THE ROLE OF DEXAMETHASONE IN PREVENTION OF POSTOPERATIVE VOMITING AMONG CHILDREN UNDERGOING ADENOTONSILLECTOMY AT MUHIMBILI NATIONAL HOSPITAL

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled, ***The role of Dexamethasone in Prevention of Postoperative Vomiting among Children undergoing Adenotonsillectomy at Muhimbili National Hospital***, in partial fulfillment of the requirements for the degree of Master of Medicine in Anaesthesiology.

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30/11/2009
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Date

DECLARATION

AND

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I, **Victor Ringo,** declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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ABSTRACT

Disease in the adenoids and tonsils are among the most common problems in paediatrics. Adenotonsilectomy is usually accompanied by significant postoperative retching and vomiting.

The aim of the study was to evaluate the role of dexamethasone in prevention of postoperative retching and vomiting among paediatrics undergoing adenotonsilectomy.

This single blinded clinical trial study, also tried to find out extent and risk factors of postoperative nausea and vomiting at MNH.

During nine months period, 94 patients were eligible for the study, the overall proportions of retching and vomimting were 31.91% and 12.77% respectively. More complications(retching and vomiting) occured at recovery compared to the ward, which were 30.85% and 8.51% vs 9.57%and 4.26% respectively.

Only risk factor which found to be statistically significant in increasing the outcome of PORV was surgical time length,while age group 2 to 5years and male gender were all nonsignificant risk factors in this study.

In general dexamethasone did not show to have any effect in the prevention of PONV in this study.

ABBREVIATIONS :

5HT	-	5 HYDROXYTRYPTAMINE
ASA	-	AMERICAN SOCIETY OF ANAESTHESIOLOGISTS (PHYSICAL STATUS)
CTZ	-	CHEMORECEPTOR TRIGGER ZONE
DBP	-	DIASTOLIC BLOOD PRESSURE
ENT	-	EAR NOSE AND THROAT
GIT	-	GASTRO INTESTINAL TRACT
I. V	-	INTRAVENOUS
MNH	-	MUHIMBILI NATIONAL HOSPITAL
MUHAS	-	MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
NPC	-	NEW PAEDIATRIC COMPLEX
NSAIDs	-	NON STEROIDAL ANTI INFLAMMATORY DRUGS
OR	-	ODDS RATIO
ORL	-	OTORHINOLARYNGOLOGY
POV	-	POSTOPERATIVE AND VOMITING
PONV	-	POSTOPERATIVE NAUSEA AND VOMITING
PORV	-	POSTOPERATIVE RETCHING AND VOMITING
POVOC	-	POSTOPERATIVE VOMITING IN CHILDREN
RR	-	RELATIVE RISK
SPSS	-	STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
SBP	-	SYSTOLIC BLOOD PRESSURE

Definition of terms:

Nausea is defined as subjective unpleasant sensation in which the patient is aware of urge to vomit but does not necessarily do so.

Retching is unproductive vomiting, often occurs before vomiting.

Vomiting is defined as objective physical motion characterized by contraction of the abdominal muscles, descent of the diaphragm and opening of the gastric cardia, resulting in expulsion of stomach contents from mouth.

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INTRODUCTION

Health problems from disease in the tonsils and adenoids are among the most common problems in Paediatrics and whole population worldwide.[1]

The technique of adenotonsillectomy has evolved significantly over the past 2000 years and various techniques are used today for extirpation of the tonsils and adenoids.[2]

Multiple tonsillectomy techniques exist including the sharp dissection initially described by Crowe Watkins Rottholz, various Electrocauterization techniques, lasers including Potassium Titanyl Phosphate (KTP) and CO_2.[2]

More recently however dissection using electrocautery has become popular, however both sharp dissection and electrocautery technique are used together at Muhimbili National Hospital.

Each year 80,000 adenotonsillectomies are performed in the UK with a rate 8/1000 under the age of 15 yrs[3], while at Muhimbili National Hospital there are about 20-40 adenotonsillectomy procedures done per month, it is estimated that children constitute about 70% to 80% of these procedures at MNH each year. Adenotonsilectomy is among the most frequent surgical procedures in children, usually associated with incidence of postoperative vomiting ranging between 43-73% in various parts of the world.[3]

This procedure is accompanied by significant post operative morbidity, which may include post operative bleeding, pain, poor oral intake, dehydration, nausea and vomiting.[4 5 6 7 8]

Vomiting is still one of the very distressing post operative complications. However nowdays many life threatening complications have become very rare with modern anaesthetic techniques.However there is no any documentation of data concerning this problem in Tanzania.

These modern techniques have encouraged practising anaesthetists to provide greater attention to the management of the post operative symptoms that distress patients.However post operative nausea and vomiting (PONV) are still viewed as minor problems by anaesthetists and physicians,even though they are leading causes of morbidity and even sometimes mortality in paediatric surgical patients. [9 10 11 12]

In contrast with the attitudes of some physicians, most patients view PONV as unpleasant experience.Investigators report that these complications are undertreated,despite that severe PONV may be associated with wound dehiscence, pulmonary aspiration of gastric contents,bleeding,dehydration and electrolyte disturbance.[13 14]

It has been found that mild PONV may result in delayed hospital discharge,decreased parental satisfaction and increased use of resources,including medical and nursing care,i.v fluids,drugs and other supplies.[15 16 17 18]

PONV remain major cause of unanticipated admission to hospital after day-case surgery and hence prevention and management is of increasing importance.[6]

The interchangeable use of the terms nausea and vomiting has led to much confusion,as the symptoms do not always accompany each other in severity.

Nausea is a subjective phenomenon,and the smaller child often may not be able to describe or gauge the severity of this symptom.Studies of this complications in children have therefore used the more objective symptoms of retching and vomiting as the end-point.

