 2.

Figure 3 expressed differences in mean pain scores in the study. Mean pain scores were significantly higher among saline group than the lidocaine group from 0 min – 40 mins and 240 mins and 1440 mins (P<0.05) but was comparable between 45 mins – 180 mins and at 2880 mins (P>0.05).

The overall incidence of postoperative side effects as shown in Table 3, was significantly more in the saline group who received saline than the lidocaine group (P=0.009). The overall incidence of patients having nausea, vomiting and itching over 48 hours in group administered lidocaine vs. Saline group was 26.67% vs. 60.0%; P=0.009. The proportion of patients with itching was significantly more in saline group as compared to the lidocaine group (46.67% vs. 20.00%; P=0.026). However, the proportion with nausea 1 (3.33%) vs. 3 (10.00%) P=0.306) and vomiting 1 (3.33%) vs. 1 (3.33%) P=0.754 were comparable in the two groups. There was no reported incidence of respiratory depression.

Patients' level of satisfaction as shown in Table 4 indicates that 7 (23.33%) of patients who were administered intravenous lidocaine 1.5 mg/kg/hr were very satisfied, with 10 (33.33%) satisfied whereas 3 (10%) of the patients in the lidocaine group were dissatisfied while 13 (43.33%) of the saline group showed a neutral satisfaction with postoperative analgesia.

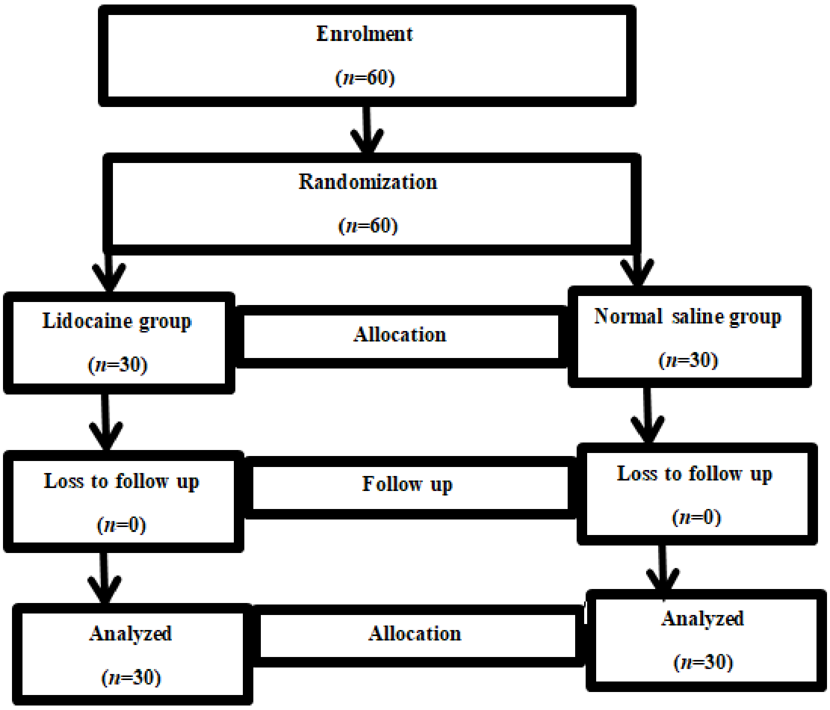

Figure 1. Consort flow chart.

Table 1. Patients' demographic and anthropometric characteristics.

Study group						
	Lidocaine		**Saline**			
Variable	**Mean ± SD**	**Range**	**Mean ± SD**	**Range**	**T**	**P**
Age in years	44.27 ±8.29	32-60	45.57 ±10.38	23-68	0.536	0.594
Weight (Kg)	63.17 ±4.91	55-75	63.37 ±4.61	56-73	0.163	0.871
Height (m)	1.60 ±0.43	154-170	1.62 ± 0.61	150-172	1.879	0.065
	Lidocaine		Saline			
ASA status:	Frequency	%	Frequency	%		
I	17	56.67	10	33.33		
II	13	43.33	20	66.67		
	Chi square X^2 =3.300; Fisher's exact P=0.059*					

