Title.

SINGLE INTRAOPERATIVE INTRAVENOUS CO-AMOXICLAV VERSUS POSTOPERATIVE FULL ORAL COURSE IN PREVENTION OF POST ADENOTONSILLECTOMY MORBIDITY.

A prospective study.

THESIS SUBMITTED IN PART FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN EAR, NOSE AND THROAT-HEAD AND NECK SURGERY, UNIVERSITY OF NAIROBI 2009.

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DECLARATION.

This thesis is my original work and the study has not been presented for a degree in any other university.

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This thesis was supervised and has been submitted for examination with my approval.

Signed..... **Date**.....15/09/09.....

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DEDICATION.

I dedicate this book to my wife Everlyne and children Nduku Jennifer and Muendo Joseph. Their love has always been inspiring and gives me strength and encouragement to go on.

ACKNOWLEDGEMENT.

I would like to give my sincere appreciation to Prof. I.M. Macharia who gave immense input to the project and guided me through it. He was always available and accessible from the time the project was an idea to its completion.

I would also give thanks to the members of the E.N.T department for their co-operation and assistance during the study.

I also acknowledge my beloved mother who struggled to see me to the level I am.

At last I appreciate the guidance and help I have always received from God and his will that this study came to completion.

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ABSTRACT

INTRODUCTION:
Adenotonsillectomy is one of the commonest operations in otolaryngology. The postoperative morbidity includes pain, infection and reduced food intake that may result in dehydration. The morbidity of adenotonsillectomy has been shown to reduce when antibiotics are used in the postoperative period. Surgical prophylaxis has been shown to prevent postoperative infection and reduces the emergence of virulent microorganisms.

METHODOLOGY: A randomized clinical trial was done in Kenyatta National Hospital between 28/5/08 and 17/10/08 in which 126 patients under the age of 12 years undergoing adenotonsillectomy were recruited. 63 were given a single dose of intraoperative Co-Amoxiclav intravenously while the remaining 63 were given postoperative oral Co-Amoxiclav. All were, in addition given oral Paracetamol in the postoperative period. Analysis was done with regards to postoperative pain assessed using the visual analogue scale, fever and the diet tolerated in the postoperative period for seven days.

RESULTS: There was no statistical significance difference between the two groups with regards to postoperative pain, fever and diet tolerated. All had a P-value of > 0.2. Postoperative pain was highest in the first postoperative day and reduced progressively to the lowest level on the 7^{th} postoperative day. As pain reduced, more patients were able to tolerate a more solid diet with all but 6 tolerating a solid diet. 4 patients developed fever in the 1^{st} postoperative day, which did not progress to require further investigation or change of management. One patient had fever on the 4^{th} and 7^{th} postoperative day and was admitted in the pediatrics ward with a chest infection. All were in the group that was on oral postoperative Co-Amoxiclav.

CONCLUSION: A single intraoperative dose of Co-Amoxiclav given intravenously at induction is just as effective as a full oral course of the same given postoperatively in prevention of postoperative morbidity after adenotonsillectomy.

INTRODUCTION.

Tonsillectomy and adenoidectomy remain among the commonest surgeries done in Otolaryngology especially in the paediatric age group [1]. The rates of the surgeries are said to be the same over the last decade in Europe but the U.S.A has reported a decrease in the surgeries performed according to the National Centre for Health Stastics: National Hospital Discharge Survey, 1988[2]. In Kenyatta National Hospital, the number of surgeries done have increased significantly over the years when data from the study of the complications of tonsillectomy and adenoidectomy done by Masinde between 1987 and 1992 is compared with current medical records [3]. This could be due to an increase in the number of days that the operations are done though no study has been done to establish this.

The indications for tonsillectomy have remained controversial but one of the most widely accepted is recurrent tonsillitis. A major textbook of otolaryngology defines this as six genuine attacks of tonsillitis per year for two years consecutively [4]. Other indications include, peritonsillar abscess, sleep apnoea, upper airway obstruction and malignancy. Adenoidectomy is indicated in corpulmonale, sleep apnoea, otitis media with effusion and recurrent acute otitis media in a patient with adenoid hypertrophy [5].

Tonsillectomy and adenoidectomy are relatively safe procedures but the morbidity and mortality of the same should never be taken lightly. Haemorrhage, both intraoperatively and postoperatively is usually a concern to the surgeon [6]. Good surgical technique reduces the risk of hemorrhage which is more threatening when the patient is a child as the total blood volume is less. The estimated blood loss has been calculated to be between 100 and 130ml [4]. Trauma to the surrounding tissues can result in odynophagia with reduced food and fluid intake that can lead to dehydration, nasopharyngeal stenosis and velopharyngeal insufficiency. Sore throat, otalgia, fever and postoperative wound infection are possible complications. Other rare complications include atlantoaxial subluxation and condylar fractures [1].

Antibiotic use after tonsillectomy and adenotonsillectomy is just as controversial as are the indications of the operations. There is no agreed criterion for antibiotic use in patients in the postoperative period after tonsillectomy and adenoidectomy. Literature review reveals limited studies on the same. While the advantage of using antibiotics post-tonsillectomy period can't be disputed, some authors have raised the

question of a single intraoperative dose in the prevention of post-operative morbidity.

Amoxycillin has been shown to be of equal efficacy as more expensive and broader spectrum cephalosporins in preventing morbidity after tonsillectomy [7]. The practice in Kenyatta National Hospital is to give a five to seven day course of Amoxycillin for all patients who have undergone tonsillectomy, adenoidectomy or adenotonsillectomy. However, it has been shown that a single intraoperative dose of Amoxycillin is just as effective in preventing morbidity post tonsillectomy as a full course of the same given postoperatively orally [8].

BACKGROUND.

Antimicrobial resistance is a growing concern to surgeons worldwide [9,10]. The widespread and often inappropriate use of broad-spectrum antibiotics is responsible for development and spread of bacterial resistance [11]. Despite well-known concerns about bacterial resistance, inappropriate use of antibiotics still persists [12,13]. This is the main cause for the emergence of selection of virulent and resistance microbials.

Resistance is of importance as it results in prolonged morbidity in patients before it is noted. Change of the antibiotic usually to a superior one that is usually more expensive, adds the cost of management to the patients and their families. Further investigations like culture and sensitivity causes a delay in treatment not to mention added cost.

2.1 SURGICAL PROPHYLAXIS.

Prophylaxis is the administration of antibiotic agent prior to contamination of previously sterile tissues in an effort to reduce microbial burden of intraoperative contamination [14, 15]. This is important in preventing morbidity and mortality that would arise from infections arising from contamination by bacteria that colonise the operation site. Though there is a rise in the use of antibiotics for prophylaxis especially in western countries with 30%-50% of antibiotics being used for prophylaxis, it has been noted that even in these countries, there is inappropriate use of the same. Either the antibiotics are given at a wrong timing or given for unnecessarily long duration [16].
Operation wounds have been classified into groups according to their level of contamination and their likelihood to get infected.
The groups are; clean, clean contaminated, contaminated and dirty depending on their nature and the likelihood to getting infected [17].

Prophylaxis is recommended for operations that have a high risk of postoperative infection or for operations that have a low risk of infection but with serious consequences if it occurs [18].
Thus prophylaxis is recommended for,
1. All clean contaminated procedures. The Medical Letter recommends prophylaxis for head and neck operations in which the pharyngeal mucosa is breached.
2. Contaminated procedures.
3. Some clean procedures with a remote risk of infection but which have grave consequences if it does occur for example cochlear implants [14,17,18].
For dirty procedures, treatment rather than prophylaxis should be considered where a longer course of antibiotic should be used [19].

The table below shows the different categories of surgical procedures with the risk to getting infected.

CATEGORY	CRITERIA	RISK OF INFECTION %
Clean	Elective, non traumatic, primarily closed, no acute inflammation, No break in technique, respiratory, gastrointestinal, billiary and Genitourinary tract not penetrated.	<2
Clean contaminated.	Urgent or emergency operation that is otherwise clean, elective, opening of the respiratory, gastrointestinal, billiary, oropharynx and genitourinary tracts opened with minimal spillage.	<10
Contaminated.	Major break in technique, major spill from the gastrointestinal or infected bile or urine, penetrating wound <4hrs.	~20
Dirty.	Purulent inflammation, preoperative penetration of the respiratory, gastrointestinal or genitourinary, penetrating wound >4hrs.	~40

2.2 PRINCIPLES THAT GOVERN PROPHYLAXIS.

1. The antibiotic selected should be able to cover for the most likely microorganism that would cause infection. The prophylactic agent should not cover all the organisms that could cause infection but only the most likely one to cause infection. This reduces the risk of selection of virulent microorganisms [14].

2. For effective antimicrobial prophylaxis, adequate concentrations of the drug must be in the tissues at the onset and throughout the operative procedure [20]. The antibiotic should be give intravenously 30 minutes before tissues are incised so as to ensure maximum concentration at the operation site for best efficacy [17]. Other studies have recommended a bolus intravenous dose of the prophylactic antibiotic at induction [14]. For longer procedures, readministration of the antibiotic is recommended at intervals one or two times the half-life of the agent. It is accepted that if the duration of surgery is less than four hours, a single dose is sufficient [21]. The administered antibiotic reduces the amount of pathogenic inoculums at the wound site.

