Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

COMPARISON OF TWO DIFFERENT DOSES OF KETAMINE IN PREVENTION OF POSTOPERATIVE SHIVERING IN CHILDREN

Dr. Haider Hussain Salman
F.I.C.M.S Anesthesia &Intensive Care. Anesthesiologist &
Intensive Care Specialist in AL-Hussain Teaching Hospital, Samawa -Iraq
(haider1975hussain@gmail.com)

Dr. Ali Aziz Ali
F.I.C.M.S Anesthesia &Intensive Care. Anesthesiologist &
Intensive Care Specialist in Al- Mosul Teaching Hospital, Mosul Iraq
(dralhafo@gmail.com)

Dr. Abdulsattar Jabbar Khalaf
F.I.C.M.S anesthesia &intensive care. Anesthesiologist &
Intensive Care Specialist in Sheikh Zayed Administrative Hospital Baghdad Iraq

ABSTRACT BACKGROUND:

Post-anesthesia shivering is one of the side effects of anesthesia. This lead to increase oxygen consumption, increase intracranial and intraocular pressure and other complications.

Aim of the study was to investigate the role of two doses of ketamine (0.5 mg and 0.25mg) for prevention of shivering after general anesthesia in children.

Patients And Methods :This was randomized prospective clinical trial conducted in Zargari Hospital, Erbil, Iraq. 80 children, of (ASA) physical status I or II scheduled for tonsillectomy under G.A . age between 6-12 year of either sex were randomly selected and divided into two groups (no. 40) receiving 0.5 mg /kg and 0.25mg /kg i.v Ketamine after induction. Data were analyzed by T-test and Chi-square using SPSS 19. The level of significance was considered below 0.05 (P 0.05),

Results

Eighty patients, 44 female 36 male, age was 8.55±1.89 ,. No significance difference was observed in this respect. Regarding anti-shivering effect of 0.5 and 0.25 i.v ketamine no difference was observed. The prevalence of ketamine 0.5mg/kg and 0.25mg/kg shivering intensity was not significant in recovery in 1 , 10 and 20 minute (P value > 0.05),

Conclusions : This study show that using ketamine 0.5 mg/kg and 0.25mg /kg has the same effect as antishivering

Keywords : Ketamine , Shivering , Children , General Anesthesia.

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

Introduction

Perioperative hypothermia and shivering is among the unwanted, recurrent health issues in surgical patients undergoing both general and regional anesthesia, Reports say the occurrence of shivering in patients recovering from general anesthesia to be between 5-65% whereas 40=60% in patients recovering from regional anesthesia.(1). Shivering is a protective reaction, It increases the production of body temperature by muscular contraction. Post-surgery shivering etiology has not perfectly understood, yet (2). Factors like: the reduction of core body temperature (The core temperature usually decreases by 0.5- 1.5C° in the first hour after induction of anesthesia), hindered spinal reflexes, post-surgery pain, the reduction of sympathetic system activity, the secretion of fever-bearing substances (cytokines by the surgical procedures), suppressing metabolic alkalosis and adrenal are probably involved (3). Other factors that contribute to a decrease in body temperature during surgery are ambient temperature <21C°administration of un warmed intravenous fluids, decreased basal metabolic rate, and heat required to humidify inhaled dry gases Post anesthetic shivering may predispose the patient to severe significant

complications such as prolong recovery period, increase oxygen consumption, hemostatic dysfunction, especially in patients with low cardiac reserve, arterial hypoxia, which has been shown to correlate with an increased risk of myocardial ischemia, increase cardiac output, increase peripheral resistance, increase intracranial and intraocular Pressure increase carbon dioxide production, increase lactic acidosis, and interfere with electrocardiography (ECG) and oxygen saturation (SpO2) monitoring(4). Various non-pharmacological and pharmacological measures have been studied to control intraoperative shivering which include covering bared body parts with surgical drapes or blankets, airway heating and humidification, warming intravenous fluids and active cutaneous warming with insulator. In addition, a variety of medications are used which include drugs like Injection pethidine, fentanyl, clonidine, tramadol, midazolam (5). Recently ketamine has been reported with better results in prevention of shivering during anesthesia. It is used as antishivering agent in dose of 0.25-0.75 mg/kg i.v (1). This study aimed to compare two doses of ketamine 0.5 mg/ kg and 0.25/ kg i.v in prevention post-operative shivering in general anesthesia for children, and compare the prevalence of adverse reaction of the both doses.