In several recent large studies,POV occured in 13% to 42% of all paediatric surgical patients.[19] [20] [21] Fortunately severe or intractable POV is less common,occuring in 1-3% of paediatric patients,and the incidence of unanticipated admission for its management is even lower (1 in 3000).[20] However, there are subsets of patients at high risk (30-80% probability) of vomiting after anaesthesia. These subsets of patients include tonsillectomy in children.

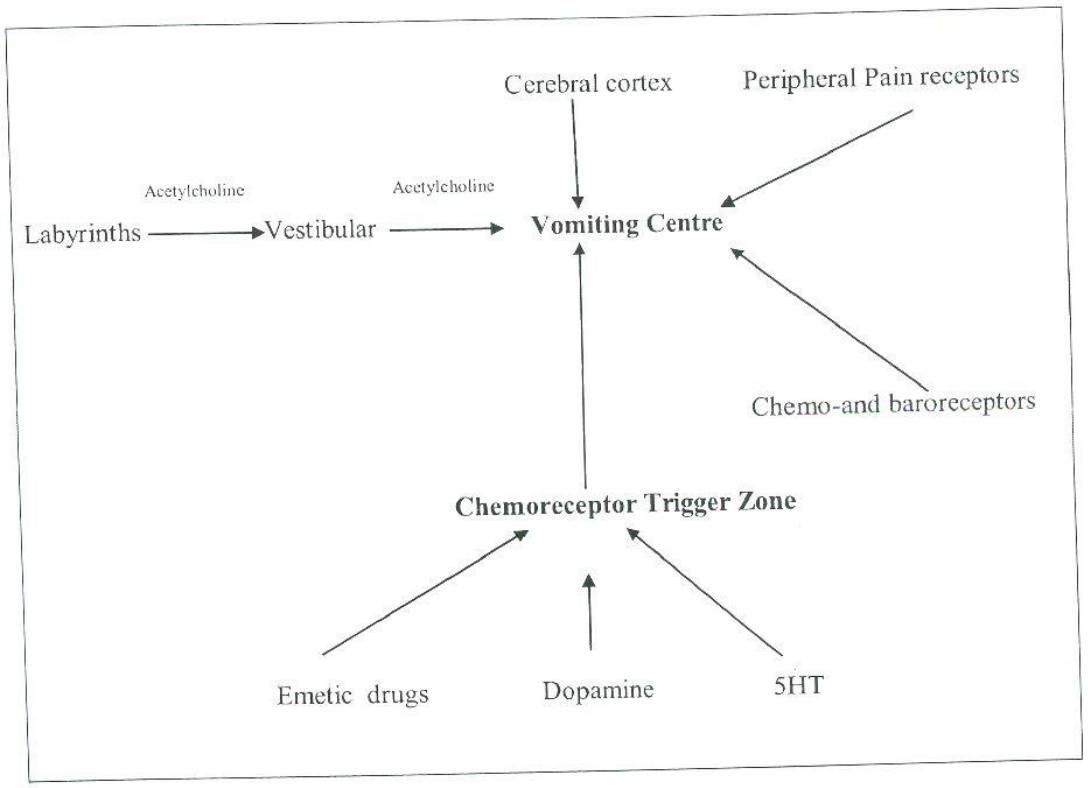
Postoperative vomiting after adenotonsillectomy may be more frequent because of stimulation of pharyngeal afferents, blood in GIT and the facts that is a common procedure in children.[3]

PHYSIOLOGY OF EMESIS

Vomiting is a complicated response mediated by the emetic centre located in the lateral reticular formation of the medulla.This centre receives input from several areas within the central nervous system,including the chemoreceptor trigger zone (CTZ),vestibular apparatus,cerebellum,higher cortical and brainstem centres,and solitary tract nucleus.These structures are rich in dopaminergic,muscarinic,serotoninergic,histaminic and opioid receptors,and block of these receptors may be the mechanism of the antiemetic action of drugs.The emetic centre coordinates efferent impulses through the vagus,phrenic and spinal nerves of the abdominal musculature during the act of vomiting.At the present time,there are no drugs known to act directly on the emetic centre.

These stimuli use different pathways to reach the emetic centre and other antiemetic drugs are usually effective against only a few of these stimuli.[13]

See the illustration of anatomy and physiology of vomiting centre and the chemoreceptor trigger zone in Figure below.



FACTORS ASSOCIATED WITH INCREASED POV

Only some of the factors associated with increasing POV can be influenced by the anaesthetist.

Factors not under the control of the anaesthetist

Patient-related factors associated with increased POV in children,but not under the control of the anaesthetist,include age,sex,and previous history of POV or motion sickness.[9 11 20 22] The incidence of emesis is low in infants and gradually increases towards adulthood.[23]

Although female sex is consistently associated with an increased risk of POV in adult subjects,this association has not always been observed in pre-pubertal children.[20 22]

In paediatric patients more than 13 years of age, girls vomited significantly more often than boys after general anaesthesia.[11] The type of surgery performed also has an influence on the occurence of emetic sequelae that is independent of other patient and anaesthetic factors.[11 13 20 21]

Children undergoing adenotonsillectomy,strabismus repair,orchidopexy, herniorrhaphy, middle ear surgery and laparotomy are at increased risk of POV.[20 24] The risk of POV increases with duration of surgery and anaesthesia, possibly because of greater accumulation of emetogenic anaesthetic agents.[13 20]

Factors under the control of the anaesthetist

Unlike the patient and surgical factors mentioned above,there are anaesthetic-related factors under the control of the anaesthetist that have an impact on the incidence and severity of POV.

Anaesthetic-related factors that affect the incidence of POV include preoperative sedation,choice of intraoperative anaesthetic drugs and postoperative factors.