Only in colorectal surgery are oral antibiotics effective as prophylactic agents as they reduce colorectal bacterial inoculum rather than achieve high tissue concentrations prior to surgery [17].

3. Some authors recommend prolonged antibiotic use when drains and catheters are left in situ for long [22].

4. The antibiotic chosen should have minimal side effects [14].

5. The antibiotic chosen should be inexpensive and active against the likely pathogens [14].

6. The antibiotic should be less likely to cause selection of virulent microrganisms. This is avoided in the choice of antibiotics that have a narrow spectrum. This also offers the advantage of reserving the broad-spectrum antibiotics for severe infections should they arise [14, 17].

7. Choice of antibiotic with consideration of the microbial resistance patterns of the health institution [14].

8. Avoid agents that are likely to be used in case of severe sepsis. These are in most cases the more expensive broad-spectrum antibiotics [14,17,18,19].

The antibiotic mostly used for prophylaxis in Head and Neck procedures where the oropharyngeal mucosa is breached is Penicillin or Cephalosporin based agents [17]. Penicillin is just as effective as Cephalosporins despite being cheaper and with a narrower spectrum of activity. This is based on the fact that the common microrganisms in the oropharynx are Streptococcus pneumonia, Hemophillus influenza, Moraxella catarhallis and staphylococcus aureus [23].

Penicillin and Amoxycillin being cheap yet effective against most gram positive and aerobes are ideal in preventing postoperative infection

following oropharyngeal operations. For infection to develop after surgery, interplay between the virulence and amount of inoculum and the host resistance come into play. The factors that are associated with an increased risk of infection have been grouped into local and systemic factors. Some systemic factors are; diabetes, corticosteroids use, malnutrition etc. while some of the local ones are; diathermy as it devitalizes tissues and foreign bodies [17].

LITERATURE REVIEW.

Mutune did a prospective double blind placebo control in which half of the patients received Amoxycillin while the remaining received placebo. He looked at the incidence of fever, pain, duration taken to return to normal diet, slough in the tonsillar fossa and mouth odour in the postoperative period as indicators of the efficacy of Amoxycillin in prevention of morbidity in the postoperative period [1].

Antibiotic use after tonsillectomy or adenotonsillectomy had mixed results .It was confirmed that antibiotics hasten the return to normal activity. On average, patient in the placebo arm took 2.93 days while those in the antibiotic took 2.37 days. Similar observations were made with regards to pain with antibiotics reducing the pain duration by 0.3 of a day, which was statistically significant. The incidence of fever was reduced by antibiotics 32.8% of patients in the placebo arm developed fever compared to 14.4% in the antibiotic arm. Clarification about the time of onset of fever was however not given. V.T.Anand et al. in his study on postoperative fever post tonsillectomy concluded that postoperative fever in the first 24 hours was due to tissue response to surgical trauma rather than infection [24]. April et al. observed that Dexamethasone reduced the incidence of fever post tonsillectomy concluding that fever in the first 24 hours was reactionary rather than infective [25]. There were no differences observed between the two groups in Mutune's study with regards to slough, return to normal diet and mouth odour.

Colreavy M.P et al did a study in which they compared Amoxycillin and Clavulinic acid, a beta lactamase active antibiotic with patients not given antibiotics post operatively after tonsillectomy. They also did cultures of the tonsillar core, surface and fossae post tonsillectomy. Antibiotic use was found to be useful in reducing morbidity postoperatively as judged

by the amount of analgesics used (P=0.379), time to resume normal diet (P=0.0072) and visual analogue scale (P=0.0006). They found that 64%of microorganisms were Hemophilus influenza, 9.4% of which were beta lactamase producers. Streptococcus viridans (55.9%) and Staphylococcus aureas (37%); 86% of these were beta lactamase producers. This is important because this renders lactamase susceptible antibiotics ineffective [26]. This study highlights the need for use of antibiotics that are effective against microbials that produce beta lactam. The study didn't look at the effect of antibiotic on fever, which is a better indicator of postoperative infection.

Fennessy B.G et al did a study on antimicrobial prophylaxis in otolaryngology/head and neck surgery [8]. The authors did literature review through Pubmed in an attempt to identify the level of evidence for or against the use of prophylaxis for various ear, nose and throat surgeries. Accordingly the strength of the studies was categorized as level 1 for well conducted randomized control trials or cohort studies, level 2 for case controlled or uncontrolled studies or where conflicting evidence tended to favors the recommendation and level 3 based on expert opinion. They noted that there was level 1evidence that confirmed superiority of antimicrobial agents over placebo in prophylaxis in ear, nose and throat surgeries where oral or pharyngeal mucosa had been breached. Level 1 evidence also existed as antimicrobial prophylaxis reduced the incidence of fever, oropharyngeal pain, mouth odour and hastened return to normal activity after tonsillectomy.

A blind prospective study was then undertaken in which only the authors knew of the study and no directive was given on the prescribing of antimicrobial in any procedure. Prescribing was in all cases done by senior doctors. The American Society of Health Systems-Pharmacist guidelines were used to assess the appropriateness of antimicrobial use in each instance.

51 patients were recruited into the study 34 of who received antimicrobial prophylactically. The timing antimicrobial was assessed; 20/34(59%) received dose at induction, 3/34(9%) received it intraoperatively and 11/34(32%) received it post operatively.17 of the procedures were tonsillectomy, 7 of whom received prophylaxis. Two received an intraoperative dose; one received a five day course of antimicrobial in addition. The remaining 5 received oral antimicrobial that commenced post operatively. All received Co-amoxyclavulinc acid except one who received Erythromycin due to allergy to Penicillin.

14 patients received prophylaxis at a time that was incompatible with ensuring good antimicrobial concentrations in tissues before incision.20 patients received the antimicrobial at induction, which was discussed to be the most appropriate time for administration in most busy centers due to inevitable patient and theater delays and the inability to predict the time for incision.

It was also noted that while the American Society of Health Systems-Pharmacist guidelines recommend Cephazolin+/-Metronidazole and Clindamycin +/- Gentamycin, Co-Amoxyclavulin acid gave good coverage of the aerobic and anaerobic microbials in the oropharynx.

This study highlighted the need for more resourceful and proficient understanding of antimicrobial prophylaxis by those who prescribe and administer prophylaxis.

In his prospective study of amoxycillin for prophylaxis after tonsillectomy, Averono G.et al. found Amoxycillin and Clavulinic acid given intravenously ten minutes before tonsillectomy to be of better efficacy than when given orally four doses, one twenty minutes before surgery. His study included fifty patients with chronic recurrent tonsillitis. Sixteen received 2.2 grammes of Amoxycillin-Clavulinic acid ten minutes before surgery while the remaining received the drug orally; three doses the day before surgery and one two hours before surgery. This confirms that the intravenous route is better for prophylaxis as has been elucidated as one of the principles of prophylaxis [27].

RESEARCH QUESTION.

Is a single dose of intravenous Co-Amoxiclav given at induction of better efficacy than a full course of the same given orally for five days postoperatively in reducing morbidity after adenotonsillectomy?

NULL HYPOTHESIS.

The efficacy of Co-Amoxiclav given as a single intravenous dose at induction is not better than a five days oral course of the same given post operatively in reducing post operative morbidity after adenotonsillectomy.

ALTERNATIVE HYPOTHESIS.

The efficacy of Co-Amoxiclav given as a single intravenous dose at induction is better than a five day oral course of the same given post operatively in reducing post operative morbidity after adenotonsillectomy.

JUSTIFICATION.

1.The results would provide literature on the form of antibiotic administration that is most effective in reducing postoperative morbidity after tonsillectomy and adenotonsillectomy. If the results favour single intravenous dose as it has in other publication, it would provide basis for change of policy that is more effective, cheaper and easier to administer. With patients in Kenyatta National Hospital being unable or straining to foot medical bills, it would mean a lot if a single dose could be used instead of a week's dose of the same.

2.The results of the study would help clinicians use the most appropriate route for the appropriate duration to prevent selection of virulent and resistant microrganisms. Unwarranted use of antibiotics will thus be avoided. A full course of antibiotic exposes the patients to antibiotic for a long duration, which is again in contradiction to the principles of prophylaxis as studies have shown that a longer duration of antibiotic doesn't have better efficacy than a single dose given intravenously 30 minutes before surgery commences. A full course of antibiotic also exposes the patient to toxicity and is more costly to the patient as opposed to a single intravenous dose.

3.Such a study is yet to be done in our country. This study would enlighten the medical fraternity on prophylaxis, which would have positive effect in terms of patient management and cost of management while offering the best outcome. If results favour the same as they have in other centres, change of management in our institution would be effected so as to ensure the most appropriate form of management with evidence deduced from results of the study. We will thus have scientific evidence from result of the study to support the form of management given to patients in our institution.

BROAD OBJECTIVE.