1. Shivering

1.1 GRADING OF SHIVERING :

Crossley and Mahajan have graded the intensity of PAS using the
following scale:

0 = no shivering;

1 = no visible muscle activity but piloerection, peripheral
vasoconstriction, or both are present (other causes excluded);

2 = muscular activity in only one muscle group;

3 = moderate muscular activity in more than one muscle group but no
generalized shaking;

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

4 = violent muscular activity that involves the whole body.(6)

1.2 ADVERSE EFFECTS OF SHIVERING INCLUDING HYPOTHERMIA :

Post anesthesia shivering, apart from patient discomfort also has several deleterious effects including difficulty with monitoring techniques increased oxygen consumption and metabolic demand, increased intraocular and intracranial pressure, metabolic acidosis and increased carbon dioxide production, increased post-operative pain from surgical incision stretching, increase in cardiac output, minute ventilation and systemic vascular resistance as well as raised plasma catecholamine levels which may be linked to morbid cardiac events in high risk patients.(7)

Mild hypothermia (defined as a core body temperature of between 33.0 –36.40C) is associated with numerous adverse side effects which the shivering patient maybe at risk of, including, impaired immunity and surgical site infection, delayed wound healing, coagulopathy, delayed post anesthetic recovery,prolonged hospitalization, patient discomfort, and morbid myocardial outcomes secondary to sympathetic nervous system stimulation and increased plasma catecholamines.(8)

2.3 PREVENTION AND TREATMENT :

A. Non-pharmalogical

Simple physical measures have been described including increasing the ambient temperature of the operative room, preventing convective heat loss by insulation with surgical drapes, space blankets, warm cotton blankets, ensuring warm skin disinfectant is used prior to draping , and the use of warm intravenous fluids and warm local anesthetics for neuro axial blockade.(5,6).

Forced air-warming devices have been associated with a significant decrease in post anesthesia shivering if applied for 15minutes prior to induction of anesthesia.(9)

B. Pharmacological

Many drugs of various classes have been documented in the prevention and treatment of post anesthesia shivering, with different mechanisms of action(5)

B.1 Opiates

Pethidine is the most widely studied drug in the treatment of post anesthesia shivering. 25mg of pethidine has been found to be an

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

effective antishivering agent. its action according to studies suggest that it's a combination of stimulating alpha 2 adrenoceptors, k opioid receptors, NMDA antagonism and monoamine reuptake inhibition.(10)
Tramadol 2mg/kg, morphine(2.5mg), fentanyl(25ug) and alfentanil
(250ug) are shown to be significantly superior to placebo in treatment ofpost anesthesia shivering

B.2 Non-opiates
Nefopam is a centrally acting non-opioid analgesic. Clonidine an alpha 2 agonist at a dose of 150ug, Doxapram, a respiratory stimulant, Physostigmine, a cholinesterase inhibitor, Ketanserin and ondansetron, serotonin antagonists, have proved to be effective against post anesthesia shivering.(10)
Magnesium and ketamine through NMDA receptor antagonism have been implicated in stopping shivering.

3.Ketamine
3.1 Structure: Ketamine is a highly lipid-soluble ***phencyclidine*** derivative.
3.2 Mechanism of action :
Blocks postsynaptic reflexes in the spinal cord and inhibit excitatory neurotransmitters in selected areas of the brain.
3.3 Dose :
Induction: 1 mg/kg (5–10 mg/kg intramuscularly or per rectum); sedation load: 200 to 1000 mcg/kg; then 30 to 80 mcg/kg/min for maintenance. (16) **3.4** usually achieved within 10–15 min after intramuscular.(11)

PATIENTS AND METHODS
After consent of patients a prospective clinical trial study was conducted with the approval of the Scientific committee of Arabic consul.Study conducted in Zargari Teaching Hospital from June to November 2017.

Inclusion criteria:
eighty children with American Society of Anesthesiologist (ASA) physical status of I or II male and female , ages from 6-12 year, who were scheduled for tonsillectomy

Exclusion criteria:
None of the participants had a history of bleeding disorders, known hypersensitivity to the study medication (ketamine), body temperature before induction <35°C or >38°C (measured by tympanic membrane

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

infrared), requiring transfusion of blood and blood products, and none of the children underwent additional surgical procedures such as adenoidectomy.

