Jungle Juice: Knowledge and Usage Among Kenyan Surgical Teams

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Abstract

Background: Lidocaine Adrenaline combination (LAC) in saline (jungle juice) is used to provide peri-operative analgesia, blood conservation and separation of tissue planes. It comprises 20mls of 2% Lidocaine, 80mls of sterile saline and 0.5mls of 1:1000 Adrenaline solution, +/- hyaluronidase. This survey aimed to evaluate knowledge and safe usage of jungle juice on patients in Kenyan public hospitals. **Objectives**: To establish formulation, extent of usage, patterns and safety measures employed during use of jungle juice among surgical teams in Kenya. **Methods**: A cross-sectional descriptive survey among 344 surgeons.and.66 anesthesiologists. **Results**: Majority (95.2%) of the respondents could not constitute the recommended jungle juice solution. Most (66.3%) had learnt about jungle juice from medical school and workmates (28.9%). About half of the anesthesiologists and 13.6% of surgeons were aware of the maximum dose of lidocaine with adrenaline. Regarding the specific antidote for severe local anesthetic toxicity and its dosage, 3.2% of surgeons and 18.2% of anesthesiologists had good awareness. Intralipid Emulsion was available in operating theaters to 3.9% of surgeons and 18.2% of anesthesiologists. **Conclusions**: Most of the Kenyan surgical teams had poor knowledge on the preparation and safe use of jungle juice.

Keywords: Lidocaine Adrenaline Combination, Jungle Juice, Intralipid Emulsion

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Introduction

Lidocaine Adrenaline Combination (LAC) for infiltration has been used to provide peri-operative analgesia, blood conservation and separation of tissues for ease of dissection (1). It can be used as sole anesthetic, or in combination with general anesthesia. Several authors have demonstrated that major general surgery can be performed under sole local anesthesia infiltration (2,3). Local infiltration of the skin and subcutaneous tissues with a solution containing the vasoconstrictor drug, adrenaline, reduces bleeding (4). The role of adrenaline is key especially in burns surgery, where its use is common (1).

The commonly used concentration is a solution of 1:200,000 of adrenaline and 0.4% lidocaine (4mg/ml) (5,6). LAC 1:200,000 is preferred, as it mitigates the incisional stress response and also minimizes bleeding. Higher concentrations of adrenaline increase potential for hemodynamic disturbances due to systemic absorption of adrenaline, with no clinical advantage (7,8). If large areas need to be infiltrated, as in tumescent surgery, then a further reduced concentration is used, to prevent overdose. A low concentration of lidocaine (0.125% to 0.05%) with adrenaline (1:1,000,000 to 1:2,000,000) is recommended (1,9-11).

In the event that systemic toxicity occurs due to large amounts of local anesthetic infiltrated, lipid rescue therapy has been shown to benefit these patients. This therapy is however not commonly used, either due to lack of knowledge, or unavailability of local guidelines that include Intralipid Emulsion (ILE) on the rescue therapy (12).

The term jungle juice is commonly used by surgical teams in the country to refer to LAC. This study aimed to establish formulation, extent of usage, patterns and safety measures employed during use of jungle juice among surgical teams in Kenya.

Methods

This was a cross-sectional descriptive survey carried out in operating theatres in Kenyan public hospitals. These included the Kenyatta National Hospital, Moi Teaching and Referral Hospital, Provincial, District and Sub-district Hospitals situated in all counties in Kenya run by the Ministry of Health (MoH) (Table 1). The target population was all 344 surgeons and

66 anesthesiologists practicing in these institutions.
A sample size of 199 was calculated at 95% confidence levels using 50% prevalence level since there were no previous published studies with information on baseline knowledge level and application of finite population correction since the target population was < 1000.
Sample selection was by multi-stage sampling using mixed methods. Stage one was purposive selection of the referral facilities, stage two was sampling of hospitals in the counties and stage three stratification of target population into surgeons and anesthesiologists according to theatres of practice. Within the lists of the various theatres of practice, random and representative samples were proportionately selected using lottery method from the sampling frame (Table 1)