To compare effectiveness of intravenous and oral Co-Amoxiclav given as a single dose and for five days respectively in preventing postoperative morbidity after adenotonsillectomy.

SPECIFIC OBJECTIVES.

1.To establish postoperative morbidity after adenotonsillectomy.
2.To compare morbidity in patients given intravenous Co-Amoxiclav as a single dose with those given orally for five days.

METHODOLOGY.

Study design.

Randomised clinical trial.

Study area.

Kenyatta National Hospital ENT department and ward 5C.

Study population.

Patients below the age of twelve years were included in the study.

Inclusion criteria.

a. Patients below 12 years undergoing adenotonsillectomy.
b. Consenting parents or guardians of patients undergoing surgery.

Exclusion criteria.

a. Non-consenting parent or guardians of patients undergoing surgery.
b. Antibiotic use in the preceding week prior to admission.
c. Patients who develop complications that warranted change of antibiotic or required hospitalisation were excluded from the study eg. Poor reversal from general anaesthesia.
d. Patients with co-morbid conditions like malnutrition, anaemia, diabetes etc.
e. Patients who developed intraoperative complications that would affect postoperative period e.g. diathermy involving the constrictors as this is expected to result in increased postoperative pain.
f. Known allergies to Penicillin or Co-Amoxiclav.

Study duration.

28th May 2008 to 17th October 2008.

Sample size determination.

Sample size necessary to detect statistically significant difference between test and control groups in reduction of morbidity with Power of 80% and 5% significant level was calculated using the formula below by Cyrus R. Mehta [8].

$$2N = \frac{4(Z_\alpha + Z_\beta)^2 \sigma^2}{\delta^2}$$

2N=Total number of patients in both arms of the study.

Z_α =1.96 for type 1 error of 5%.

Z_β =0.842 for type 2 error 20%.

σ =Variance from other studies.

δ =Difference between test and control that is considered clinically significant.

From the calculations, a total number of 126 were required for the study; 63 in each arm.

PROCEDURE.

The patients were randomised into two groups, A and B using a table of numbers prior to commencement of the study. The numbers were sealed in envelops as they are randomises with each group having 63 patients.

Research numbers were then given to the patients consecutively from 1 to 126 once the study commenced. The principle researcher examined the patients and filled the details in a preoperative sheet [appendix 1].

Both the surgeon scheduled to perform the operation and anaesthetist reviewed patients preoperatively. Overnight admission was mandatory with starving of the patients six hours prior to surgery.

The patients were taken to the operating room the following day and Atropine was given half an hour before surgery to dry bronchial and oral secretions at a dose of 20 micrograms per kilogram [29].
Patients in group A received intravenous Co-Amoxiclav at induction at a dose of 25mg/kg [30]. These patients also receive Paracetamol suppositories 125mg for patients under 5 years and 250mg for those

above 5 years. This group only receive oral Paracetamol in the postoperative period at a dose of 10mg/kg [31].
Those in group B received intraoperative Paracetamol suppositories and postoperatively like those in group A. They however receive oral Co-Amoxiclav for 5 days in the postoperative period at a dose of 25mg/kg expressed as Amoxycillin [30]. No intraoperative Co-Amoxiclav was given to patients in this group.

Tonsillectomy was done by blunt dissection while adenoidectomy by curettage. Diathermy or pressure packing achieved haemostasis. Documentation was done appropriately in forms that were made available in theatre [appendix 2].

The patients were discharged the day following surgery. Any complication in the general condition that arose was investigated and appropriate management given.
Patients, guardians or parents were advised to look out for haemorrhage, postoperative fever, severe odynophagia and vomiting in the postoperative period. They were advised to present themselves to hospital immediately for review in case there were changes in their general condition that warranted concern. The principal researcher gave his mobile phone number to all those in the study and flash back services was used in case any information requirement arose.
The principal researcher reviewed the patients after surgery in the ward on the 1st, 4th and 7th postoperative days in the Ear Nose and Throat clinic.

Outcomes.
Comparison between the two groups was done with special emphasis on,
1. Postoperative pain was assessed using a visual analogue scale (appendix 3). The parents or guardians would be shown the scale and explained to on how it is used. They would then be asked to estimate the amount of pain they thought their patients were experiencing and indicate the same on a scale of 1 to 10.
2. Fever, which was defined by a temperature reading that is more than 37.2 degree on Celsius scale taken by thermometer on the axilla. A thermometer was placed in the axilla of the patient till it made an alert sound indicating that the maximum temperature had been reached.
3. Return to normal diet was assessed by the duration of time taken for the patient to start taking his usual diet after surgery. A progressive assessment was done with regards on the diet consistency the patients were tolerating.

The patients were reviewed on days 1, 4 and 7 and the above three outcomes recorded.

DATA ANALYSIS AND PRESENTATION.

Data was analysed using the SPSS computer programme. The independent Student T test was used to compare data from the two groups with calculation of the t value for each of variables. This was subsequently used to calculate the Probability value, which would then determine significance. The help of a statistician and supervisor were sought in cases of difficulties.
Text, Bar graphs, line graphs, tables and pie charts were used to present the results from the study.

ETHICAL CONSIDERATIONS.

The study commenced after approval by The Ethical and Research Committee of Kenyatta National Hospital. It was made clear that participation in the study was purely voluntary. Assurance was given that no mismanagement would result if parents or guardian declined to consent to the study. No extra cost was incurred because of the study and confidentiality was assured. Names and phone numbers were used only for the purposes of follow up if need arose. It was made clear that the results of the study would be published for perusal by the medical fraternity for improvement of health care provision to patients who have undergone adenotonsillectomy. Consent information was given and clearly explained to the parents or guardians. If in agreement with the terms of the research, a written consent was taken by the researcher.

RESULTS.

DROP OUT.

A total of 141 patients were recruited into the study during the study period. There was a drop out of 10.6% as 15 patients were excluded from the study due to various reasons. The remaining 126 patients, 63 in each group were analysed.

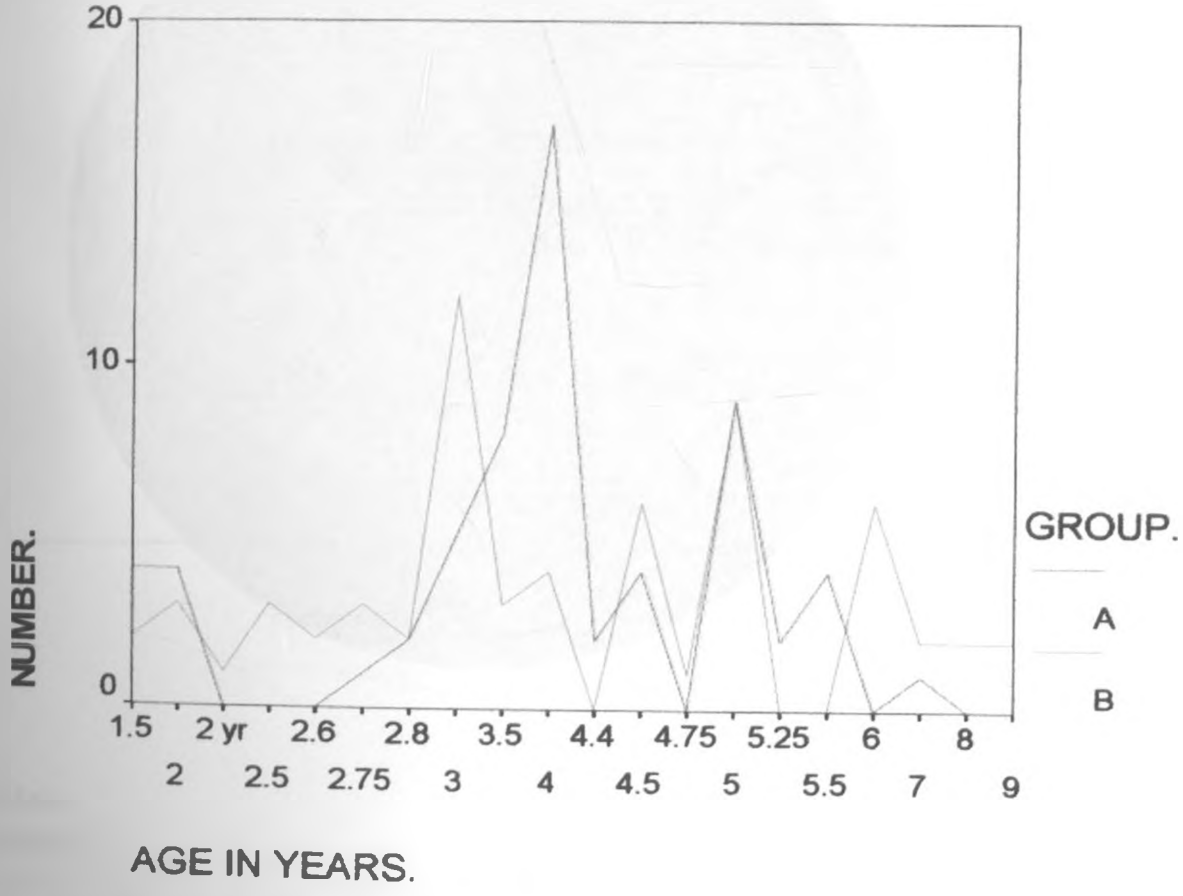
REASON FOR DROP OUT.	NUMBER.
1.Loss to follow up.	8.
2.Wrong medication.	5.
3.Wrong mode of administration.	2.
Total.	15.

