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Research article

# Lidocaine versus propofol administration on the attenuation of hemodynamic responses during extubation in the adult elective surgical patient: A prospective cohort

Ephrem Nigussie [a], Adugna Aregawi [b], Meron Abrar [b], Assefa Hika [c,*], Bacha Aberra [c], Belay Tefera [a], Diriba Teshome [d]

[a] Department of Anesthesia, College of Health Science and Medicine, Arsi University, Asella, Ethiopia
[b] Department of Anesthesia, College of Health Science and Medicine, Addis Ababa University, Addis Ababa, Ethiopia
[c] Department of Anesthesia, College of Health Science, Aksum University, Aksum, Ethiopia
[d] Department of Anesthesia, College of Health Sciences, Debre Tabor University, Debre Tabor Ethiopia

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ABSTRACT

*Background:* Tracheal extubation is the process of removing a tube from the trachea. It is associated with an increase in heart rate, blood pressure, intracranial pressure, intraocular pressure, coughing, bronchospasm, laryngospasm, and bleeding. Many techniques, as well as drugs, have been attempted for attenuation of the airway and cardiovascular responses. Propofol and lidocaine are widely available drugs in resource-limited settings even though their relative effectiveness for smooth extubation is not well established.

*Objectives:* To assess the effectiveness of intravenous lidocaine and propofol on the attenuation of extubation-induced hemodynamic responses in the adult elective surgical patient from November 01, 2019, to February 30, 2020, at Asella teaching and referral hospital, Ethiopia.

*Methods:* Institutional-based prospective observational cohort study design was conducted on 72 ASA I patients who underwent elective surgery. The study participants were allocated into three groups equally based on anesthetists' extubation plan; Group P, 0.5 mg/kg propofol, group L, 1.5 mg/kg lidocaine administered 2 min before extubation and group C was a control group. Data were analyzed by SPSS version 20 after the normality of the data was checked by the Shapiro Wilk test. One-way ANOVA followed by a Tukey posthoc test has been employed to find the pair-wise significance and a p-value of $<0.05$ was considered as statistically significant.

*Results:* A demographic status and clinical characteristics of the patient were comparable between groups with p-values of $>0.05$. After extubation; heart rate, systolic, diastolic, and mean arterial blood pressure were decreased significantly in groups of propofol and lidocaine within 10 min. Propofol shows better results in maintaining stable systolic blood pressure up to 3 min, while heart rate, diastolic, and mean arterial pressure were maintained stable up to 5 min after extubation ($p = 0.001$).

*Conclusions:* 0.5 mg/kg propofol or 1.5 mg/kg lidocaine might help to attenuate extubation induced hemodynamic responses.

## 1. Introduction

Tracheal extubation is the discontinuation of an artificial airway when its indications for placement is no longer required. Extubating at the light plane of anesthesia can stimulate receptors that are found throughout the larynx, trachea, and bronchi. There is an increase in the concentrations of noradrenaline and adrenaline in the plasma due to the stimulations which affect various cardiovascular and airway responses. Again, it leads to an increase in heart rate, blood pressure, arrhythmias, coughing, bronchospasm, intracranial pressure, intraocular pressure, and bleeding from the surgical site [1, 2].

Many techniques: extubation in a deeper plane of anesthesia, the substitution of the endotracheal tube with a laryngeal mask airway, and drugs (fentanyl, verapamil, esmolol, nicardipine, low dose propofol, clonidine, dexmedetomidine, lidocaine spray and intravenous, etc) have been proposed to attenuate airway and cardiovascular responses with different success [3, 4].

* Corresponding author.
*E-mail address:* bcassefa2020@gmail.com (A. Hika).

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Propofol, a potent intravenous hypnotic anesthetic agent that is used widely in clinical anesthesia and is known for inhibiting airway reflexes [5]. Propofol can decrease systemic vascular resistance and cardiac contractility which leads to a decrease in heart rate and blood pressure [6].

Lidocaine, an amide local anesthetic agent can decrease heart rate, blood pressure, and cough reflex induced during endotracheal extubation by its mechanisms of direct myocardial depressant effect, peripheral vasodilator effect, interruption of cholinergic synaptic transmission, and suppression of the cough reflex [7].