ASA- American society of Anesthesiologist

Table 2. *Patients' surgical profile.*

Study group					
Variable	**Lidocaine**		**Saline**		**P**
Type of surgery:	**Frequency**	**%**	**Frequency**	**%**	
Myomectomy	16	53.33	12	40.00	
TAH	10	33.33	8	26.67	
Ovarian cystectomy	4	13.33	10	33.33	
	Chi square X^2 =3.365; *P*=0.186*				

Table 3. *Side effects.*

Side effects	Lidocaine (n=30) N (%)	Saline (n-30) N (%)	Fisher's exact P value
Nausea	1 (3.33)	3 (10.00)	0.306
Vomiting	1 (3.33)	1 (3.33)	0.754
Itching	6 (20.00)	14 (46.67)	0.026
Respiratory depression	0 (0.00)	0 (0.00)	-
Total (overall proportion with side effect)	8 (26.67)	18 (60.00)	0.009

Table 4. *Patient's satisfaction.*

Level of satisfaction	Group Lidocaine (n=30) N (%)	Saline (n=30) N (%)
Very satisfied	7 (23.33)	2 (6.67)
Satisfied	10 (33.33)	6 (20.00)
Neutral	9 (30.00)	13 (43.33)
Dissatisfied	3 (10.00)	6 (20.00)
Very dissatisfied	1 (3.33)	3 (10.00)
Measure of Association X^2 for Linear trend = 6.008; P = 0.014 Kruskal Wallis test H = 6.202; P = 0.013		

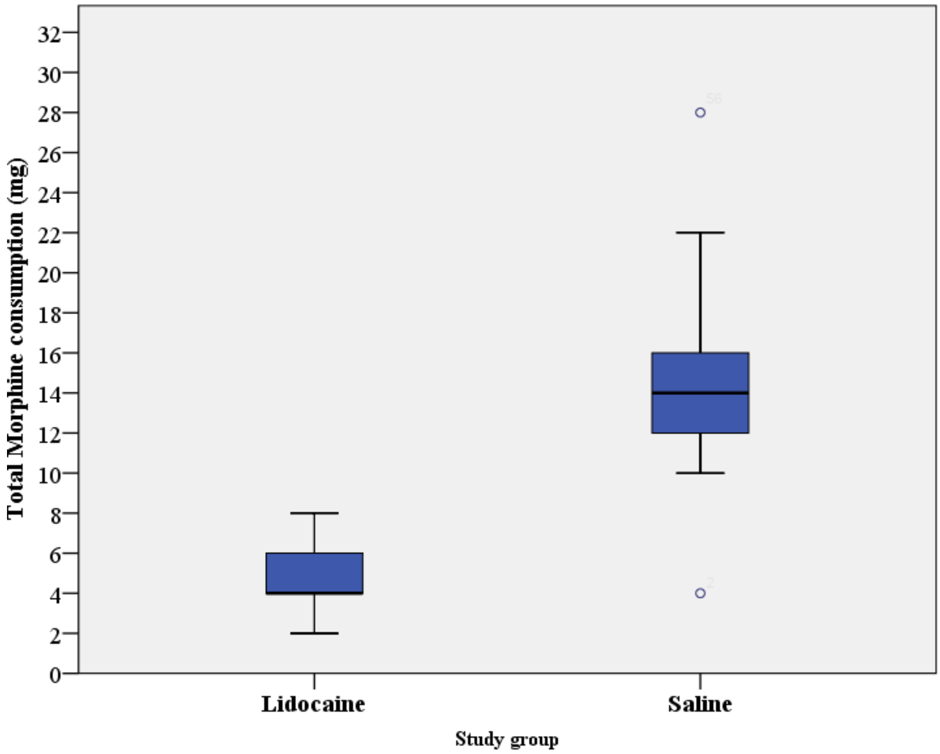

Figure 2. Box plot representing total morphine consumption in the study groups.