5 patients were given postoperative Amoxycillin instead of Co-Amoxiclav.
2 patients who belonged to group A were erroneously prescribed for postoperative oral Co-Amoxiclav while 8 patients failed to turn up for review.

AGE.

All the patients recruited into the study were below the age of twelve years.
Below is a table representing the age stratification of each of the groups.

	GROUP A	GROUP B	BOTH GROUPS
Minimum age	1.5 years	1.5 years.	1.5 years.
Maximum age	7 years.	9 years.	9 years.
Mean	4 years.	4 years.	4 years.

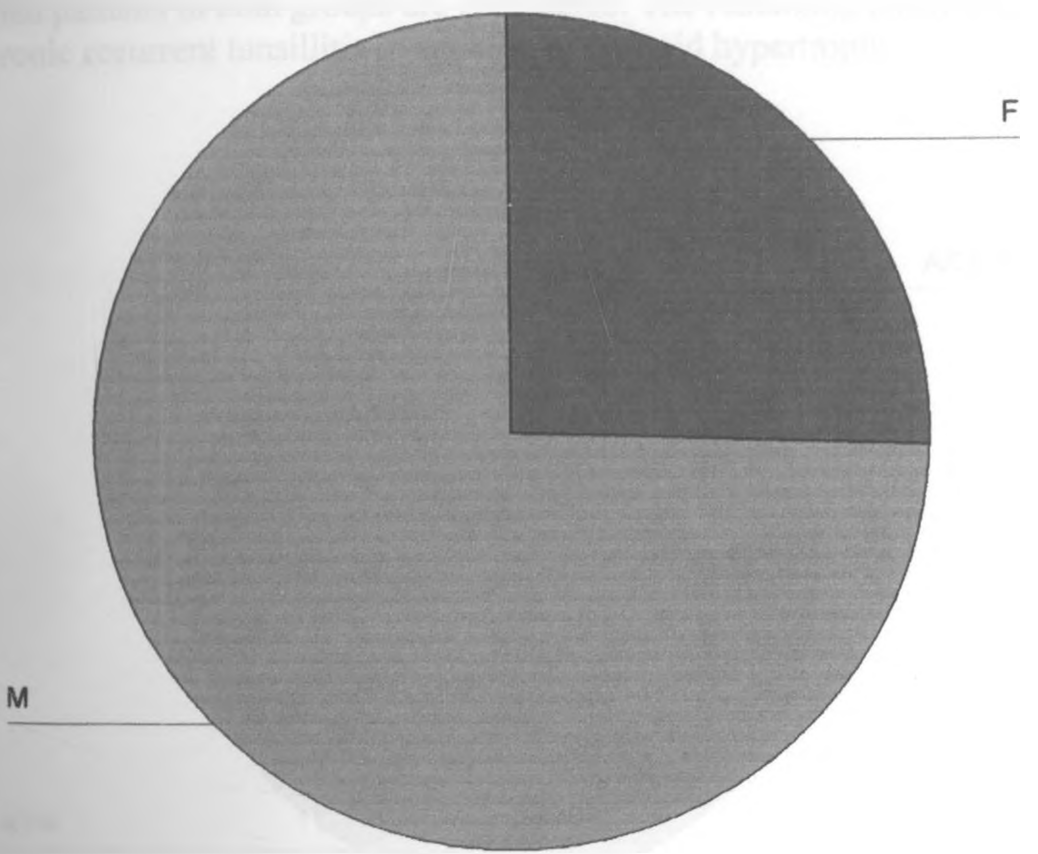


Line graph showing age distribution

SEX.

More males were recruited into the study than females in both groups. The table below represents the sex ratios in both the groups that were studied. Males formed 57% of the total number of patients in group A and 74% in group B. Overall; males formed 65% of patients in the study.

SEX	GROUP A	GROUP B
Male	36	47
Female	27	16
TOTAL	63	63



M=Male.
F=Female.

Pie chart showing overall sex distribution.

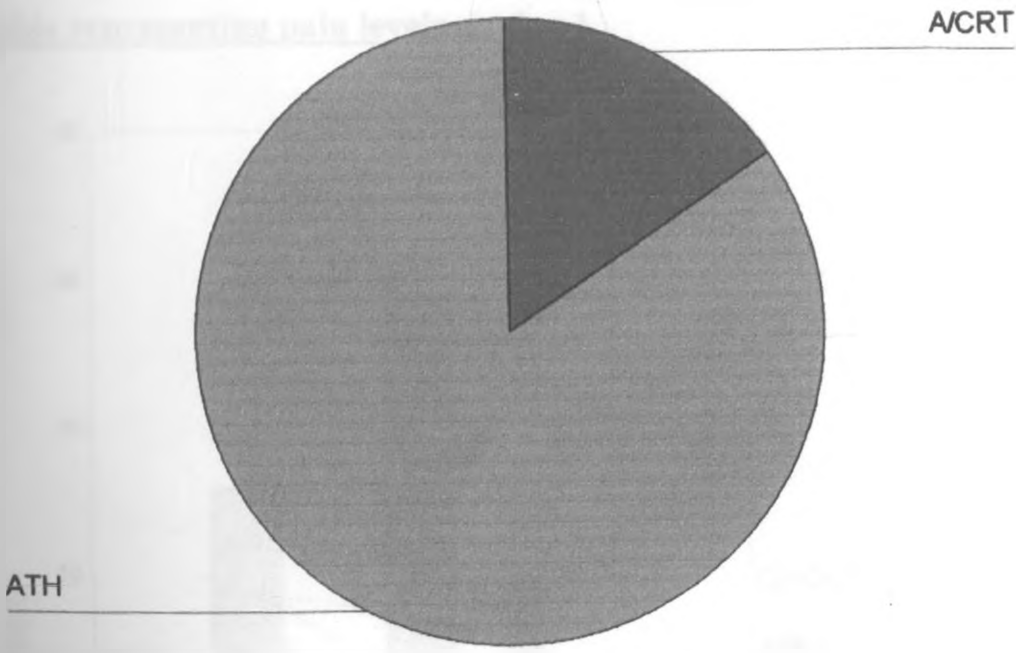
INDICATION FOR SURGERY.

The indication for surgery fell into two main groups. One group had obstructive symptoms due to hypertrophy of pharyngeal and palatine

tonsils. The other group had in addition chronic recurrent tonsillitis. Majority of the patients fell in the first group as can be seen in the table below.

	GROUP A	GROUP B	BOTH GROUPS
ATH	50	53	103
AH+CRT	13	10	23
TOTAL	63	63	126

Adenotonsillar hypertrophy formed 79% and 84% in group A and B respectively. Overall, 81% of patients had adenotonsillar hypertrophy when patients in both groups are considered. The remaining patients had chronic recurrent tonsillitis in addition to adenoid hypertrophy.



ATH=Adenotonsillar hypertrophy.
A/CRT=Adenoid hypertrophy and chronic recurrent tonsillitis.

Pie chart representing diagnosis.

ANALYSIS OF PAIN.

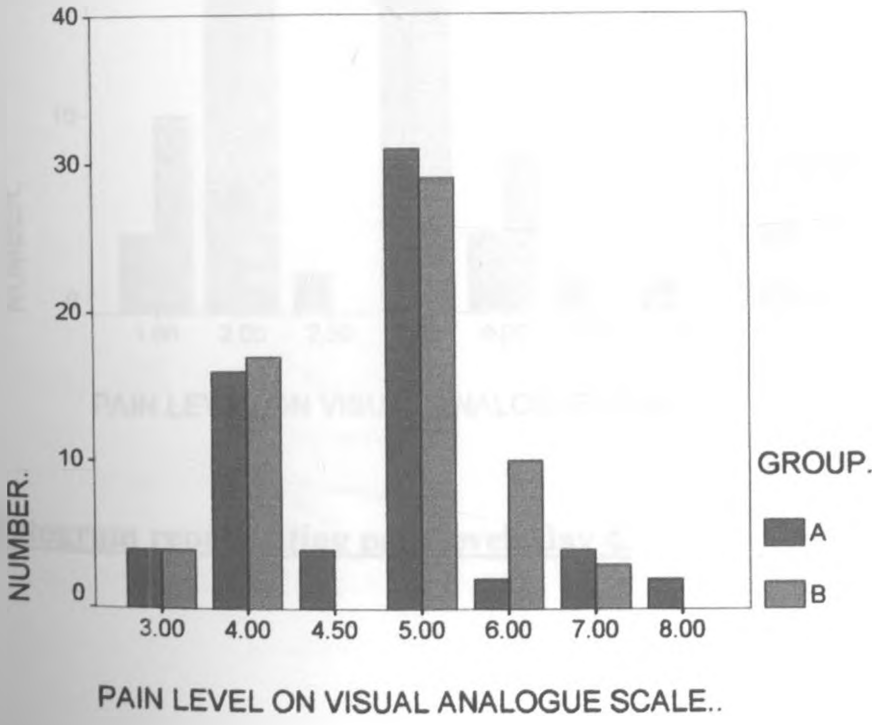
The visual analogue scale was used to evaluate pain the patients were experiencing postoperative at day 1,4 and 7.