Premedication

These are drugs administered to provide anxiolysis, sedation analgesia and to reduce airway secretions and cardiovascular responses during induction. Benzodiazepines particularly midazolam are used widely for premedication and also reduce POV in children after strabismus repair and adenotonsillectomy.[25 26] The mechanism of action is unknown, but does not involve reduction of gastric volume or increase in gastric pH. In contrast, premedication with opioid analgesics increase the risk of PONV.[27]

INTRAOPERATIVE ANAESTHETIC DRUGS AND POV

Potent inhalation Anaesthetic agents.

Modern potent inhalation anaesthetics are associated with a much lower incidence of PONV than ether and cyclopropane,which are agents that cause release of endogenous catecholamines.[13] However differences in the incedence of POV with halothane,enflurane,isoflurane,desflurane and sevoflurane have not been well studied.There are some reports of a lower incidence of POV in children undergoing ENT and endoscopic procedures during anaesthesia with sevoflurane than with halothane.[28 29] Volatile anaesthetics are associated with a higher incidence of vomiting in the early recovery period.[23]

Intravenous Anaesthetic Agent.

Propofol an i.v hypnotic agent,is an alkyl phenol compound that has been used for induction and maintenance of general anaesthesia,short- and long-term sedation,and as an antiemetic in sub-hypnotic doses.Studies in children and adults suggest that postoperative emetic sequelae occur less frequently with propofol.[30]

Other intravenous agent drugs

Etomidate is a useful sedative-hypnotic agent for anaesthetic induction in patients with compromised cerebral perfusion or limited cardiovascular reserve and is more emetogenic than propofol.[31]

POSTOPERATIVE FACTORS

Pain management and PONV

Pain can prolong gastric emptying time and contribute to the occurence of emetic symptoms after surgery. Use of opioid therapy for pain management can also increase POV. When administered in equi-analgesic doses, all opioids are capable of eliciting emetic symptoms. Proposed mechanisms for this action include direct stimulation of the CTZ and vestibular apparatus, decreased motility of the stomach and small and large intestine.[32]

Gastric distension has been associated with increased PONV in adults, however, routine evacuation of the stomach via orogastric suctioning has either no effect or increases the risk of PONV.[33]

Motion, including ambulation or transportation on a stretcher,wheel-chair or by car during the recovery phase can precipitate POV.This is particularly true for patients who have received opioids.The vestibular apparatus may become sensitized by opioids resulting in activation of the emetic reflex.

ANTIEMETIC AGENTS

There are several groups of drugs used routinely as antiemetic prophylaxis either singly or in combination. These include:[23]

(i) **Butyrophenones eg. Droperidol:**

Is a neuroleptic drug with Antiemetic properties as a result of its Antagonistic effects at central dopaminergic receptor.

(ii) **Phenothiazines:**

Antiemetic effect results from their ability to block dopamine receptors CTZ of the brain. Rarely used in outpatient setting due to extrapyramidal effects.

(iii) **Gastrokinetic drugs:**

Metoclopramide facilitate gastric and small bowel motility and increase lower esophageal sphincter tone.

Metoclopramide (20mg I/V or 0.2 mg/kg) is effective in the prevention of PONV. Because of its half life, metoclopramide should be administered near the end of surgery to ensure optimal efficacy in the early postoperative period.

Combination of metoclopramide and droperidol appears to be more effective than droperidol alone.

(iv) **Anticholinergics :**

Eg. Atropine, glycopyrrolate and scopolamine.

Transdermal scopolamine, centrally active anticholinergic, can reduce the incidence of severe PONV, but the patch should be placed several hours before surgery to achieve a therapeutic level in the early postoperative period.

(v) **Antihistamines:**

Eg. Dimenhydrinate and hydroxyzine act on the central vomiting centre and vestibular pathways to prevent PONV.

(vi) **Serotonin antagonists:**

Ondasetron, granisetron, dolasetron, and tropisetron are highly selective 5-HT_3 receptor antagonists that lack the sedative, dysphoric or extrapyramidal effects of other commonly used antiemetics.

Of the available 5-HT_3 antagonists, dolasetron appears to be the most cost-effective in both adults and children.

(vii) **Neurokinin – 1 Antagonists:**

Preliminary studies suggest that the neurokinin-1 antagonists have superior antinausea and longer lasting Antiemetic properties than the $5HT_3$ antagonists do.

In addition these compounds may act synergistically with 5-HT_3 antagonists.

(viii) **Miscellaneous Compounds:**

Dexamethasone 4- 8mg intravenously, is highly effective in the prevention of PONV when administered alone or in combination with other Antiemetic drugs.

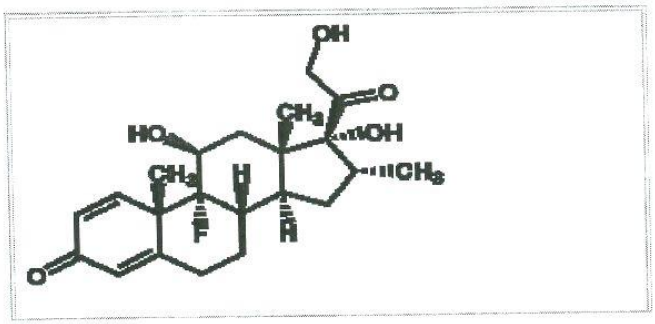
(ix) **Non pharmacologic Techniques:**

Acupuncture and Acupressure have been used for the prevention of PONV with varying degrees of success.

Most studies have suggested that the use of electrostimulation is more successful in preventing nausea than vomiting and there is no benefit in children [41]

Pharmacology of Dexamethasone

Chemical structure



9-fluoro-11β,17,21-trihydroxy-16a-methylpregna-1,4-diene-3,20-dione

Corticosteroids usually affect the strength of heart muscle and its response to natural chemicals affecting heart rate. They affect the water and salt balance in the body and also enable the body to cope with stresses such as changes in temperature, pain, fear and anxiety. Corticosteroids respond to stress by increasing the rate, force of the heartbeat, blood supply to muscle, heart, brain and body's supply of energy by raising blood sugar and by several other effects on body systems.