All patients received standard general anesthesia propofol 2 to 2.5 mg/kg,

no premedication was use ,10 mL/kg/hour Ringer given to maintain intravascular volume. After intubation, anesthesia was maintained with manual assistance of100% O2 ,2.5-3% sevoflurane, and spontaneous ventilation. Patients monitoring during surgery were ECG, arterial blood pressure, oxygen saturation, capnography and Temperature ,Children were covered with surgical sheets over their calves, chest and thighs Ambient temperature was between 22 -25^0 C. The study drug was administered intravenously immediately after

induction; group(K0.5) received 0.5 mg/kg and group (K0.25) received0.25 mg/ kg of ketamine .Volatile anesthetic agents were discontinued at the end of surgery, and tracheal extubation was done when sufficient spontaneous ventilation was accepted. and the children regained cough or gag reflex. The children were brought to the recovery room, after they were fully awake. The

shivering intensity was graded using a standardized four-point scale (6)

(Table 1) at the following time points: T1, at the recovery room; and T10,10 minutes; T20, 20 minutes

Table: 1. Grading of Shivering Intensity

Grade	Clinical Signs
0	No shivering
1	Peripheral, piloerection vasoconstriction, or both are present but no visible shivering
2	Muscular activity in only one muscle group
3	Muscular activity in more than one muscle group but no generalized shivering (moderate muscular activity)
4	Muscular activity in more than one muscle group but no generalized shivering (moderate muscular activity)

RESULTS

Eighty patients enrolled the study. 44 of them were female and 36 were male (Figure 3) with mean ±S.D age of 8.60±1.94 years, ,mean ±S.D weight of 32.31±7.60 kg , mean ±S.D of height 133.23±8.38 , mean ±S.D of BMI of

17.93±2.46,and mean ±S.D of BSA of 1.08 ± 0.155 (table 1)

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

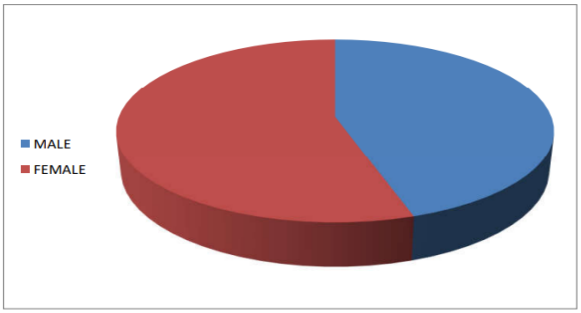

Figure (3): Gender distribution of participants.

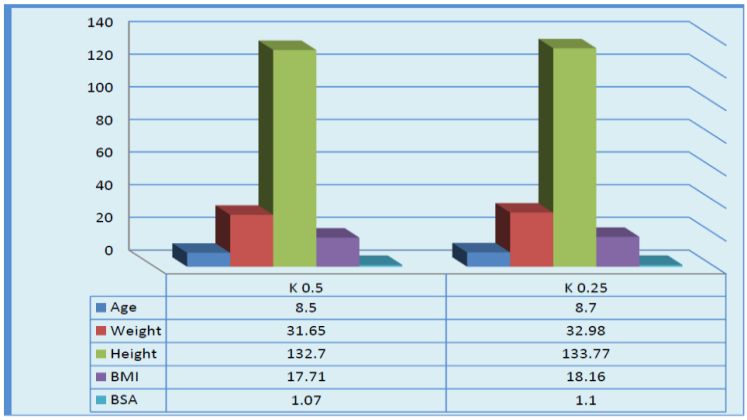

Figure 4 : demographic distribution of the two groups

Table 2:Demographic data of the patients

Measures	Groups	N	Mean	S.D	P-value	T-test
Age	K 0.5	40	8.50	1.97	0.647	Non-significance
	K 0.25	40	8.70	1.91		
	Total	80	8.60	1.94		
Weight	K 0.5	40	31.65	7.95	0.437	Non-significance
	K 0.25	40	32.98	7.25		
	Total	80	32.31	7.60		
Height	K 0.5	40	132.70	8.48	0.568	Non-significance
	K 0.25	40	133.77	8.28		
	Total	80	133.23	8.38		
BMI	K 0.5	40	17.71	2.86	0.423	Non-significance
	K 0.25	40	18.16	2.06		
	Total	80	17.93	2.46		
BSA	K 0.5	40	1.07	0.16	0.431	Non-significance
	K 0.25	40	1.10	0.15		
	Total	80	1.085	0.155		

.P<0.05-significant

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

Comparing the ketamine 0.5mg /kg group and ketamine 0.25mg /kg group regarding postoperative shivering in 1minute , 10 minute and 20 minute show that ; most of the patients in both groups did not have
in all times. Also no patient suffer grade 3 or grade 4 shivering in both groups.