Endotracheal extubation might lead to significant hemodynamic disturbances. However, most of the literature is limited to the respiratory complications of endotracheal extubation [8, 9]. During extubation, massive catecholamine release secondary to suctioning and stimulation leads to an increase in blood pressure, heart rate, intraocular pressure, and intracranial pressure. There could be bleeding from the surgical site and disruption of surgical wounds from excessive movement. Myocardial ischemia and bronchospasm might happen [10, 11]. Different drugs, and extubation techniques, were used to overcome this hemodynamic instability of endotracheal extubation. Extubating in a deeper plane of anesthesia has been studied to blunt hemodynamic instability and cough responses to extubation [12]. The unavailability of drugs in a resource-limited setting makes the problem challenging. Lidocaine and propofol are widely available in our setup and even in other resource-limited settings. Literature shows conflicting results on the effectiveness of propofol [13] and lidocaine [7] on attenuating extubation-induced hemodynamic responses. This study aims to assess the effectiveness of intravenous lidocaine and propofol on the attenuation of extubation-induced hemodynamic responses in adult elective surgical patients.

## 2. Methods

### 2.1. Study area

The study was conducted in Asella teaching and referral hospital which is located in the Arsi zone of Oromia regional state in Ethiopia. It is 159 km away from Addis Ababa the capital of the country in the south direction. The Hospital is serving around 3.5 million people in Arsi and the nearby zones by having internal Medicine (45 beds), general surgery (58 beds), obstetrics and gynecology (24 beds), pediatrics (48 beds), and an ophthalmologic unit (5 beds) with a total of 180 beds. The Hospital has 6 major operation rooms.

### 2.2. Study design and period

In this study, a prospective institutional-based cohort was employed from November 01, 2019, to February 30, 2020.

### 2.3. Ethical approval

Ethical clearance and approval was obtained from the ethical review committee, Addis Ababa University College of health sciences. Permission to conduct a study was obtained from Asella teaching and referral hospital. The purpose of the study was explained to patients under the study and written informed consent was obtained from each patient. The patients were informed that the care to be given was not be compromised in any way and confidentiality was assured. Name and other identifying information were not used in the study.

### 2.4. Source population

All patients admitted to Asella teaching and referral hospital to undergo surgery under general anesthesia with endotracheal intubation were a source population.

### 2.5. Study population

All adult patients are scheduled for elective surgery and fulfill inclusion criteria during the study period were our study population.

### 2.6. Study variables

Dependent variables: Hemodynamic parameters: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DB), and mean arterial pressure (MAP).

Independent variables: age, gender, duration of anesthesia, a total opioid used, induction agent (ketamine, thiopental), IV lidocaine, propofol, Mallampati classification, a procedure performed.

### 2.7. Inclusion criteria

Patients scheduled for elective surgeries under general anesthesia with endotracheal intubation, age of 18–65 years, ASA I, airway assessment of Mallampati grade I and II, induced with ketamine or thiopental, and who agreed to participate were included.

### 2.8. Exclusion criteria

Patients were excluded from the study if they: were allergic to study drugs, had known difficult intubation, if they received other than 1.5 mg/kg lidocaine or 0.5 mg/kg propofol for extubation, and if they received lidocaine or propofol other than the intended time for the study.

### 2.9. Sample size and sampling technique

Since there is no similar study done in the study setting, we did a pilot study at St. Peters specialized hospital on 15 elective adult patients from October 01 to 21/2019. The sample size was calculated based on the results of the pilot study. According to the pilot study results, we chose the mean diastolic blood pressure to determine sample size; since it provided us a large sample size = 69. A priori power analysis for one-way ANOVA with 3 groups was conducted in G-power 3.1.9.2 to determine sample size using an alpha = 0.05 and power of 0.80. To ensure a minimum of 69 patients needed, an additional 3 patients (≈5 %) were enrolled to account for non-respondents. A total sample size of 72 was included in the study with 24 samples in each group.

### 2.10. Data collection technique and instrument

A checklist that was prepared in English was used to collect the data. Data of demographics and surgery-related factors were collected by data collectors from patient charts. The following observations were made: hemodynamic parameters (HR, SBP, DBP, and MAP) before the residual effect of muscle relaxant was reversed (baseline), at the first minute, third minute, fifth minute, and tenth minutes after extubation from standard ASA monitors (pulse oximetry, electrocardiography, and non-invasive blood pressure). The data collectors also recorded what the anesthetist in charge administered before extubation either A for lidocaine, B for propofol, or C for nothing using a prepared data collection tool. The drug doses administered to the patient were recorded by asking the anesthetist in charge and later checked from the anesthesia sheet. The data collectors were following drug administrations (A, B, and C) by the anesthetist in charge and extubation time by using his stopwatches and continued until 10 min after extubation by excluding those extubated within the first 2 min of drug administration.