It has combined Anti-emetic and Anti-inflammatory effects that may decrease post operative edema and subsequently may improve oral intake after tonsillectomy.

It is a synthetic corticosteroid which can also be used to control symptoms caused by low levels of corticosteroids in the body. This can be due to many reasons, including Addison's disease or surgical removal of the adrenal gland(s).

It usually prevents the release of histamine, interleukin, leukotriene that are important in the immune system; these chemicals are normally involved in producing immune and allergic responses, resulting in inflammation. By decreasing the release of these chemicals in a particular area, inflammation is reduced.

Pharmacokinetics

Dexamethasone is readily absorbed after oral administration achieving peak plasma concentrations after one hour. Binding to plasma proteins is less than for most other corticosteroids.

The biological half-life is approximately 190 minutes. Dexamethasone penetrates tissue and cerebrospinal fluid.

Elimination occurs via metabolism and renal excretion.

Antiemetic effect

The Glucocorticoids,dexamethasone and methylprednisolone,exert antiemetic properties by a mechanism which is yet unknown.These drugs have been used for many years to prevent chemotherapy-related emesis,and are now being used in the postoperative setting.Dexamethasone in doses upto 1 mg kg-1 i.v (maximum dose 25 mg) is effective in reducing postoperative vomiting in children after tonsillectomy.[37] Dexamethasone lacks side effects when used as a single dose and has a low cost compared to other standards antiemetic agents.

Side effects

Occurs when used for long period of time

- Thinning of the skin
- Increased pressure inside the eye (glaucoma)
- Weight gain
- Irregular menstrual cycle
- Decreased functioning of the adrenal gland (adrenal suppression)
- Thinning of the bones (osteoporosis)
- Ulceration of the stomach or intestine
- Increased susceptibility to infections
- Increased risk of fractures of the bones
- Increased hair growth (hirsutism)
- Yeast infection of the moist areas of the body, especially the vagina (candidiasis)
- Supression of growth in children and adolescents
- Alterations in number and motility of sperm
- Changes in mood
- Muscle weakness
- Acne

Drug interactions

The following medicines may increase the removal of dexamethasone from the body, thus reducing its effects:-

- Antiepileptics e.g carbamazepine and phenytoin
- Barbituates e.g phenobarbitone
- Rifampicin

When taken with carbenoxolone, amphotericin or diuretics e.g. frusemide, there is an increased risk of low blood potassium levels (hypokalaemia). When taken with non-steroidal anti-inflammatory drugs (NSAIDs) e.g. indomethacin, there is an increased risk of adverse effects on the gut, such as stomach ulceration and bleeding.

The blood levels of salicylates e.g. aspirin, are decreased by corticosteroids and therefore may increase to excessive levels once the corticosteroid is stopped.Dexamethasone may oppose the treatment of high blood pressure and heart failure as they may cause retention of salt and water. As corticosteroids may cause hyperglycemia, they can oppose the effects of antidiabetics. Live vaccines are contraindicated in people taking corticosteroids as they can cause active infection due to impaired immunity. Antacids may decrease the absorption of corticosteroids from the gut.

LITERATURE REVIEW

Steward and colleagues published a Meta Analysis of seven double blind randomized placebo controlled trials of dexamethasone in 2001. Doses ranged from 0.15 – 1 mg/kg.

The summary RR calculated was 0.55 (95%) (I-041 – 0.74)

Two further trials have been published as that would have met their inclusion criteria and hence the Meta- Analysis for POV was re- performed.

The dose used in both studies was 0.5mg/kg (maximum dose of 8mg).

The summary RR incorporation these studies was 0.48 (95% CI 0.40 – 0.57) while the summary OR was 0.239 (95% CI 0.16-0.33).

There was no strong evidence of significant interstudy heterogeneity (P=0.24). [38]

In a quantitative systematic Review done in Geneva, Switzerland, 1946, patient from 17 trials were analyzed, 598 received dexamethasone, 582 received ondasetron granisetron, droperidol, Metoclopamide or pherphenazine, 423, received a placebo and 343 received a combination of dexamethasone with ondasetron or granisetron.

With placebo, the incidence of early and late PONV was 35% and 50% respectively. 16 regimens of Dexamethasone where tested most frequently 1 or 1.5mg/kg in children.

With these doses, the number needed to prevent early and late vomiting compared with placebo was 3.8 (2.9-5) Ondasetron or granisetron further decreased the risk of PONV.

There were no reports on Dexamethasone related side effects.

It is very likely that the best prophylaxis of PONV can be achieved by combining dexamethasone with a 5-HT_3 receptor antagonist. [39]

Dexamethasone is a cost effective alternative to Ondasetron in preventing PONV after peadiatric strabismus repair.

In a study done in New Delhi India-135 children (2-15 yrs, ASA I-II), the incidence and severity of PONV in the 24hrs were significantly less in dexamethasone and ondasetron group than in placebo group ($P < 0.005$).

The incidence ($P = 0.04$) and severity ($P=0.03$) of PONV at the 6-24 hrs were significantly less in dexamethasone group than in ondasetron group.
The cost to benefit in a child treated with dexamethasone was approximately 22 times less than that of ondesetron. [40]

Double blinded, randomized, placebo-controlled study done in Beirut, Lebanon, the overall incidence of vomiting, as well as the incidence of late vomiting, was significantly less in the Dexamethasone group as compared with the Saline group (23% and 19% vs 51% and 34%, respectively).[34]

Paediatric patients have a higher incidence of POV than adults,with a peak incidence of 34-50% in school children.The lowest incidence occurs in infants 5%, while preschool children have an incidence of 20%.[9,13]

In Cairo, Egypt where a double blinded study was done to compare a group of patients who received dexamethasone and those with placebo, dexamethasone significantly showed to decrease the incidence of early and late vomiting ($P < 0.05$, $P < 0.001$ respectively).[7]

In another prospective, randomized, double-blind, placebo-controlled study in Illinois, USA showed that during the 24 h after discharge, more patients in the control group experienced PONV (62% vs 24% in the steroid group).