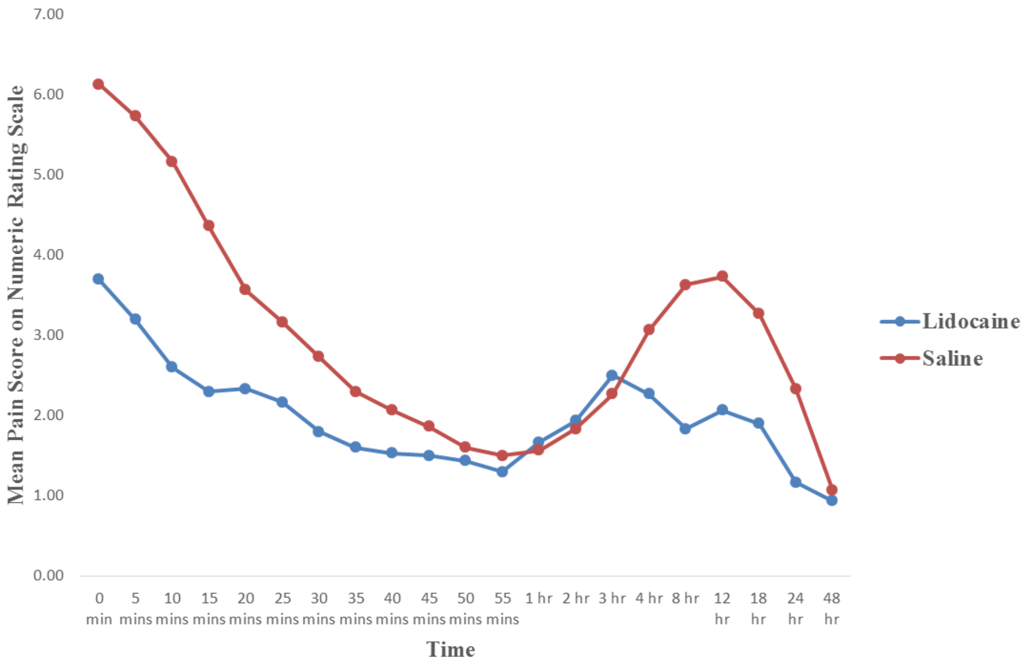

Figure 3. Mean Pain Scores on Numerical Rating Scale: 0-10.

4. Discussion

The results obtained from this study demonstrated that there was a significant difference in the postoperative pain intensity in the study (lidocaine) group in comparison to the control (saline group) as expressed in figure 2. The mean pain scores were significantly higher in the saline group. This agrees with the results obtained from the study by Shady et al [5] in Egypt where they concluded that adjuvant intravenous lidocaine infusion reduces pain during the postoperative period after abdominal hysterectomy associated with early recovery, decreased postoperative opioid analgesic requirement and better patient satisfaction in overweight and obese women.

Also, Ahsan et al [6] and Hika et al [7], showed that lidocaine reduces postoperative pain score and mean analgesic requirements, which is in keeping with the results of this study.

On the other hand, the study by Oliviera et al [8] demonstrated no difference in post- operative pain severity and no analgesic benefit when intravenous lidocaine infusion was used in patients undergoing hysterectomy. Similarly, Wuethrich et al [9] showed that there was no significant difference in pain scores postoperatively between groups at rest (P=0.71) and during mobilization for patients who had intravenous lidocaine infusion during laparoscopic renal surgeries. This could probably be because of the type of surgery done as laparoscopy confers the benefit of minimal tissue damage, reduced postoperative pain and early ambulation [10].