### 2.11. Anesthetic techniques at Asella teaching and referral hospital

The routine practice of general anesthesia consisted of preoxygenation with 100 % oxygen for 3–5 min. Atropine 0.02 mg/kg, and before induction 1 mg/kg IV pethidine/meperidine is given for premedication purpose. Induction of anesthesia with Thiopental or Pentothal (5 mg/kg) or Ketamine (2 mg/kg) or propofol (2.5 mg/kg) will be done based on patients' condition and the decision of the anesthetist. After manual ventilation with oxygen for 1-minute, tracheal intubation could be facilitated with succinylcholine 2 mg/kg using the appropriate size Macintosh laryngoscope blade. The endotracheal tube balloon is filled with air after the endotracheal tube position is checked and confirmed.

Anesthesia is maintained with 100 % oxygen and .75 % Halothane. For muscle relaxation, intermittent doses of vecuronium (0.025 mg/kg) will be administered. For analgesia, pethidine 1 mg/kg could be administered an hour. The patient is mechanically ventilated with intermittent positive pressure ventilation and oxygen saturation is monitored throughout the anesthetic. Blood pressure and heart rate are recorded before induction of anesthesia and throughout the procedure every 5 min from a standard ASA Monitoring machine (pulse oximetry, non-invasive blood pressure, and echocardiography).

When the surgeons began closing the wounds, the patients will be allowed to breathe spontaneously with 100 % oxygen and halothane. Halothane is discontinued at the time of the last surgical suture and reversal of neuromuscular blockade with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg will be administered intravenously.

The patient's ability to breathe spontaneously and the recovery from neuromuscular blockade is assessed and confirmed. Then, the patient is extubated 2 min after administration of lidocaine (1.5 mg/kg) or propofol (0.5 mg/kg). Extubation is performed without the administration of any drugs in the control group. The oral cavity of the patient is suctioned gently with a suction catheter immediately before extubation. All patients will be extubated in supine, head up, and left lateral position. Immediately after extubation, 100 % oxygen is given via face mask for 5 min and the patient will be shifted to the recovery room after adequate spontaneous respiration or ventilation is verified.

### 2.12. Data quality assurance

To ensure the quality of data, a pilot study of the checklist has been performed on 15 patients who fulfilled the inclusion criteria at St. Peter Hospital. Training and orientation about the objectives and relevance of the study were provided for data collectors and supervisors. During data collection, follow-up was done and cross-check for completeness and consistency of data on daily basis, and rejecting incomplete data was done by the supervisor and repeated by the researcher.

### 2.13. Data processing and analysis

Data were checked manually for completeness and then coded and entered into SPSS version 20-computer program. The distribution of data was tested for normality using the Shapiro-Wilk test and homogeneity of variance by Levene's test. Analysis of variance (ANOVA) has been used to study the comparison of parameters between groups after the assumption of data is checked. Tukey post hoc test has been employed to find the pairwise significance. Continuous data were expressed as a mean and standard deviation for normally distributed data. P-value $<0.05$ is considered statistically significant for all analyses. Tables and figures were used to display the results.

### 2.14. Operational definitions

**Hemodynamic attenuation:** A reduction in hemodynamic responses (heart rate and blood pressure) during endotracheal extubation.

**Baseline vital signs**: Vital signs recorded just before the administration of the reversal agent.

**Elective surgery**: Is surgery done before the onset of any complication that might constitute an urgent indication.

**Endotracheal extubation:** Removal of an endotracheal tube from the trachea which is performed in the operating room.

**Hemodynamic parameters:** Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure which is measured before study drug administration (baseline), first minute, third minute, fifth minute, and the tenth minute after extubation.

## 3. Results

A total of seventy-two ASA I respondents participated with a 100 % response rate.

### 3.1. Demographic status and clinical characteristics of the respondents

The demographic status and clinical characteristics of respondents were comparable between groups with p-values of $>0.05$ (Table 1).

### 3.2. Comparison of heart rates among groups

There was a significant difference in HR at 1$^{st}$, 3$^{rd}$, 5$^{th}$ and 10$^{th}$ minutes after extubation. Heart rate was significantly lower in propofol and lidocaine groups when compared to the control group at 1$^{st}$, 3$^{rd}$,5$^{th}$, 10$^{th}$ minutes after extubation. Propofol induced a lower HR compared with the Lidocaine group except at minute 10, where the lidocaine group showed lower HR $p < 0.001$) (Table 2).