Additionally, more children in the control group (8% vs 0% in the steroid group) returned to the hospital for the management of PONV.
The preoperative administration of dexamethasone significantly decreased the incidence of PONV over the 24 h after home discharge in these children. [35]

In a randomized, double blind, placebo controlled study done in Riyadh, Saudi Arabia a total of 60 patients were analyzed. The overall incidence of early as well as late vomiting was significantly less in dexamethasone as compared to control group (37% versus 74% P=0.016), overall incidence of retching was 29% in control and 3.4% in dexamethasone (p=0.008). Vomiting once or more than once was significantly high in control as compared to dexamethasone group. [41] Dexamethasone markedly affected the postoperative course in the first day after surgery. According to parental reports, the percentage of patients vomiting was reduced from 48 to 4% as shown by the double-blind study done in Philadelphia, USA. [36]

In a study done in Grafton, New Zealand a dose-response curve for intravenous morphine and vomiting was investigated in children having day-stay tonsillectomy. A retrospective chart review was performed for the 164 children fulfilling the inclusion criteria. Morphine (mean 0.09 mg/kg SD 0.05) was used in 108 children in the perioperative period and a further 56 children were given no opioid. Fifty-five of these 164 children vomited and 20 children required an overnight stay in hospital because of vomiting. The probability of vomiting or overnight stay in hospital was related to morphine dose (by logistic regression).[27]

In another study done in Karlstad, Sweden, it was found that Sevoflurane, a new volatile anesthetic agent, is of great potential interest in peadiatric anesthesia. Its use for ENT surgery in children was compared with halothane in this study.

Altogether 40 children participated in the investigation. In 18 (median age 4.2 years), halothane was used. The remainder (median age 4.0 years) were anesthetized with sevoflurane. During emergence, postoperative nausea/vomiting was more frequent after halothane anesthesia.[14 28]

Watcha, Bras et al, in their study done in St. Louis, Missouri showed that paediatric patients have a higher incidence of POV than adults, with a peak incidence of 34-50% in school children. The lowest incidence occurs in infants (5%), while preschool children have an incidence of 20%. [13]

PROBLEM STATEMENT AND RATIONALE

PONV is one of the immediate post surgery anaesthetic complications with incidence ranging from 43% to 73 % worldwide.[23] PONV has been mainly observed in the ENT surgeries especially the Adenotonsillectomy.[20]

At MNH the adenotonsillectomy is common procedure and accounts for 52.4% of procedures performed by the ENT department.

There are number of anti-emetics agents available that includes emmeset(5HT3 blocker), metoclopamide, but these are expensive. Dexamethasone has shown to be effective in reducing the incidence of PONV in some of studies.[36 39]

Dexamethasone if found effective is cheaper than emmeset and metoclopamide as the cost of emmeset and metoclopamide is about 5- 10 times higher than the same dose of dexamethasone.

Looking at the magnitude of PONV as observed in other parts of the world and the number of procedures prone to PONV performed at the MNH, we decided to quantify the prevalence of PONV and effect of dexamethasone in preventing the occurrence of those events.

OBJECTIVES

Broad objective

The Role of Dexamethasone in Prevention of Postoperative retching and vomiting among children undergoing adenotonsillectomy at MNH.

Specific objectives

1) To determine proportions of postoperative retching and vomiting according to sex and age
2) To determine proportions of postoperative retching and vomiting with respect to dexamethasone groups (received vs none).
3) To determine the effect of dexamethasone in preventing PONV (retching and vomiting) by age, sex and duration of surgery.

METHODOLOGY

Study Design:

This was a single blinded clinical trial.

Study Area:

The study was conducted at Muhimbili National Hospital (MNH) in Dar es Salaam, the National and largest University teaching hospital in Tanzania.

Sample Size:

The study included all children aged 2-15 yrs who were scheduled for adeno tonsillectomy at ENT department MNH from April – October 2008. The calculated sample size was 155, however, a total of 94 children were enrolled during the study period.

The sample size was obtained using;

$$N = \frac{d^2 P(100-P)}{A^2}$$

Where N is sample size

d, the critical value, equals to 1.96

A- Maximum likely error is 7%

P- Prevalence of PONV used was 73 %.[23]

$$\text{Therefore } N = \frac{(1.96)^2\ 0.73\ (1-0.73)}{(0.07)^2}$$

$$N = 155$$

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Inclusion Criteria:

- Age 2-15 years scheduled for tonsillectomy at ENT department MNH
- Patients with ASA I and II with no previous history of adverse effects with anaesthetics
- Patient consented (written) for surgery and anaesthesia.

Exclusion:

- Patients with ASA III and IV previous adverse reaction to Anesthetics.
- Patients with contraindication to steroids
- Patients on steroids 48 hrs before surgery

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MATERIALS and DRUGS:

- Dexamethasone that was given to one group of enrolled.
- Anesthetic agents(halothane)
- Automated monitor for hemodynamic parameters monitoring (SBP and DBP, Oxygen saturation and Pulse rate).
- Peadiatric cuff.
- Stop watch – for recording of time length of the procedures
- Weighing scale, used to measure weights of children without weight measurements.

Anesthetic Procedure and Data Collection:

The candidates for this study included all patients between 2-15 years who were scheduled for elective adenotonsillectomy, tonsillectomy or adenoidectomy. Informed consent to participate in the study was obtained from the subjects' parents or guardians as per protocol of MUHAS ethical Committee. The

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participants were divided into two groups and administration of dexamethasone was done using the randomized permutation blocks.