Table: 4 comparison of shivering intensity between K0.5 and K 0.5 groups (Pearson Chi- square) (P value >0.05)

	Dose											
	K 0.5					K 0.25					Pearson Chi-square	P-value
	No Shivering	Grade 1	Grade 2	Grade 3	Grade 4	No shivering	Grade 1	Grade 2	Grade 3	Grade 4		
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)		
1st Min	35 87.5%	4 10%	1 2.5%	0 0%	0 0%	33 82.5%	6 15.0%	1 2.5%	0 0%	0 0%	0.459	0.795
10th Min.	33 82.5%	5 12.5%	2 5.0%	0 0%	0 0%	29 72.5%	8 20%	3 7.5%	0 0%	0 0%	1.15	0.563
20th Min.	36 90%	3 7.5%	1 2.5%	0 0%	0 0%	31 77.5%	7 17.5%	2 5%	0 0%	0 0%	2.30	0.316

P<0.05-significant

During 10th Min. 5(12.5%) and 2(5.0%) of the patients in group K 0.5 suffer grade 1and 2 respectively, while there was 8(20%) and 3(7.5%) of patients in group K 0.25. the 20th Min. results was 3(7.5%) and 1(2.5%) of patients of K 0.5 group suffer grade 1and 2 compare to 7(17,5%)and 2(5.0%) patients of K 0.25 group.

The side effects of ketamine in the two groups were as that, no patient had hallucination, seizure or blurred vision in both groups, 3(7.5%) of K0.5 group and 2(5.0%) of K 0.25 patients had nausea, while 2(5.0%) and
1(2.5%) had vomiting respectively

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

Table 5; side effect of the ketamine in the two groups

variables	K 0.5 group	K 0.25 group	P value
hallucination	0	0	Not significant
Nausea	3(7.5%)	2(5.0%)	0.213
vomiting	2(5.0%)	1(2.5%)	0.346
tachycardia	0	0	Not significant
Blurred vision	0	0	Not significant
seizure	0	0	Not significant

DISCUSSION

In a recent observational study, Eberhart et al(12) found that there were three major risk factors of shivering: young age, endoprosthetic surgery, and core hypothermia. many drugs are used for preventing and treatment shivering but these drugs had many side effects, including respiratory depression, hypotension, sedation, itching, nausea and vomiting.(13) ketamine is a good drug in prevent post-operative shivering without causing cardiovascular or respiratory depression.(14) ketamine controls shivering by non-shivering thermogenesis either by the action on the hypothalamus or by the β-adrenergic effect of Norepinephrine by decreasing core to peripheral redistribution of heat.(15) many studies proved that ketamine at a doses of 0.25-0.75 mg/kg was considered as an effective antishivering agent during perioperative period with reduced side effects.(15) All patients received same general anesthesia propofol and 3% sevoflurane core temperature taken using tympanic temp.(infra-red ear thermometer Truemeds®) before, after induction, 1st ,10th and 20th Min. postoperatively, presence or absence of shivering recorded in 1st , 10th,and 20th Min.(4 grades of shivering considered) ,we also recorded any side effects .

According to the data founded in this study, administration of intravenous ketamine at a dosage of 0.5mg /kg or 0.25 mg / kg after general anesthesia induction in children has the same antishivering effect postoperatively with lower incidence of side effects

hemodynamic alterations, and reduces the occurrence of unwanted side effects.

Norouzi et al(1) found same results in their study, they compare \ three doses of ketamine with placebo and found that 0.5 and 0.25 mg /kg of ketamine have same antishivering effect. Vida et al(13) they reported that Prophylactic use of low doses of intravenous ketamine (0.3 or 0.5 mg/kg) was found to be effective to prevent postanesthetic shivering. However, administration of 0.3 mg/kg ketamine lowered the rate of hallucination as compared with 0.5 mg/kg. Zahra et al. (16)reported that 1mg/kg of intramuscular ketamine is effective in inhibiting post-operative shivering in children, Mirza Koeshardiandi et al(17) concluded that ketamine 0.25 mg/kg i.v is effective in lowering shivering after spinal anesthesia with same effectiveness as pethidine 0.5 mg/kg. Shakya et al.(18) found that fall in temperature was more significant in saline and ondansetron group than in ketamine (0.25mg/kg) group at all time intervals. Considering the findings of this study in association with the literature, the