Table 1: Distribution of study respondents

SPECIALTY	HOSPITAL				
	KNH	UON	MoH	MTRH	Calculated sample size
Surgeons	51	43	58	15	167
Anesthesiologists	11	4	15	2	32
TOTAL	62	47	73	17	199

Data were collected using administered structured questionnaires that contained closed and open ended questions. Section A of the questionnaire consisted of preliminary categorical data on surgeons' and anesthesiologists' demographic characteristics and section B consisted of questions that enabled the researchers establish formulation, extent of usage, patterns and safety measures employed during use of "jungle juice" among the surgical teams.
Quality control was a continuous process throughout the study to maximize validity and reliability of the findings of the study. The study instrument was approved by research panelists and pre-tested in privately owned hospitals to structure and modify the research instrument so as to avoid bias and misinterpretations of the questions, ensure consistency, timing, accuracy and content validity. Reliability was ascertained by use of Cronbach's alpha (α) score of 0.70 or higher.
Study respondents included only surgeons and anesthesiologists within the purposively selected health institutions. Surgeons and anesthesiologists in theatre on a particular surgical day were randomly identified and allowed time to read and understand the consent form and seek clarification over the study then give consent to participate. Those who declined to give consent to participate were excluded from the study. Each questionnaire was administered by one of the core researchers and immediately filed for data entry. The quantitative data collected were coded and processed. The qualitative data were analyzed through the selection of concepts, categories and themes. Data were analyzed by the use of SPSS version 20 and findings presented in text, graphs and tables.
Ethical clearance was given by the Egerton University Ethics Committee and authorization from the National Commission for Science, Technology and Innovation, and the management of the selected institutions where applicable.

Results

The response rate was 94% including, 154 surgeons and 33 anesthesiologists. There were 148 (79.1%) males and 39 (20.9%) females. The mean age of surgeons was 40.3 (±7.8) years and anesthesiologists was 39.5 (±7.1) years. The most common specialty of the surgeons was general surgery and obstetrics and gynecology (Table 2).

Table 2: Distribution of respondents by highest qualification

Title	Highest qualification	Frequency (n=187)	Percent
Surgeon	MMed Surgery	73	47.4
	MMed Orthopedics	19	12.3
	MMed Obs Gyn	34	22.1
	MMed Ophthalmology	9	5.8
	MMed Maxillofacial	8	5.2
	MMed ENT	11	7.1
Anesthesiologists	MMed Anesthesia	33	100.0

Jungle Juice and its uses

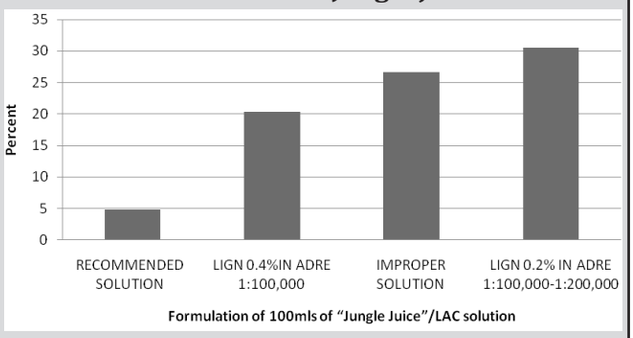
All respondents knew of the existence of jungle juice. Majority respondents had acquired knowledge from medical school 124(66.3%), work mates 54(28.9%), library 5(2.7%) and media 3(1.6%) while 1(0.5%) did not indicate the source. An assessment of knowledge on usage of jungle juice indicated that 62(33.2%) respondents knew of all uses including reducing bleeding (46.6%), separating tissue planes (30.7%) and analgesia (22.7%). Eighty one (43.3%) knew of only 2 uses, 40(21.4%) knew of one use while 4(2.1%) had missing data.