All patients were subjected to standard anaesthetic procedures regardless of the assigned group. The standard anaesthetic procedure in our setting includes provision of atropine 0.02mg/kg for anticholinergic effect, halothane (2-3%) for induction and (1.5-2%) for maintenance and suxamethonium 2mg/kg muscle relaxant(to assist intubation), morphine (0.05 mg/kg), pethidine 0.5 mg/kg were used as analgesia.

Dexamethasone was administered prior to induction of anaesthesia (0.5mg/kg).All drugs were administered by the investigator.

Time length of surgery was recorded.

Upon completion of the surgery (procedure), oro-pharyngeal suction and extubation was done to all patients before being transferred to the recovery room. At recovery room the trained nurse observed and was instructed to document any event of retching and vomiting throughout the period the patient was at the recovery room. The guardians and parents were trained to observe the patient in the ward and were requested to chart down any event of retching or vomiting. The main outcome measure was episodes of vomiting or retching from time of extubation to the day of discharge, (Nausea was not recorded as it was difficult to assess in children).

No patient received rescue antiemetic agent during the whole time of the study.

Data collection methods

Records were obtained from the medical records, data collected at the time of surgical procedure included demographic and clinical information (Age, sex, weight), indication for surgery, associated medical conditions and type of procedure.

Data was entered in a structured questionnaire (Refer appendix 1). A parent or guardian was requested to answer some questions concerning episodes of

vomiting and/or retching and the responses were filled in the questionnaire by the author. Other data was taken by the author through observation during the time of surgery (e.g type of analgesic agent used, timelength of surgery, episodes of retching and/or vomiting etc).

Data Management

Data collected was entered and stored in the computer and movable disks. Analysis was done using computer program, SPSS version 13.0 window program.

Ethical Considerations

Approval of the study to be carried out was sought from the MUHAS ethical review committee and written consent observed from guardian or parent.

Refusal of consent did not lead to discrimination in care.

RESULTS

CHARACTERISTICS OF POPULATION STUDY (n=94)

During the 9 months period there were a total of 307 patients who were listed for several types of ENT procedures at NPC theatre of MNH.

Among them, 126 patients had adenoidectomy, adenotonsilectomy or tonsillectomy; out of which 94 patients were eligible for the study. In these eligible patients, 56 (59.57%) were males and 38 (40.43%) were females.Only 60% of sample size obtained due to limitation of time and few number of eligible cases during the time of the study.

Among the sample population, 49 (52.13%) received Dexamethasone while 45 (40.43%) didn't. The age distribution was between 2 and 15 yrs with a mean age of 5.15 ± 3.21 yrs. Majority of them, 62 (65.96%) fell within the age group 2-5 yrs.

In this study surgical timelength was between 5 and 55 mins with a mean time of 27.39 mins ±10.79 mins. Most of the study population 52 (55.34%) had surgical timelength of less than 30 mins.

Most of the patients received Morphine 53 (56.38%) as analgesia compared to Pethidine 41 (43.62%).

The characteristics of the study population are summarized below in Table 1:

Table 1: Characteristics of study population.

Characteristic	Number
Age	
Range	2-15 yrs
Mean	5.15 yrs±3.21
Age group	
2-5 yrs	62 (65.96)
6-10 yrs	22 (23.40)
>10 yrs	10 (10.64)
Sex	
Males	56 (59.57)
Females	38 (40.43)
Surgical Timelength	
Range	5-55 mins
Mean	27.39 mins±10.79
Analgesia	
Morphine	53 (56.38)
Pethidine	41 (43.62)
Dexamethasone	
Yes	49 (52.13)
No	45 (47.87)
Final status	
None	52 (55.32)
Retching	30 (31.91)
Vomiting	12 (12.77)
Weight	
Range	8-45Kg
Mean	18.99 +_ 7.43

Table 2. Age group and Sex

Age group	Female	Male	Total
2-5	20 (33.260	42 (67.740	62 (100.00)
6-10	9 (40.91)	13 (59.09)	22 (100.00)
>10	9 (90.00)	1 (10.00)	10 (100.00)
Total	38	56	94

P=0.003

Majority of patients were in the age group of 2-5 yrs, with a high number of males (67.74%) while age group > 10 yrs made the least number of patients, with more females (90.00%). The age distribution and sex were statistically significant , with more males in the group (1 and 2).

Table 3. Surgical timelength by Sex and Age group

	Surgical Timelength				
		>30	<30	Total	P-value
Sex	Female	15 (39.47)	23 (60.53)	38 (100.00)	0.403
	Male	27 (48.21)	29 (51.79)	56 (100.00)	
	Total	42 (44.68)	52 (55.32)	94 (100.00)	
Age group	2-5 yrs	23 (37.10)	39 (62.90)	62 9100.00)	0.0093
	6-10 yrs	14 (63.64)	8 (36.36)	22 (100.00)	
	>10 yrs	5 (50.00)	5 (50.000	10 (100.00)	
	Total	42 (44.68)	52 (55.32)	94 (100.00)	

Age group and surgical time length had significant association. Most of males (48.21%) were in surgical timelength of >30 mins compared to females

(39.47%) while most of females (60.53%) were in surgical timelength of less than 30 mins compared to males (51.79%). In this study most patients had surgical time of less than 30 minutes(55.32%) compared to (44.68%) who had more than 30 minutes.

Most of patients in age groups 2-5 yrs (62.90%) had surgical time of less than 30 minutes compared to age groups 6-10 yrs (36.36%) and greater than ten years (50%), however most of patients in age group 6-10 years had surgical time of more than 30 minutes (63.64%) compared to age above ten years (50.00%) and 2-5 yrs (37.10%).