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

administration of (0.25mg/kg)ketamine in children undergoing general anesthesia has the same effect of(0.5mg/kg) ketamine without hemodynamic alterations, and reduces the occurrence of unwanted side effects

CONCLUSIONS

1. Ketamine proved to be effective drug as antishivering, without dangerous side effects like respiratory or cardiovascular depression
2. Intravenous Ketamine (0.25 mg / kg) given after induction have the same antishivering effect as ketamine 0.5mg / kg, with less
side effects like mild sedation or hallucination .

REFERENCES

1. Norouzi M, Doroodian MR, Salajegheh S. Optimum dose of ketamine for prevention of Postanaesthetic shivering; a randomized double-blind placebo controlled clinical trial. Acta Anaesthesiol Belg. 2011;62(1):33-6.
2. Zang Y, Wong KC. Anesthesia and postoperative shivering, its etiology, treatment and prevention. Acta Anesthesiol Sing 1999; 37: 115-20.
3. Cheong KF, Chen FG, Yau GHM. Post anesthetic shivering a comparison of Thiopentone and Propofol. Ann Acad Singapore 1998;27:729-32.
4. Insler SR, Sessler DI. Perioperative thermoregulation and temperature monitoring. Anesthesiol Clin 2006; 24: 823-37.
5. L, Jain R, Bhattacharya P, Bhattacharya Aggarwal R. Post Anaesthesia shivering (PAS): A Review. Indian J Anaesth.
2003;47(2):88-93.
6. Crossley AW, Mahajan RP. The intensity of postoperative shivering is unrelated to axillary temperature. Anaesthesia1994;49: 205-207.
7. Witte J, Sessler DI. Perioperative shivering. *Anaesthesiology* 2002;96(2):467-484.
8. Sessler DI. Temperature Monitoring and Perioperative Thermoregulation. Anaesthesiology 2008 August; 109 (2) 318- 338.
9. Chung et al. Effect of preoperative warming during caesarean section under spinal anaesthesia. Korean J. Anesthesiol 2012 May 62(5) : 454-460.
10.Witte J, Sessler DI. Perioperative shivering. Anaesthesiology 2002;96(2):467-484.
11. G. Edward Morgan, Jr, MD Maged S. Mikhail, MD. Clinical Anesthesiology 5th edition. McGraw-Hill Companies. United States of America 2013: p.,182..
12. Eberhart LH, Doderlein F, Eisenhardt G, Kranke P, Sessler DI, Torossian A, et al. Independent risk factors for postoperative shivering. Anesth Analg 2005; 101: 1849-57
13. Dal D, Kose A, Honca M, Akinci B, Basgul E, Aypar U. Efficacy of prophylactic ketamine in preventing postoperative shivering. Br J Anaesth. 2005;95:189-92.

ISSN: 2776-1010 Volume 3, Issue 9, Sep., 2022

14. Reves JG, Glass P, Lubarsky DA, McEvoy MD, Martinez-Ruiz R. Intravenous anesthetics. In Miller RD, Eriksson LI, Fleisher LA, Wiener-kronish JP, Young WL (editors). Miller's Anaesthesia, 7th Edition. Philadelphia, Elsevier Churchill Livingstone; 2010: 742-747.
15. Sharma DR, Thakur JR. Ketamine and shivering Anesthesia. 1990;45:252-3.g..
16. Zahra FA, Abudallah HM, Shabana RI, Abdulmageed WM, AbdulrazikSI, Nassar AM. Intramuscular ketamine for prevention of post anesthesia shivering in children. Saudi Med J. 2008;29(9):1255–9. [PubMed: 18813407].
17. Koeshardiandi M, Rehatta N. Effectiveness Dose Ketamine 0.25 mg/kg i.v for Shivering as Therapy During Spinal Anesthesia on surgery of cesarean section. Journal of Emergency. 2011;1(1):45- 53.
18. Shakya B, Chaturvedi A, Sah BP. Prophylactic low dose ketamine and ondansetron for prevention of shivering during spinal anaesthesia. J Anaesthesiol Clin Pharmacol. 2010;26(4):465-9.