Constitution of 100mls of Jungle Juice

Only 4.8% (N=187) of the respondents constituted the recommended solution of lidocaine 0.4% in adrenaline 1:200,000 and were rated as knowledgeable. Another 20.3% used adrenaline 1:100,000,which is double the recommended strength. A further 26.7% developed a solution that had neither the recommended proportions of constituents of LAC, nor other common protocol proportions. About a

third of respondents (30.5%) used lidocaine 0.2% (half the recommended concentration) in adrenaline 1:100,000 to 1:200,000. They were rated as lacking knowledge in its constitution.

Figure 1: Distribution of respondents formulation of 100mls of Jungle juice



Safe volumes, dosages and antidotes

An assessment of the maximum volume routinely given to 70 Kg adult indicated that 12(7.8%) of 154 surgeons and 1(3.0%) in 33 anesthesiologists were aware of proper volumes. Volumes administered by surgeons had a mean of 64.2(±74.2) mls, with a range of 7 mls to 560 mls , while volumes administered by anesthesiologists had a mean of 148.8(±158.9) mls, with a range of 4 mls to 490 mls.

Similar assessment of the maximum volumes routinely given to 10kg child indicated that none of the surgeons and anesthesiologists used the correct volumes. Volumes administered by surgeons had a mean of 14.5(±12.5) mls, with a range of 0 mls to 70 mls, while anesthesiologists used a mean of 27.3(±26.2) mls, with a range of 2 mls to 100 mls volume. There was no difference in the distribution of knowledge levels between surgeons and anesthesiologists on the safe volumes of Jungle Juice (Mann-Whitney U test p-value=0.629).

An assessment of the knowledge on the maximum dose for lidocaine with adrenaline indicated that 13.6% (N=154) surgeons and 51.5%(N=33) anesthesiologists were aware.

An assessment of the specific antidote for severe local anesthetic toxicity and its dosage indicated that 3.2% (N=154) surgeons and 18.2% (N=33) anesthesiologists were knowledgeable. In 20% of cases was ILE solution available in operation theatres to 3.9% (N=154) surgeons and 18.2% (N=33) anesthesiologists .

Table 3: Knowledge on Jungle juice dosage and ILE as specific antidote

	Knowledge attribute	Jungle juice maximum dose to 70 Kg adult		The maximum dose for Lidocaine with Adrenaline mg/kg		The dosage of the antidote	
		Frequency (n=187)	Percent	Frequency (n=187)	Percent	Frequency (n=187)	Percent
Surgeon	Lack of Knowledge	142	92.20	133	86.40	149	96.80
	Knowledgeable	12	7.80	21	13.60	5	3.20
Anesthetist	Lack of Knowledge	32	97.00	16	48.50	27	81.80
	Knowledgeable	1	3.00	17	51.50	6	18.20

Use of Jungle Juice

Jungle juice was used for operations including thyroidectomy 116(17.6%); reconstruction surgery 94(14.3%); mastectomy 91(13.8%); wide excisions 89(13.5%); mastoidectomy 40(6.1%); parotidectomy 38(5.8%); burn surgery 37(5.6%); dentistry 24(3.6%) hysterectomy 21(3.2%); open reduction internal fixation 20(3.0%) and eye exenteration 12(1.8%) among others.

Most 79(42.7%) of the respondents had always used jungle juice in surgery while 78(42.2%) sometimes used and 25(13.5%) rarely used it. Jungle juice was commonly used among adults 150(81.1%), patients aged 5-13 years 17(9.2%), 1-5 years 6(3.2%) and <1 year 2(1.1%).

Toxicity

Forty six (24.9%) respondents had experienced toxicity symptoms after giving jungle juice that mainly included arrhythmias 33.9%, tachycardia (28.6%) and hypertension (14.3%) among others as indicated below (Table 4).

Table 4: Toxicity symptoms respondents had seen in their patients

Toxicity	Frequency (n=58)	%
Tachycardia	16	28.6
Arrhythmias	19	33.9
Hypertension	8	14.3
Cardiac Arrest	4	7.1
Palpitations	3	5.4
Bradycardia	2	3.6
Convulsions	2	3.6
Circumoral numbness	1	1.8
Anaphylactic shock	1	1.8
Massive local vasoconstriction	1	1.8
Breathlessness	1	1.8

The immediate management steps followed when dealing with a patient with toxicity included mainly CPR (20.2%), stopping injection and administering oxygen (17.8%) (Table 5).