Table 4. Dexamethasone by Sex, Age group, Analgesia and Surgical timelength

Characteristics		Dexamethasone			p-values
		Yes	No	Total	P=0.814
Age group (yrs)	2-5	31 (50.00)	31 (50.00)	62 (100.00)	
	6-10	12 (54.55)	10 (45.45)	22 (100.00)	
	> 10	6 (60.00)	4 (40.00)	10 (100.00)	
Sex	Females	20 (52.63)	18 (47.37)	38 (100.00)	P=0.936
	Males	29 (51.79)	27 (48.21)	56 (100.00)	
Surgical timelength (min)	<30 mins	29 (55.77)	23 (44.23)	52 (100.00)	P=0.432
	≥30 mins	20 (47.62)	22 (52.38)	42 (100.00)	

Administration of dexamethasone done randomly without being influenced by age group, sex or surgical timelength.

Table 5. Dexamethasone and outcomes

	Dexamethasone	Outcome				
Recovery		None	Retching	Vomiting	Total	P value
	Yes	30 (61.22)	13 (26.53)	6 (12.24)	49 (100.00)	0.316
	No	27 (60.00)	16 (35.56)	2 (4.44)	45 (100.00)	
	Total	57 (60.63)	29 (30.38)	8 (8.52)	94 (100.00)	
Ward	Yes	43 (87.76)	3 (6.12)	3 (6.12)	49 (100.00)	P=0.343
	No	38 (84.44)	6 (13.33)	1 (2.23)	45 (100.00)	
	Total	81 (86.17)	9 (9.57)	4 (4.26)	94 (100.00)	

The results show that dexamethasone did not have influence on both recovery and ward (P recovery =0.316, P ward=0.343), however in recovery most complications (ie. vomiting and retching) occured in those who did not receive dexamethasone (40.00%) compared to those received (38.77%) while in the ward it was 12.24% compared to 15.55% respectively. Most complications occured at the recovery (39.37%) compared to the ward (13.83%).

Table 6. Outcomes

	Vomiting	Retching	None	Total
Recovery	8 (8.51)	29 (30.85)	57 (60.64)	94
Ward	4 (4.26)	9 (9.57)	81 (86.17)	94

Most patients retched nevertheless most did not vomit. In the recovery retching occured in 30.85% compared to 8.51% for vomiting while in the recovery ward it was 9.57% and 4.26% respectively. Both retching and vomiting improved in the ward.

Table 7. Final Vomiting Status against Sex, Age group, Analgesia, Surgical timelength

Characteristics		None	Retching	Vomiting	Total	P=value
Sex	Male	27 (48.21)	21 (37.50)	8 (14.50)	56 (100.00)	P=0.238
	Female	25 (65.79)	9 (23.68)	4 (10.53)	38 (100.00)	
Age group	2-5 yrs	31 (50.00)	22 (35.48)	9 (14.52)	62 (100.00)	
	6-10 yrs	12 (54.55)	7 (31.82)	3 (13.64)	22 (100.00)	P=0.224
	> 10 yrs	9 (90.00)	1 (10.00)	0 (0.00)	10 (100.00)	
Surgical Time	≥ 30 mins	16 (38.10)	17 (40.48)	9 (21.43)	42 (100.00)	P=0.006
	< 30 mins	36 (69.23)	13 (25.00)	3 (5.77)	52 (100.00)	

More males had retching and vomiting (37.20) and (14.50) respectively compared to to females.

Age group 2-5 yrs had high risk of retching and vomiting, 35.48 and 14.52 respectively compared to other age groups.

The study showed that,most retching and vomiting occured in patients who had surgical timelength of 30 mins and above compared to those with less than 30 mins and above compared to those with less than 30 mins (40.48) versus (21.43) compared to (25.00) versus (5.77).

However Sex, Age group and analgesia were not statistically significant but only surgical timelength showed statistical significance (p=0.006).

TABLE 8. FINAL OUTCOME.

PONV	DEXAMETHASONE		TOTAL
	Yes	No	
PONV	22	21	43
NO PONV	27	24	51
	49	45	94

Odds Ratio=0.93 95% CI=0.38-2.27 and P-value=0.86.

There is no association between PONV and dexamethasone.

TABLE 9. PONV ADJUSTED BY SEX, AGE GROUP AND DURATION OF SURGERY.

		OR	95% CI OR	P value
Sex	Female	0.52	0.10-2.56	**0.30**
	Male	1.31	0.40-4.31	
	Crude OR	**0.93**	**0.38-2.27**	
	M-H Combined OR	**0.94**	**0.38-2.15**	
Age	2-5 years	0.77	0.25-2.35	**0.92**
	6-10years	3.27	0.42-28.60	
	>10 years	0	0	
	Crude OR	**0.93**	**0.38-2.27**	
	M-H Combined OR	**0.99**	**0.43-2.26**	
Surgical time length				
	Less than 30 min	1.62	0.38-7.15	**0.30**
	30 min and above	0.71	0.19-2.76	
	Crude OR	**0.93**	0.38-2.27	
	M-H Combined OR	**1.04**	0.44-2.47	

There is no association between dexamethasone and PONV adjusted by sex,age group and duration of surgery.

DISCUSSION

Disease in tonsils and adenoids are among the most common problems in paediatrics.[1]Therefore tonsilectomy with or without adenoidectomy is one of the most frequently performed surgical procedures in children at MNH, Tanzania. Frequently, ENT surgeries are accompanied by significant post operative morbidity which may include bleeding, pain, poor oral intake, dehydration, nausea and vomiting.[4,5,6,7,8]

However nowadays many life threatening complications have become very rare with modern anaesthetic techniques, still vomiting and retching being ones of very distressing post operative complications in tonsilectomy/adenoidectomy and adenotonsilectomy.

Being a common problem faced by anaesthetists and surgeons in day to day practice there is no any documentation of data concerning this problem in Tanzania, that is why this study was conducted to find out the extent and risks factors of this problem in our hospital set up.