Patients in both groups reported a high score in the first postoperative day with reduction of the same with all reporting lowest levels at day 7.

DAY 1.

	GROUP A	GROUP B	BOTH GROUPS
Minimum	3	3	3
Maximum	8	7	8
Range	5	4	5
Median	5	5	5
Mode	5	5	5
Mean	4.8413	4.8571	4.8492

Table representing pain levels on day 1.

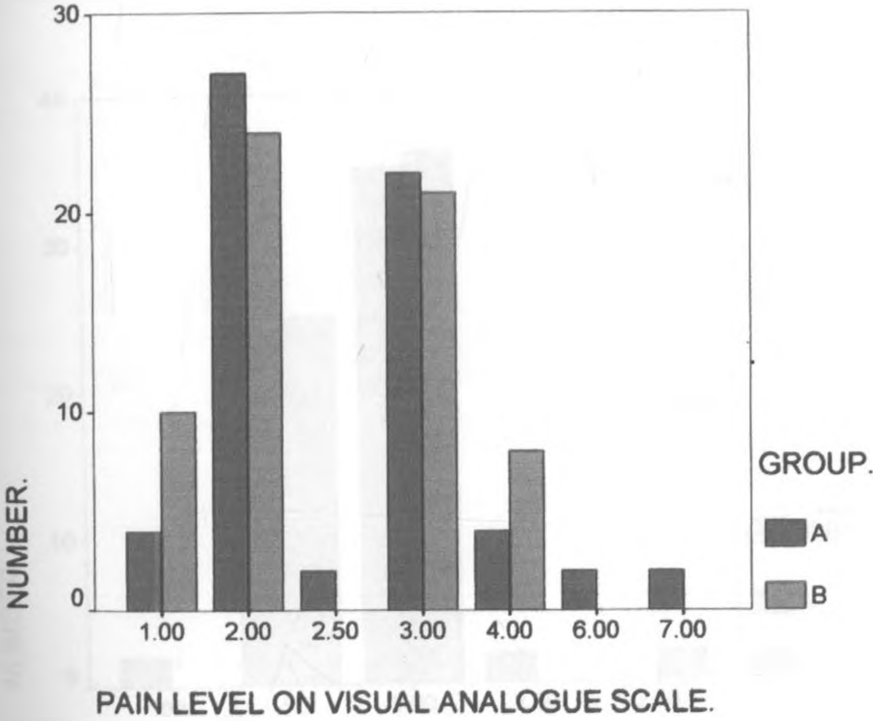


Histogram representing pain levels day 1.

DAY 4.

	GROUP A	GROUP B	BOTH GROUPS
Minimum	1	1	1
Maximum	7	4	7
Range	6	3	6
Median	2.5	2.0	2.0
Mode	2	2	2
Mean	2.7143	2.4286	2.5714

Table representing pain levels on day 4.

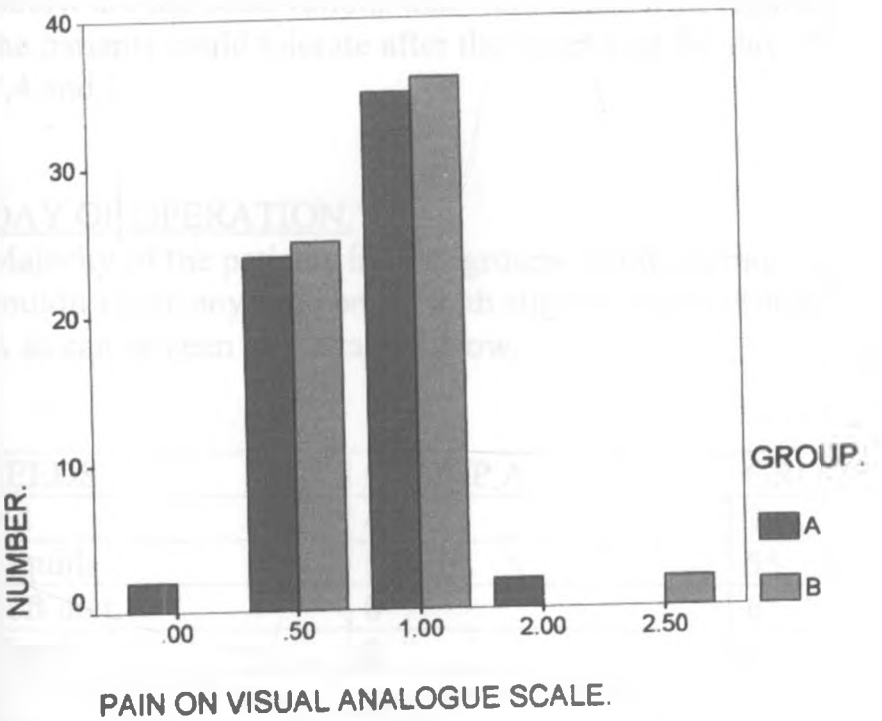


Histogram representing pain levels day 4.

DAY 7.

	GROUP A	GROUP B	BOTH GROUPS
Minimum	0	0.5	0
Maximum	2	2.5	2.5
Range	2	2	2.5
Median	1	1	1
Mode	1	1	1
Mean	0.8095	0.8492	0.8294

Table representing pain levels on day 7.



Histogram representing pain levels day 7.

Comparison between the two groups was made using the Students T test [independent sample test] at day 1,4 and 7 giving the results below.

DAY	T VALUE	df	P VALUE	SIGNIFICANCE
1	-0.090	124	P>0.2	Nil
4	1.489	124	P>0.1	Nil
7	-0.601	124	P>0.2	Nil

In all the days analysed, thresholds required to reject the null hypothesis were not reached. Thus, with regards to pain, there was no demonstrable difference between a single dose of intravenous Co-Amoxiclav given at induction and a full oral postoperative course of the same.

DIET.

The diet that the patients could take was assessed at day 0,1,4 and 7. Generally it was noted that as the days passed after the surgery, the patients could tolerate more solid feeds as is expected.

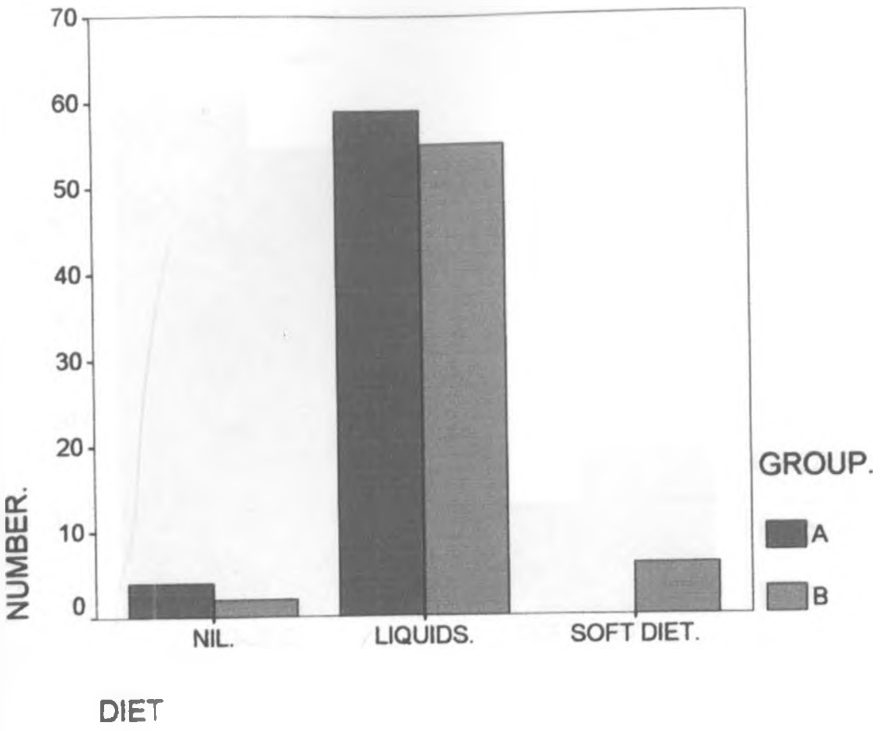
Below are the observations that were made with regards to the diet that the patients could tolerate after the surgery at the day of operation, day 1,4 and 7.

DAY OF OPERATION.

Majority of the patients in both groups could tolerate liquids. Only a few couldn't take anything orally with slightly more of these being in Group A as can be seen in the table below.

FEEDS	GROUP A	GROUP B
Nil	4	2
Liquids	59	55
Soft diet.	0	6
Usual	0	0

Table representing diet on the operation day.