Table 5: Immediate response when dealing with a patient with toxicity

Immediate response	Frequency (n=213)	%
CPR	43	20.2
Stop injection	38	17.8
Oxygen	38	17.8
Resuscitation	21	9.9
ILE	19	8.9
IV Fluids	19	8.9
Convulsions	18	8.5
EGC Monitoring	8	3.8
Antidote administration	8	3.8
Isosorbide dinitrate	1	0.5

Discussion

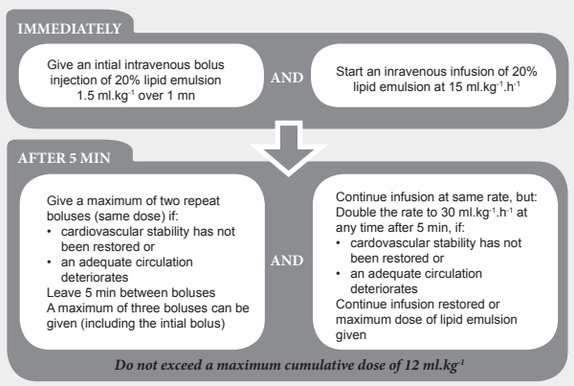
Results showed that all respondents knew of Jungle juice, having acquired knowledge mainly from medical school and work mates. There is very scanty information in literature regarding safe use of jungle juice (6,9). In absence of clear standard formulae on lidocaine-adrenaline combination, not very accurate information may be passed on, especially regarding toxic levels and management of the same.

Constitution of the correct amounts of adrenaline and lidocaine and administration of the correct maximum dosage helps minimize toxicity of component drugs (13). Our study showed that 20% of respondents used adrenaline 1:100,000. This is double the recommended dosage and increases potential for hemodynamic disturbances due to systemic absorption of adrenaline with no clinical advantage (7,8). In this study, hemodynamic disturbances featured often as some of the toxicity symptoms experienced in patients.

Majority of our respondents lacked knowledge on proper dosages and volumes though anesthesiologists were more likely to use the recommended dosages and volumes. The maximum dose limit for lidocaine with adrenaline for infiltration is 7mg/kg (14). A survey in 2010, by Collins, similarly showed that more anesthesiologists than surgeons knew the recommended doses of lidocaine with adrenaline (13). Exceeding the maximum dosage of lidocaine and adrenaline, may lead to systemic toxicity (15). The maximum dose limit of adrenaline when halothane is used is 10mcg/kg (16). Toxicity can be life threatening but is diagnosed easily by a careful and vigilant surgical team (17). Our survey noted that a quarter of respondents had experienced toxicity symptoms in their patients including four cardiac arrests.

Early recognition, airway management and early cardiopulmonary resuscitation, with rapid lipid infusion is recommended for use in the event of severe local anesthetic toxicity by the 2010 American Heart Association guidelines and 2010 Association of Anesthesiologists of Great Britain and Ireland guidelines (18,19) (Figure 2). This kind of therapy is not known to most surgical teams in our survey probably due to non availability of the lipid solution or absence of displayed guidelines on rapid lipid therapy at our work stations. It has been shown that while 41% of anesthesiologists were aware of the initial dose of ILE, only 3% of non-anesthesiologists knew the initial dose (13).

Figure 2: AAGBI Local anesthetic toxicity 2010 guidelines (Reproduced With Kind Permission Of The AAGBI)



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Conclusion

Jungle juice is a common concoction used by Kenyan surgical teams. However there is poor knowledge on its preparation and safety. Regular continuous medical education will promote safe practice on its use. We recommend display of formulae for making jungle juice in all our work stations where it is used, and maximum dose calculation charts. Emergency ILE packs and guidelines should be available in these work stations.

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