### 3.3. Comparison of systolic blood pressure among groups

There was a significant difference between groups in systolic blood pressure at 1$^{st}$, 3$^{rd}$, 5$^{th}$ and 10$^{th}$ minutes after extubation. Systolic blood pressure was lower in a group of propofol at 1$^{st}$ and 3$^{rd}$ minutes after extubation when compared with lidocaine. But, in the 5th and 10th minutes, the opposite happened. The control group had always a higher systolic blood pressure compared with the other groups after extubation ($p < 0.001$) (Table 3).

### 3.4. Comparison of diastolic blood pressure among groups

There was a significant difference between groups in diastolic blood pressure at 1$^{st}$, 3$^{rd}$, 5$^{th}$ and 10$^{th}$ minutes after extubation. Mean diastolic blood pressure was lower in the group of propofol at 1$^{st}$, 3$^{rd}$, and 5$^{th}$ minutes after extubation when compared with lidocaine and control groups (Table 4).

### 3.5. Comparison of mean arterial pressure among groups

The mean arterial pressure was lower in the group of propofol at 1$^{st}$, 3$^{rd}$, and 5$^{th}$ minutes after extubation when compared with lidocaine and control groups (Table 5).

## 4. Discussion

This cohort study was conducted to determine the attenuation of extubation-induced hemodynamic responses on 72 ASA I adult patients allocated into propofol 0.5 mg/kg, Lidocaine 1.5 mg/kg, and control (who did not receive any medication) groups who underwent elective surgery. In our study, the demographic and clinical characteristics (age, sex, weight, height, Mallampati, induction agent, a procedure performed, duration of surgery, and anesthesia) are matched between the groups ($p > 0.05$). On completion of the surgery, there were statistically significant differences in hemodynamics (HR, SBP, DBP, MAP) between the groups ($P < 0.05$).

Heart rate was lower in propofol and lidocaine groups at 1$^{st}$, 3$^{rd}$, 5$^{th,}$ and 10$^{th}$ minutes post-extubation when compared to the control group ($p < 0.001$). In line with our study, Yong Chong Cheng et al (2011) [14] and CS Sanikop SB (2010) [15] demonstrated that a reduction in heart rate after extubation for up to 10 min in patients who received intravenous

**Table 1.** Demographic and clinical characteristics among groups who underwent elective surgery at Asella teaching and referral hospital from November 01/2019 to February 30/2020.

| Variables | | Group P (n = 24) | Group L (n = 24) | Group C (n = 24) | P-value |
|---|---|---|---|---|---|
| Sex | Male (#) | 7 (29.2) | 5 (20.8) | 6 (25) | .808 |
| | Female (#) | 17 (70.8) | 19 (79.2) | 18 (75) | |
| Intubation trial | I (#) | 20 (83.3) | 22 (91.7) | 24 (100) | .613 |
| | II (#) | 4 (16.7) | 2 (8.3) | - | |
| Mallampati classification | I (#) | 14 (58.3) | 19 (79.2) | 18 (75) | .252 |
| | II (#) | 10 (41.7) | 5 (20.8) | 6 (25) | |
| Induction agent | Ketamine (#) | 10 (41.7) | 9 (37.5) | 13 (54.2) | .493 |
| | Thiopental (#) | 14 (58.3) | 15 (62.5) | 11 (45.8) | |
| Procedure performed | General surgery (#) | 18 (0.75) | 22 (91.6) | 19 (71.2) | .481 |
| | Gynecology (#) | 5 (20.8) | 1 (4.2) | 5 (20.8) | |
| | Orthopedics (#) | 1 (4.2) | 1 (4.2) | - | |
| Age | (mean ± SD) | 40.46 ± 12.61 | 36.13 ± 10.05 | 43.33 ± 9.64 | .075 |
| Weight | (mean ± SD) | 62.71 ± 7.69 | 67.54 ± 11.25 | 67.88 ± 11.80 | .165 |
| Height | (mean ± SD) | 1.61 ± .081 | 1.63 ± .07 | 1.65 ± .08 | .232 |
| Total opioid used | (mean ± SD) | 104.58 ± 12.50 | 110.00 ± 14.14 | 109.17 ± 19.76 | .445 |
| Duration of surgery | (mean ± SD) | 1.68 ± .64 | 1.63 ± .54 | 1.70 ± .69 | .684 |
| Duration of anesthesia | (mean ± SD) | 1.97 ± .67 | 1.82 ± .57 | 1.94 ± .67 | .912 |

N.B: (#) variables explained by frequency and followed by percentage, P = propofol group, L = group of lidocaine, C = control group, % = percent, n = number of patients, SD = standard deviations, $p > 0.05$ no significant difference.