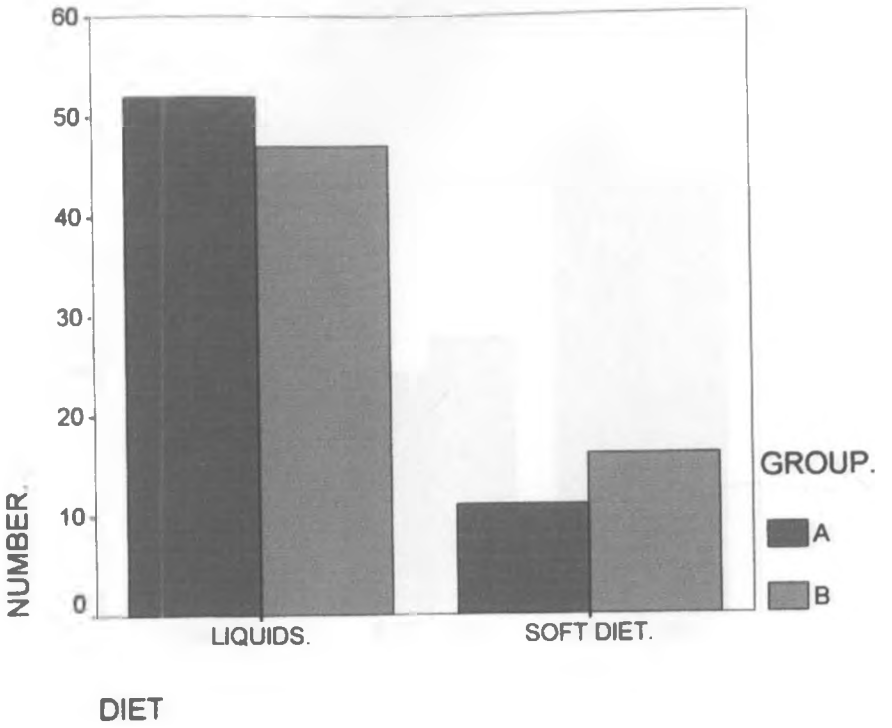
Histogram representing diet on the operation day.

DAY 1.

At day 1, all the patients in both groups could take feeds orally but slightly more patients in group B could tolerate semisolids. No patients in either group could take their usual diet.

FEEDS	GROUP A	GROUP B
Nil	0	0
Liquids	53	47
Soft diet.	10	16
Usual	0	0

Table representing diet on day 1.



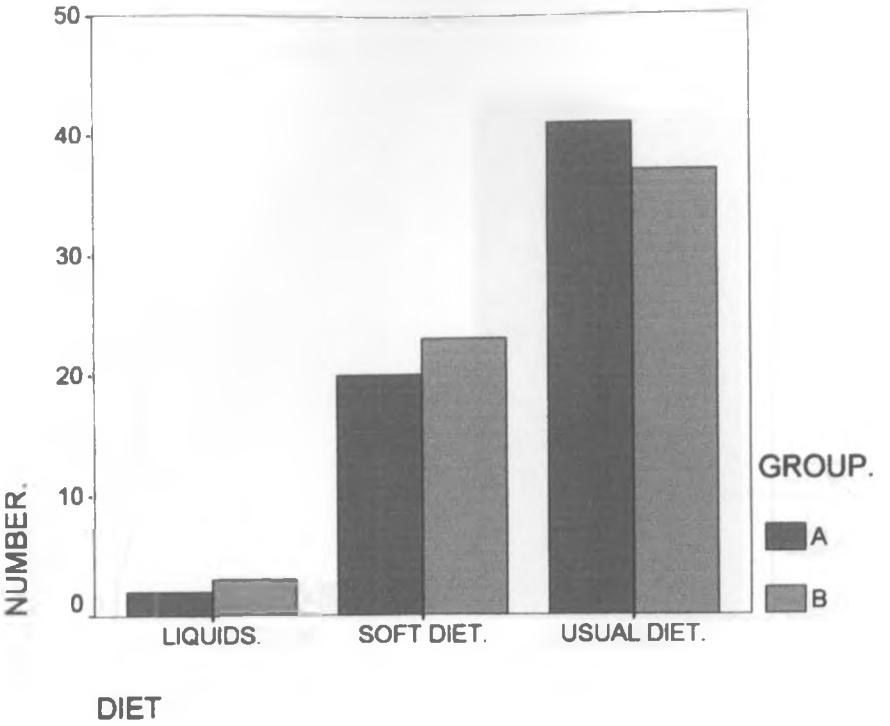
Histogram representing diet on day 1.

DAY 4.

At day 4, most of the patients in both groups could tolerate their usual diet. Over 60% in both groups could tolerate their usual diet. Only few were still on liquid feeds at this time.

FEEDS	GROUP A	GROUP B
Nil	0	0
Liquids	2	3
Soft diet.	20	23
Usual	41	40

Table representing diet on day 4.



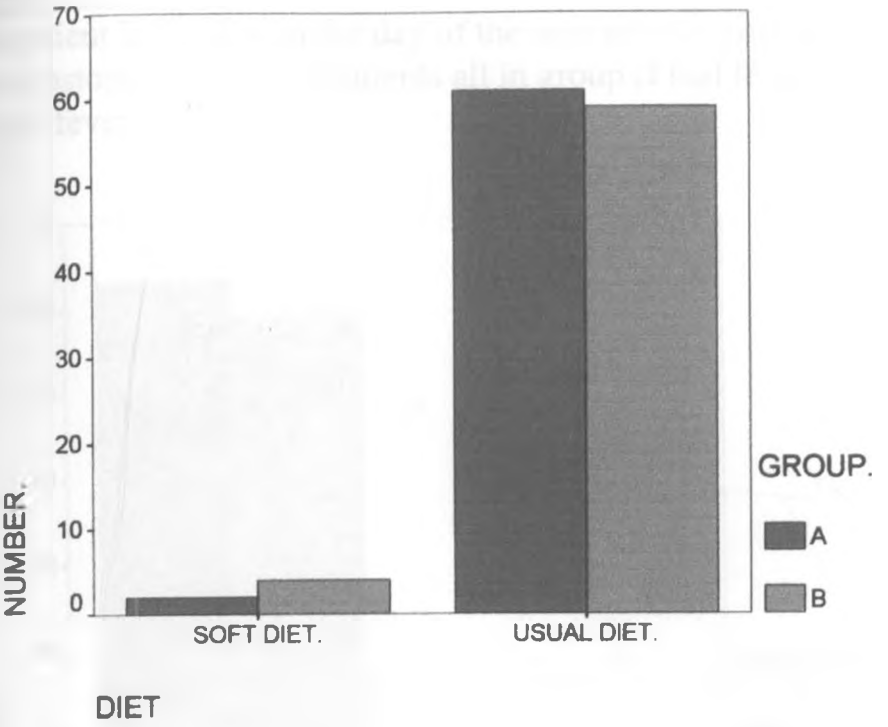
Histogram representing diet on day 4.

DAY 7.

At this time almost all the patients could take their usual diet with only a few who were still on semisolid diet.

FEEDS	GROUP A	GROUP B
Nil	0	0
Liquids	0	0
Semisolids	2	4
Usual	61	59

Table representing diet day 7



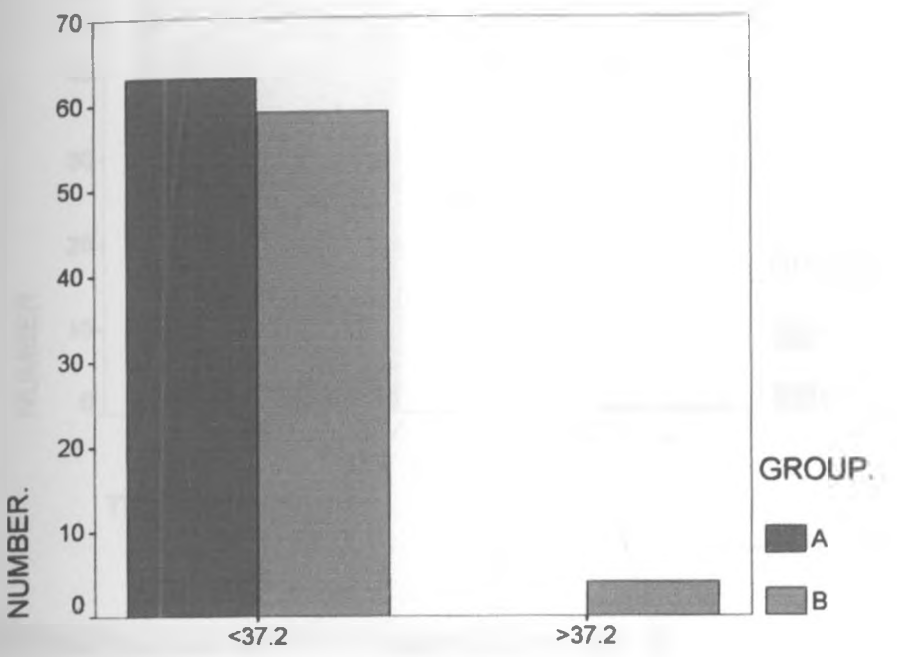
Histogram representing diet day 7

The Students T test [independent sample test] was used to compare the groups with regards to feeds on subsequent days. The two groups were not found to have any statistical difference with regard to feeds on all the days that were analysed. Thus there was no demonstrable difference between a single intravenous dose of Co-Amoxiclav given at induction and a full oral postoperative course of the same with regards to resumption to usual diet after operation. The table below represents the finding of the analysis.