Morphine, an opioid analgesic, is widely used to manage moderate-to-severe pain in the immediate postoperative period [11]. It is a vital component in the multimodal analgesic approach to acute pain management. However widespread concerns about its side effects and abuse have increased the quest for opioid free analgesia. This study showed that the cumulative mean morphine consumption was significantly higher among the saline group (14.13 ± 4.10 mg) than the study group (4.87 ± 1.8 mg) (P< 0.0001), suggesting that the intravenous lidocaine infusion reduced the postoperative morphine consumption among the study subjects. This is similar to results obtained by Tauzin-fin et al [12] in their study. However, their results were slightly higher than that obtained in this study (4.87 ± 1.80 vs 14.13 ± 4.10) probably because they did not administer a bolus dose of iv lidocaine before commencing the infusion, but commenced iv lidocaine infusion at 1.5 mg/kg/hr at induction of anaesthesia till 24 hrs postoperatively. Ghimire et al [13] showed there was reduced morphine consumption in the first 24 hrs 0 (0-1) mg in the lidocaine group and 4 (1-8) mg in the placebo group (P < 0.001) after total extraperitoneal laparoscopic inguinal hernia. Hika and colleagues [7] used tramadol, a weak opioid, to manage postoperative pain in their study. They observed that the median tramadol consumption within 24 hours among the lidocaine group was 50 mg when compared to the placebo group 100 mg (P< 0.0001) and concluded that intraoperative lidocaine infusion decreases postoperative pain score, total analgesia consumption and prolongs time to first analgesic request for abdominal surgery done under general anaesthesia. In a similar study by Koshyari et al [14] where tramadol was used for postoperative pain management, they reported that tramadol consumption was reduced among the lidocaine group (477.0 ± 133.2 mg) in comparison to Placebo (560.0 ± 115.0 mg) (P < 0.001). This phenomenon of observed reduced postoperative opioid consumption following perioperative lidocaine infusion can be attributed to the anti-inflammatory properties of lidocaine which can be compared with steroids and NSAIDS [15]. Although the definite anti- inflammatory mechanism remains vague; however, it is presumed that the drug affects a multitude of inflammatory processes such as phagocytosis, migration, exocytosis and cellular metabolism with significant inflammatory markers such as IL-1, IL-6, interferon-γ and TNF-α all reduced [16, 17].

The systemic effect of intravenous lidocaine on intubation and extubation has been well established as seen in several studies [18-20], which has warranted its use to attenuate pressor response to laryngoscopy, while its effect on intraoperative haemodynamics has remained scarcely explored.

In this study, the overall incidence of postoperative side effects was significantly higher in the saline group, with itching predominating in comparison to the lidocaine group. This may be explained by the anti-inflammatory properties [21] of lidocaine with resultant reduced pain intensity and morphine requirement postoperatively, hence the lower incidence of side effects in the study group. The incidence of nausea and vomiting was comparable between groups which is in keeping with the results obtained by Yon et al [22] in their study to determine the effect of intraoperative lidocaine for preemptive analgesia in subtotal gastrectomy. This is in tandem with the study by Choi et al [23], which showed that no patient in the lidocaine group showed lidocaine associated arrythmias, severe bradycardia or hypotension during surgery, or delayed recovery from anaesthesia. Also, no patient reported subjective symptoms of lidocaine related adverse side effects. This may be due to the dose of iv lidocaine (1.5 mg/kg/hr) which corresponds to a plasma concentration 2 μg/ml [24] and limited to the intraoperative period. This is considered small and not adequate to cause a manifestation of toxicity as it has been shown that toxicity manifests when the plasma concentration is 5 μg/ml [21, 26] and above. However, Mckay and colleagues [25] noted that one patient reported dizziness and visual disturbances at the end of the lidocaine infusion with a lidocaine plasma level of 2.4 μg/ml. This may be as a result of the use of morphine intraoperatively as dizziness constitutes part of the side effects of the use of morphine. Also, they used iv fentanyl and iv morphine interchangeably, although standardized for analgesia, this could have been responsible for the dizziness experienced in this patient.

Although accumulation of lidocaine is a concern with continuous infusion, at doses used in the studies cited here, plasma concentration remains well below the toxic level (5 μg/ml) [24] even after 24 hours. Toxicity from perioperative lidocaine infusion is exceedingly rare [26, 27] but may present with symptoms. Monitoring plasma lidocaine levels may be considered in patients at risk of lidocaine toxicity such as those with abnormal hepatic or renal function or those who cannot be queried about symptoms of lidocaine toxicity.

There are situations where additional local anaesthetics may be used, such as transversus abdominus plane block, subarachnoid block, epidural block, wound infiltration or instillation into a joint [28]. This raises concerns of increased risk of local anaesthetic toxicity as the plasma concentrations of the local anaesthetic agents may be higher than the therapeutic range.