**Table 2.** Mean heart rates among groups who underwent elective surgery at Asella teaching and referral hospital from November 01/2019 to February 30/2020.

| HR | Group P (n = 24) Mean ± SD | Group L (n = 24) Mean ± SD | Group C (n = 24) Mean ± SD | P-value | Pairwise significance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Group P Vs Group L | Group P Vs Group C | Group L Vs Group C |
| Base line | 109.46 ± 3.13 | 107.88 ± 4.68 | 110.46 ± 3.90 | .082 | .511 | 1.000 | .081 |
| 1st minute | 102.67 ± 4.86 | 106.71 ± 3.38 | 121.67 ± 3.78 | .001 | .003 | .001 | .001 |
| 3rd minute | 99.29 ± 7.98 | 105.00 ± 3.76 | 118. 58 ± 3.06 | .001 | .001 | .001 | .001 |
| 5th minute | 95.08 ± 9.10 | 102.08 ± 8.96 | 116. 46 ± 4.91 | .001 | .009 | .001 | .001 |
| 10th minute | 95.13 ± 5.92 | 89.29 ± 5.71 | 108.21 ± 4.53 | .001 | .001 | .001 | .001 |

N.B: HR = Heart rate, SD = Standard Deviation, P= Propofol, L = lidocaine, C= Control, n = Number of patients, Vs = Versus, $P < 0.05$ is statistically significant.

**Table 3.** Mean systolic blood pressure among groups who underwent elective surgery at Asella teaching and referral hospital from November 01/2019 to February 30/2020.

| SBP | Group P (n = 24) Mean ± SD | Group L (n = 24) Mean ± SD | Group C (n = 24) Mean ± SD | P value | Pairwise significance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Group P vs L | Group P vs C | Group L vs C |
| Base line | 135.50 ± 7.39 | 137.17 ± 7.34 | 132.46 ± 8.22 | .105 | 1.00 | .291 | .059 |
| 1st minute | 124.88 ± 5.69 | 130.83 ± 8.61 | 139.63 ± 6.19 | .001 | .012 | .001 | .001 |
| 3rd minute | 120.54 ± 5.77 | 125.92 ± 8.41 | 139.88 ± 4.88 | .001 | .017 | .001 | .001 |
| 5th minute | 117.41 ± 5.44 | 113.29 ± 5.63 | 135.54 ± 4.81 | .001 | .027 | .001 | .001 |
| 10th minute | 116.13 ± 6.64 | 111.38 ± 5.28 | 128.88 ± 4.92 | .001 | .015 | .001 | .001 |

SBP = Systolic blood pressure, SD = Standard Deviation, P= Propofol, L = lidocaine, C= Control, n = Number of patients, Vs = Versus, $P < 0.05$ is statistically significant.

lidocaine (1.5 mg/kg) when compared with patients who received placebo ($p < 0.05$).

In contradiction to our results; Soon Y. J. et al. (2014) [13] and Savitha K.S (2014) [16] concluded that patients who received propofol 0.3 mg/kg and lidocaine 1 mg/kg did not experience a reduction in HR up to 10 min after extubation when compared to their controls ($P > 0.05$), The contradiction might be due to dosage difference of study drug.

A planned comparison revealed that there was a significant difference in SBP, DBP, and MAP between the three groups. Blood pressure measurements (SBP, DBP, and MAP) were lower in propofol (0.5 mg/kg) and lidocaine (1.5 mg/kg) groups at 1st, 3rd, 5th, and 10th minutes post-extubation when compared to control groups.

In line with our study Laxminarsaiah et al (2018) [17], Mohammad T (2013) [18], CS Sanikop SB (2010) [15], Tefera (2018) [19] and Amrita Rath AJ (2018) [7] demonstrated that patients who received 0.5 mg/kg of propofol and 1.5 mg/kg of esmolol or lidocaine show a significant decrease in systolic blood pressure post-extubation up to 10 min in both groups ($p < 0.05$).