This study reflects on risk factors and extent of immediate and late postoperative complications (retching and vomiting) among paediatrics patients who had ENT procedures at MNH in Tanzania.

The results of this study indicate that dexamethasone alters the postoperative course of children undergoing tonsilectomy, reducing the overall proportions of postoperative vomiting and retching, especially in the ward (late) compared to recovery (early). However the results were not statistically significant(P recovery=0.316,P ward=0.343).

Most of the complications (retching and vomiting) occured in recovery (39.37%) compared to the ward (13.83%). In the recovery most of the complications occured in those who did not receive dexamethasone (40.00%). Compared to those received (38.77%) while in the ward it was (15.55%) compared to (12.24%) in those received it.

These findings are different from the quantitative systematic review done in Geneva by Iris Henzi et al where by 17 trials were analyzed in which 298 received Dexamethasone and 423 received placebo.With placebo, the incidence of early and late PONV was 35% and 50% respectively.[39]

However the results were not statistically significant (p^{ward}=0.343 and $p^{recovery}$=0.316) but the proportion of the patients with postoperative complications in those received dexamethasone and in those didn't received dexamethasone both in recovery and the ward showed some improvement in those received. This difference in proportions could have been attributed by the difference in ethnicity between the study populations.

In this study most of complications occured at recovery compared to the ward, this could have been due to time of onset of action of dexamethasone which start to work after some several minutes, as well as most of the surgeries were done in less than thirty minutes.
These findings could also been attributed with small number of sample size of my study. In this study, neither rescue antiemetic regime was needed nor any side effects of dexamethasone noted.

Consistent results have been reported from Beirut Lebanon where the overall incidence of vomiting as well as the incidence of late vomiting was significantly

less in the dexamethasone group as compared to with the saline group (23% and 19% vs 51% and 34% respectively) [34]

In a randomized double blinded, placebo controlled study done in Riyadh, Kingdom of Saudi Arabia where by 60 patients with 2-12 years were enrolled for tonsilectomy.

The overall incidence of early as well as late vomiting was significantly less in dexamethasone group compared to control, 37% versus 74% respectively (p=0.016). Overall incidence of retching was 29% in control and 3.4% in dexamethasone group (p=0.008).

Dexamethasone was considered safe and there was no adverse effects in both groups, also found to have antiemetic properties as overall incidence of retching and vomiting was significantly less in dexamethasone group compared to control group.[43] Neither rescue antiemetic needed nor any adverse effect noted in this study.

This study shows that, most complications (retching and vomiting) occured in males who received dexamethasone (58.62%) compared to females on the same group (25%) while in those who didnt receive dexamethasone the proportions of males and females were almost the same ie. 44.44%.

These findings are different from most studies whereby females show predominance.These could be attributed by a big number of male patients 27 (48.21%) compared to females 15 patients (39.47%) who had surgical timelength of more than 30 minutes,as well as a small sample size of the study.

However, this study was not statistically significant (p=0.403),usually female sex is consistently associated with an increased risk of PONV in adult subjects

which is thought to be due to high estrogen but not always been observed in prepubertal children. [20,22]

Although not reached statistically sigificance, it was noted that age group 2-5 yrs had high risk of retching and vomiting, 35.8 and 14.52 respectively compared to other age groups, infact risk of postopertive complications seem to decrease with increasing age group i.e (31.82 and 13.64 versus 10.00 and 0.00 in age group 6-10 yrs and > 10 yrs respectively).

Although age group was not statistically significant (p=0.152) but it seems that age group 2-5yrs had more complications (retching and vomiting), 16 patients (51.61%) in those non dexamethasone group compared to other age groups 6-10 yrs and > 10 yrs as they had least events, 3 (30%) and 1 (25%) respectively. It seems that being in age group 2-5yrs and without receiving dexamethasone, the risk of postoperative vomiting and retching is almost doubled.

A number of investigators have identified childhood after infancy and young adulthood as independent PONV risk factors, in children aged less than 14 yrs found to have a sharp increase in PONV risk at around age of 3years; with a 0.2%-0.8% per year increase in risk thereafter, depending on the presence of other risk factors.[44 47]

This study also revealed that most of postoperative complications (retching and vomiting) occured in those with surgical timelength of more than 30 mins (40.48) and (21.43) respectively compared to those who had less than 30 mins (25.00) and (5.77) respectively.

These results were statistically significant (p=0.006), as increasing in surgical timelength usually increases risk of PONV due to greater accumulation of emetogenic anaesthetic agents.[13 20 44]

Administration of dexamethasone seems to decrease much retching and vomiting episodes in those with surgical time of less than 30 mins (27.59) for those received versus (34.78) in those didnt receive, compared to those who had surgical timelength of more than 30 mins.

This could be due to a big proportion of patients who had surgical time of less than 30 mins received dexamethasone (55.77) compared to those who had more than 30 mins (47.62).

Also most studies have consistently reported an increase in outcome of PONV with longer durations of surgical stimulation and anaesthesia.In one of the studies reported that every 30 mins increase in duration of surgery progressively increased the incidence of PONV.[4]

Limitation of the study

The sample size was small, therefore the power of the study was also small to give concrete conlusion on the findings in the study

CONCLUSION AND RECOMMENDATIONS.

In this study dexamethasone did not show to have any effect in the prevention of PONV.However the overall incidence of vomiting at MNH is lower(12.77%),but there is need of backup plan of standard antiemetic drugs in case a severe case of retching or vomiting occurs.

The results showed that PONV it is not a problem warrant an anttention in our setups,there is no need of using drugs to prevent PONV among patients undergoing adenotonsillectomy;if a need be then standard antiemetic should be used.

However the results are inconclusive compared to other findings elsewhere,further observation to attains significant sample size for significant conclusion is needed.

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