Lipid emulsion (20% Intralipid) has been found to be effective in the treatment of cardiovascular collapse and central nervous system symptoms caused by local anaesthetic toxicity, including that of bupivacaine, ropivacaine, levobupivacaine and lidocaine [29]. However, availability of lipid emulsion is a challenge in poor resource settings which poses a challenge to the safe administration of local anaesthetic agents and limits the treatment options available for the patients.

Patient satisfaction cannot be regarded as an objective indicator of the quality of anaesthesia care, however patients reported satisfaction provides the best access to the outcome based on a patient's perspective which is reflective of the patient's education and understanding of what pain is [30].

The result of the present study showed a higher level of satisfaction with the investigated anaesthetic approach at assessed postoperative time points. This result is in keeping with the results reported by Grady et al [31] of 92% in the experimental group vs 71% in the placebo. Also, Ghimire and colleagues [13] reported patient satisfaction with postoperative pain relief was better in those receiving lidocaine.

However, Choi et al [23] reported that patient satisfaction was comparable between the study groups. This may probably be because the subjects used for this study had breast surgery (mastectomy) and were all connected to intravenous PCA comprising of fentanyl and ketorolac postoperatively. An understanding of the factors that reduce patient satisfaction with a given anaesthetic technique might contribute to the improvements in the standards of quality in patient discomfort.

In this study, the rate of patient dissatisfaction with the investigated anaesthetic approach was low 10.00%. This may be so because patients' responses may be modified to please staff, and hence may be an underrepresentation of the true level of dissatisfaction [32]. Dissatisfaction with anaesthesia has been reported to be associated with a 12-fold risk of global dissatisfaction with day case surgery [33]. The index study was carried out in patients admitted overnight after open abdominal gynaecological surgeries and are therefore expected to cooperate, which may influence satisfaction rate. The risk of dissatisfaction increases as the number of postoperative side complications increases. With the exception of itching, adverse intraoperative events were not related to the patient's dissatisfaction.

A large percentage of the study subjects showed a neutral satisfaction to the postoperative pain management. It has been reported that pain management can be affected by multiple factors such as gender, age, preoperative expectations, information given prior to surgery, ASA status, preoperative pain medication, type of anesthesia, type and duration of surgery, communication of staff with patients, and experience of pain relief [33].

5. Conclusion

This study demonstrated that a bolus dose (1.5mg/kg) of intravenous lidocaine and a continuous infusion of 1.5mg/kg/hr till the end of surgery reduced the postoperative pain intensity, the postoperative morphine consumption and increased the time to first analgesic request in patients undergoing major gynaecological surgeries with a significant effect on intraoperative heart rate.

Abbreviations

ANOVA	Analysis of Variance
ASA	America Society of Anaesthesiologists
BP	Blood Pressure
cm	Centimeter
$\chi 2$	Chi Square
ECG	Electrocardiography
FMCL	Federal Medical Centre Lokoja
g	Gram
HR	Heart Rate
Hr	Hour
kg	Kilogram
MAC	Minimum Alveolar Concentration
MAP	Mean Arterial Pressure
Mg	Milligram
min	Minute
Ml	Milliliters
mm	Millimeters
mmHg	Millimeters Mercury
NRS	Numerical Rating Scale
NSAIDS	Nonsteroidal Anti-inflammatory Drugs
PACU	Post Anaesthesia Care Unit
%	Percentage
SBP	Systolic Blood Pressure
SD	Standard Deviation
SpO2	Peripheral Oxygen Saturation
SPSS	Statistical Package for Social Sciences
VAS	Visual Analogue Score
VRS	Verbal Rating Score
16G	16 Gauge

Author Contributions

Agwu Nnanna Uchechukwu: Conceptualization, Data curation, Methodology, Resources, Writing – original draft, Writing – review & editing

Oyewole Ezeikel: Supervision

Agu Edith Ebere: Supervision, Writing – review & editing

Adeyemi Osebequin William: Conceptualization, Supervision, Writing – review & editing

Achi Joseph Olung: Supervision, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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