Contrary to our finding Nagrale M.H et al. (2016) [20], Shrestha S (2013) [21], Savitha K.S (2014) [16], and Soon Y. J. (2014) [13] reported that the blood pressure measurement (SBP, DBP, and MAP) is not constantly decreased in patients who received 0.5 mg/kg propofol and lidocaine 1 mg/kg up to 10 min after extubation $p > 0.05$ respectively. This might be due to the use of a lower dose of study drug and inclusion

**Table 4.** Diastolic blood pressure among groups who underwent elective surgery at Asella teaching and referral hospital from November 01/2019 to February 30/2020.

| DBP | Group P (n = 24) Mean ± SD | Group L (n = 24) Mean ± SD | Group C (n = 24) Mean ± SD | P Value | Pair wise significance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Group P vs L | Group P vs C | Group L vs C |
| Base line | 86.83 ± 7.93 | 86.04 ± 7.71 | 82.08 ± 5.78 | .057 | 1.00 | .077 | .184 |
| 1st minute | 78.08 ± 6.47 | 82.13 ± 6.04 | 86.50 ± 3.91 | .001 | .044 | .001 | .025 |
| 3rd minute | 75.50 ± 6.05 | 79.83 ± 5.86 | 85.71 ± 4.39 | .001 | .024 | .001 | .001 |
| 5th minute | 72.58 ± 4.73 | 76.38 ± 5.31 | 82.46 ± 4.49 | .001 | .026 | .001 | .001 |
| 10th minute | 73.08 ± 5.09 | 69.92 ± 3.89 | 79.75 ± 3.45 | .001 | .033 | .001 | .001 |

DBP = Diastolic blood pressure, SD = Standard Deviation, P= Propofol, L = lidocaine, C= Control, n = Number of patients, Vs = Versus, P < 0.05 is statistically significant.

**Table 5.** Mean blood pressure among groups who underwent elective surgery at Asella teaching and referral hospital from November 01/2019 to February 30/2020.

| MAP | Group P (n = 24) Mean ± SD | Group L (n = 24) Mean ± SD | Group C (n = 24) Mean ± SD | P value | Pairwise significance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Group P vs L | Group P vs C | Group L vs C |
| Base line | 102.71 ± 7.47 | 102.33 ± 8.60 | 97.83 ± 6.19 | .051 | 1.00 | .082 | .123 |
| 1st minute | 93.21 ± 5.88 | 98.21 ± 7.07 | 103.38 ± 4.35 | .001 | .013 | .001 | .010 |
| 3rd minute | 90.33 ± 5.39 | 94.08 ± 5.59 | 103.67 ± 4.27 | .001 | .040 | .001 | .001 |
| 5th minute | 85.79 ± 4.87 | 89.08 ± 4.84 | 99.46 ± 3.72 | .001 | .041 | .001 | .001 |
| 10th minute | 86.92 ± 4.93 | 82.71 ± 3.26 | 95.25 ± 3.49 | .001 | .001 | .001 | .001 |

DBP = Diastolic blood pressure, SD = Standard Deviation, P= Propofol, L = lidocaine, C= Control, n = Number of patients, Vs = Versus, P < 0.05 is statistically significant.

of procedures more prone to airway stimulation such as eye, nose, throat and neurosurgery compared with the procedures of our study.

Propofol 0.5 mg/kg reduces the systolic blood pressure by reducing systemic vascular resistance, cardiac contractility, preload, sympathetic inhibition, while lidocaine 1.5 mg/kg reduced the systolic blood pressure by central stimulation effect, peripheral vasodilator, suppressing the airway reflexes [22, 23, 24, 25].

## 5. Conclusion

Propofol 0.5 mg/kg is superior to lidocaine 1.5 mg/kg in maintaining stable heart rate, diastolic blood pressure, and mean arterial pressure up to 5 min, systolic blood pressure up to 3 min after extubating while Lidocaine 1.5 mg/kg is superior to propofol 0.5 mg/kg in maintaining stable heart rate, diastolic blood pressure and mean arterial pressure after 5 min and systolic blood pressure after 3 min of extubating (P < .001).

## 6. Limitation of the study

The limitation of this study is that it did not include the study of respiratory alterations to have a full profile of these anesthetics on extubation. Thus, we recommend further studies to emphasize the effects of these drugs on respiratory complications during extubation.

## 7. Recommendation

Anesthetist might consider propofol 0.5 mg/kg or lidocaine 1.5 mg/kg as attenuation of hemodynamic response to endotracheal extubation.

## Declarations

### *Author contribution statement*

Assefa Hika, Ephrem Nigussie, Adugna Aregawi, Meron Abrar, Bacha Aberra, Belay Tefera and Diriba Teshome: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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### *Data availability statement*

Data will be made available on request.

### *Declaration of interests statement*

The authors declare no conflict of interest.

### *Additional information*

No additional information is available for this paper.

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