DAY	T VALUE	df	P VALUE	SIGNIFICANCE
0	-2.341	124	P>0.2	Nil
1	-1.082	124	P>0.2	Nil
4	0.779	124	P>0.2	Nil
7	0.832	124	P>0.2	Nil

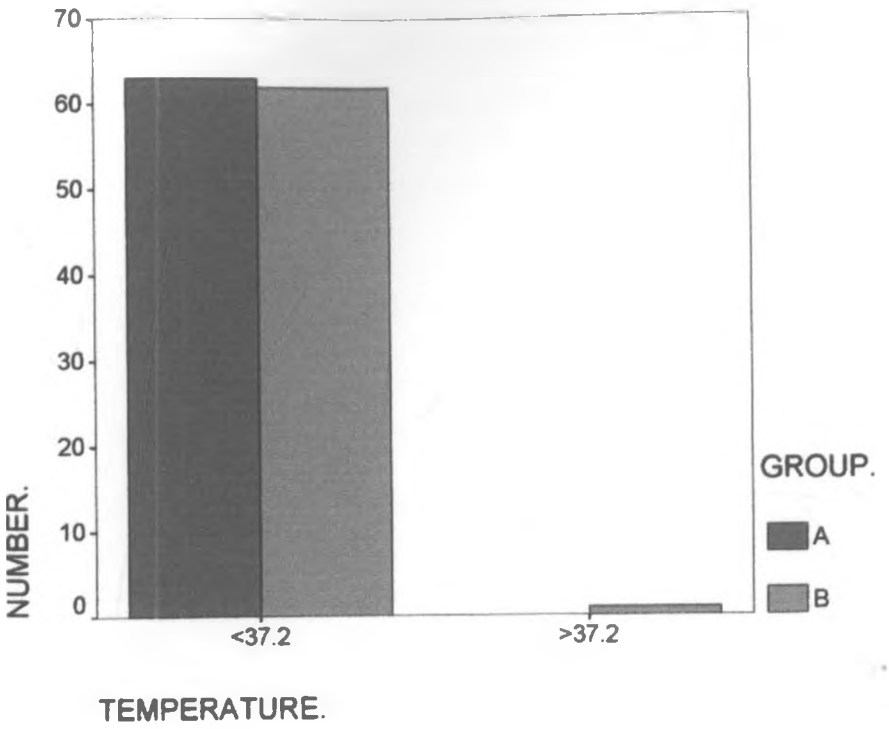
TEMPERATURE.

No patient had fever on the day of the operation in both groups. On the first postoperative day 4 patients all in group B had fever. None in group A had fever.



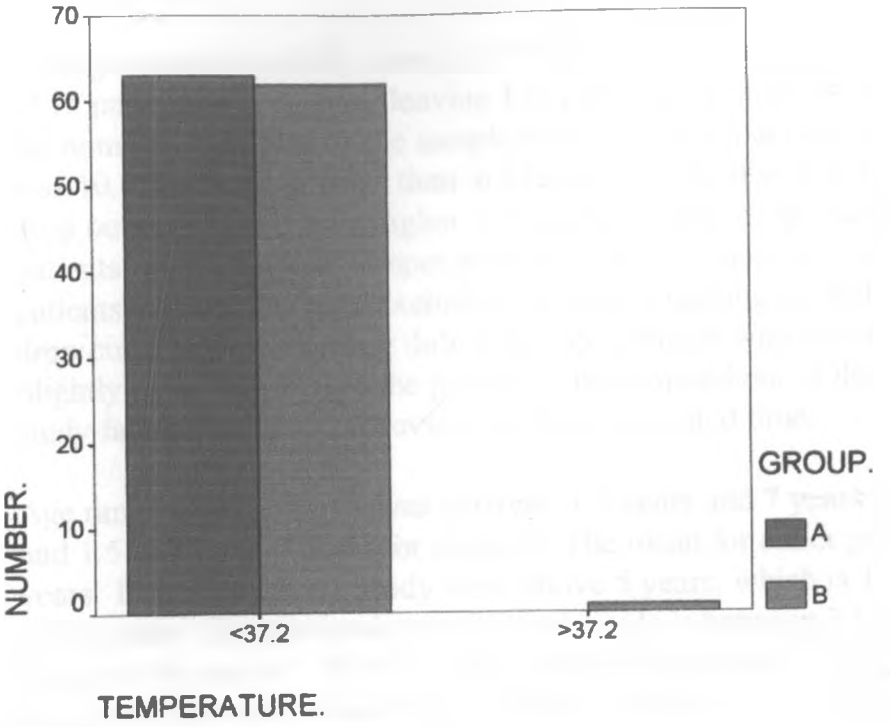
Histogram representing temperature day 1.

On the 4th postoperative day, only 1 patient in group B had fever. This patient was not among those who had fever on the 1st postoperative day. No patient in group A had fever.



Histogram representing temperature day 4.

On the 7th postoperative day the same patient who had presented with fever on the 4th postoperative day had fever. This patient was admitted in the paediatric ward the following day with a chest infection. He had taken Co-Amoxiclav and Paracetamol for five days as had been instructed.



Histogram representing temperature day 7.

Analysis of the two groups with regards to temperature was made with the Students T test [independent sample test] and the tabulation below represents the findings.

DAY	T VALUE	df	P VALUE	SIGNIFICANCE
1	-2.050	124	P>0.2	Nil
4	-1.000	124	P>0.2	Nil
7	-1.000	124	P>0.2	Nil

It can thus be deduced that there is no difference between a single intravenous dose of Co-Amoxiclav given at induction and a full oral postoperative course of the same in prevention of postoperative infection.

DISCUSSION.

During the study period, a total of 141 patients were recruited. A drop out of 15 patients was realised leaving 126 patients for analysis which was the number calculated as the sample size. The drop out rate in the study was 10.6%, which is lower than in Mutune's study that was 18%. The drop out could have been higher in Mutune's study as he excluded patients who developed temperature more than 38 degrees Celsius. 13 patients in his study were excluded due to this making the bulk of the drop out. The current study didn't exclude patients who developed fever. Slightly more than half of the patients who dropped out of the current study failed to turn up for review on their appointed time.

Age range of the patients was between 1.5 years and 7 years for group A and 1.5 years and 9 years for group B. The mean for either group was 4 years. 17 patients in the study were above 5 years, which is 13.5% of all in the study. The maximal growth of adenoids is between 3 to 5 years, which is the age of 86.5% of the patients in the study [32]. The , adenotonsillar tissues decrease in growth at the age of 5 with eventual involution after puberty. There is an increase in the size of the nasopharynx after 5 years bringing about relief of airway obstruction. As adenotonsillar disease was considered together, most of the patients were below the age of 5 as expected. Those who were above this age could have been experiencing obstructive symptoms due to tonsillar hypertrophy alone. The study didn't consider the intraoperative findings of the sizes of the tonsils and adenoids and the degree of airway obstruction by either. It is also possible patients with adenotonsillar hypertrophy may have relative reduction of the sizes of adenotonsillar tissue with time due to a long waiting time for surgery. This was also not considered and may account for the patients operated who are above the expected age.

Fever in the postoperative period could be due to infection or as a response to tissue injury. Both conditions give rise to pyrogenic cytokines that cause production of Prostaglandin E 2 with resetting of the hypothalamic thermal setpoint. Interleukin 2 has been identified as an important intracellular messenger in the development of fever whether due to trauma or infection [33].

Fever that develops during the first two days postoperatively is usually regarded to be due to the body's response to trauma while that which

develops later is likely to have an infective pathophysiology. 4 patients developed fever in the first postoperative day, which by the second day had resolved. All belonged to group B and were on oral Co-Amoxiclav and Paracetamol. All had low-grade fever as none had temperature more than 38 degrees Celsius. They formed 3.1% of all the patients in the study compared to 54% in V.T Anand's study of postoperative fever in paediatrics after tonsillectomy [24]. In the later study, temperature was monitored 2 hourly after surgery in the first 24 hours while it was monitored 4 hourly in the latter study with documentation starting the day after surgery. This could mean that some patients might have had developed fever but not captured as monitoring in the first 24 hours was not done comprehensively. It was also not considered whether Dexamethasone was or not given during the surgery as this could suppress the inflammatory response in the first 24 hours which has been shown to give rise to fever in this period as some anaesthesiologists routinely give the drug at induction.
The effect of Paracetamol should also be taken into account due to its antipyretic activity. It was not considered whether the antipyretic was given before or after the temperatures were taken.
Only 1 patient had fever at day 4 and 7. He belonged to group B and was on oral Co-Amoxiclav and Paracetamol and didn't have fever at day 1. He was admitted in the paediatric ward and treated for pneumonia with intravenous drugs and discharged 5 days later. More patients in Mutune's study developed fever as compared to the current study; 25.9% vs. 3.9% respectively. Beta lactamase producing microrganisms have been reported to be as high as 86% of streptococci and staphylococci and 9.4% of Hemophillus influenza. As half of the patients in Mutune's study who developed fever were on Amoxycillin, poor coverage of beta lactamase producers by the antibiotic might have gave rise to a higher incidence of infection and thus fever.
Analysis of Co-Amoxiclav given as a single dose at induction and the same given orally postoperatively show no difference in their ability to prevent postoperative infection, which presents clinically as fever.

Pain in the postoperative period result from trauma to the surrounding tissues during surgery, diathermy or ligation especially if the constrictors are involved. Infection gives rise to inflammation, which causes increase in pain being experienced by a patient. Pain in the first two postoperative days is due to trauma to the surrounding tissues while an increase in pain at a later day may be a pointer to infection. Pain may restrict feeds and fluids intake that may result in dehydration. In the study, pain was noted to be highest in the first postoperative day and least on the 7th. It is expected that in the absence of infection, pain should decrease with

progressive healing of the tissues. With progressive healing, the patients are able to tolerate more solid feeds as the discomfort in the oropharynx reduces. The patients in the study had reduction of pain in subsequent days with the minimum in the 7th day. It is difficult to compare the findings with Mutune's who reported that 52% of patients who had undergone adenotonsillectomy had pain in the 7th postoperative day as pain was not quantified by a visual analogue scale.

Mutune found that it took 2.9 and 2.7 days for patients in the placebo and antibiotic group to be able to take soft diet. In the current study, only 2 patients in group A and 3 in group B were not taking soft diet by day 4; the rest were on soft or usual diet. It is however not possible to establish if the patients could have been able to tolerate soft diet at an earlier date as review was done at day 1and 4.

The patient who developed a chest infection on the 4th postoperative day was on soft feeds on the said day and 7th day. He was not able to take his usual diet on the 7th day. He didn't have infection in the tonsillar region and the inability to take his usual diet could have been a misinterpretation of anorexia, which is an attendant of chest infection.

Comparison between those patients who had diathermy with those who didn't showed no statistical significance. In all those where diathermy was used, the constrictors were not involved. Studies have shown increased pain after diathermy or ligation when the constrictors are involved.

Analysis of the two groups with regards to postoperative pain and diet showed no statistical significance. This means that a single dose of Co-Amoxicav given at induction is just as effective as a full oral coarse of the same given postoperative period with regards to pain and diet, which in effect reflects on healing.

CONCLUSION AND RECOMMENDATIONS.

1.From the study's results and their analysis, a single intraoperative dose of Co-Amoxiclav given at induction is just as effective as full oral postoperative course of the same in prevention of post adenotonsillectomy morbidity.

The fore mentioned medication is cheaper as it is given once and compliance is assured. Emergence of resistant and virulent microorganisms is prevented by this prophylactic medication, as compliance in patients post adenotonsillectomy is not assured due to pain.

Oral Co-Amoxiclav requires refrigeration once reconstituted so as to ensure potency. As refrigeration might not be available in some of the homes of the patients, a single dose at induction circumvents the predicament.

A prophylactic single dose of Co-Amoxiclav given at induction is thus recommended.

2.The practice in Kenyatta National Hospital is not standardised with regards to medication of adenotonsillectomy patients. Some anaesthesiologists give an intraoperative dose of intravenous antibiotic while others don't. With results from study, a single intraoperative prophylactic dose should be adapted as the practice in the institution.

3.Majority of the patients who have undergone adenotonsillectomy in Kenyatta National Hospital receive oral Paracetamol and Amoxycillin in the postoperative period. A rise in micro organism resistant to the antibiotic has been noted to be on the increase. A study on the resistance patterns in the institution with regard to adenotonsillectomy needs to be done.

4.A study of the effects of Dexamethasone on postoperative fever and pain should be done to add to the results of the current study.

DIFFICULTIES ENCOUNTERED.

1.Follow up in the postoperative period was difficult as it is in prospective studies. Some patients failed to turn up for review on the appointed days.

2.Quantification of pain was subjective but use of the visual analogue scale was helpful in standardizing the information in the study.

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APPENDIX 1

PRE-OPERATIVE PROFILE.

Name. ..... Study Number.....
Age..... Group; A...../B.....
District..... Sex.....

Presenting complains.	**Yes**	**No**	**Duration of symptoms.[months]**
Snoring.			
Mouth breathing.			
Nasal blockade.			
Reduces hearing.			
Recurrent sore throat.			

Clinical examination:

Body weight.....Kgs. Temperature.....

General condition; Good...Fair...Sick.....[tick where appropriate].

Throat; Tonsils grade; Inflammation;

1	2	3	4

Yes	No

Nose; Hypertrophy of inferior turbinate.

Yes	No

Ears; Tympanic membrane. Otorrhoea;

Perforated	Intact

Yes	No

Otitis media with effusion;

Yes	No

Other findings.....

Indication for surgery.....

Laboratory investigations.

Urea and electrolytes; Full hemogram;

Normal	Abnormal

Normal	Abnormal

APPENDIX 2.

OPERATIVE DETAILS.

Name.....

Date.....

Weight.....

Research number.....

Sex.....

Age..... Group; A.... / B...[tick]

Diagnosis..... Operation.....

Drugs; 1.Atropine.....mg
2.Paracetamol suppositories.....mg
3.Intravenous Co-Amoxiclav.....mg

Diathermy	Packing

Haemostasis achievement

Diathermy points...[nasopharynx...]

[Tonsillar fossa; right.../left.....]

Constrictors involved...yes/...no.

Complications.....
.....
.....

APPENDIX 3.

POST OPERATIVE PROFILE.

Name..... Date.....

Study No.....

1.POST OPERATIVE PAIN.

Visual Analogue Scale.

Please indicate the severity of the pain your child is experiencing today according to your judgement.

No pain. Very severe pain.

Day 1

Day 4.

Day 7.

2.TEMPERATURE.

Day.	D0	D1	D4	D7
Temperature.				

3.DIETARY INTAKE.

Consistency.	D0	D1	D4	D7
None.				
Liquids.				
Soft diet.				
Usual diet.				

MODE OF TREATMENT.

A.	
B.	

APPENDIX 4.

CONSENT EXPLANATION.

This is a study that looks at the effects of antibiotics that are used perioperatively with regards to tonsillectomy and adenotonsillectomy. The results of the study will enable health workers have a better understanding that will enable better management of patients scheduled for the surgeries in question.

The operation will be done under general anaesthesia in the E.N.T minor theatre and in the standard technique that has been confirmed to result in good outcome. The complications expected are bleeding, post operative pain and infection. These will be taken care of both during the operation and postoperatively by ensuring good surgical technique and use of drugs.

Participation in the study is on a voluntary base and no monetary remunerations will be awarded. Declining to participate will also not result in improper attention of the patient. No added cost will result from participation in the study.

MAELEZO YA IDHINI.

Utafiti huu unatarajia kuangazia matumizi ya dawa baada ya upasuaji wa tonsillectomy au adenotonsillectomy. Matokeo ya utafiti utawawezesha wauguzi kuwauguza wagonjwa waliotajwa hapo awali vima.

Upasuaji wenyewe utafanywa baada ya nusu kaputi itakayo pewa wagonjwa huko katika chumba cha upasuaji cha E.N.T.Utaratibu uliokubalika utatumika ili kupata matokeo bora.Vikwazo vinovyotarajiwa ni kama vile kutokwa na damu,uchungu na kuathiriwa na maradhi.

Usajili katika utafiti ni kwa hiari yako na hakuna mapato yanatarajiwa kupatikana.Kutoshiriki katika utafiti hakuta sababisha upungufu wa hali ya uuguzi unaohitajika.Hakuna malipo zaidi yatatozwa.

APPENDIX 5.

CONSENT FORM.

Name.....
Age.....
Address.....
Relationship.....

I hereby give consent to be included in the study comparing the efficacy of Co-Amoxiclav given either intravenously as a single dose orally for five days in preventing postoperative morbidity after tonsillectomy or adenotonsillectomy the nature of which has been explained to me by Dr..... It has been made clear to me that the study is for academic purposes and will contribute to the improvement of management of patients.

Signature of patient/ guardian..... Date.....

Signature of doctor.....
Date.....

KIBALI CHA USAJILI.

Umri.....
Anwani.....
Uhusiano.....

Nakubali usajili katika utafiti unaoangazia ubora wa Augmentin katika upunguzaji wa adhari mbaya za upasuaji kwa wagonjwa wa tonsillectomy au adenotonsillectomy.Nimefahamishwa na Daktari
.....
ya kwamba utafiti wenyewe ni wa kielimu na matokeo yatachangia pakubwa kwa uuguzaji wa wagonjwa waliotajwa hapo juu.Nimefaamishwa zaidi kuwa usajili ni kwa hiari yangu.

Sahihi ya mgonjwa/ mzazi..... Tarehe.....

Sahihi ya daktari..... Tarehe.....