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**Complications of Pediatric Adenotonsillectomy and Associated Factors at  
Centre Hospitalier Universitaire de Butare (CHUB): September 2018 up to  
February 2019**

A thesis submitted as partial fulfillment of the requirements for the award of the Degree of  
Master of Medicine in Anesthesiology

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September 2019

**DECLARATION**

I, Dr. Jean Claude NTAGARUKANWA, hereby certify that this dissertation entitled **“Complications of Pediatric Adenotonsillectomy and Associated Factors at Centre Hospitalier Universitaire de Butare (CHUB): September 2018 up to February 2019”** is my original work and it has not been presented to elsewhere.

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This research proposal has been submitted with our approval as the University of Rwanda Supervisors.

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Date: 24/09/2019

## **“DEDICATION”,**

This dissertation is lovingly dedicated to all contributors to this current study that supported it to be well made.

It is dedicated to my wife and children for their constant source of inspiration and patience as well as crucial support throughout the study.

This scientific investigation is dedicated to my colleagues and friends for their advice, their care and for encouraging the drive and discipline to tackle any task with enthusiasm and determination.

## **ACKNOWLEDGEMENTS**

First of all, I thank my family that provided their care and crucial support that motivated me to do the current study as it was planned. Their contribution helped me for achieving the goal of bringing new knowledge through the findings of the current study that was the first to be conducted in the country.

I would like to thank the academic personnel of the College of Medicine and Health Sciences and the University of Rwanda for giving me permission to conduct the present research which I think is important in promoting the health of Rwandans. The assistance, encouragement and collaboration from the lecturers provided to me throughout my studies was crucial.

Indeed, I am most grateful to Dr. TWAGIRUMUGABE Theogene, M.D who was the supervisor of this thesis for his constructive criticism, advice, guidance, orientation, kind assistance and crucial suggestions. I appreciate his painstaking efforts throughout the supervision despite his tight schedule, to offer academic guidance and very useful suggestions when I most needed them. He helped me to improve my knowledge and skills of fundamentals to carry out the research inquiry.

I kindly thank all my colleagues and friends who provided direct and indirect contributions during this study. Lastly, I thank the contributors whom I have not mentioned here because they facilitated the execution of academic endeavors.

**Dr. Jean Claude NTAGARUKANWA**

## ABSTRACT

**Background:** Adenotonsillectomy remains a burden leading to high morbidity and mortality due to complications at medical settings. This study aimed to identify perioperative complications of adenotonsillectomy at CHUB and associated factors.

**Method:** Prospective observational study was conducted among 72 pediatric patients aged 0 to 15 years at Centre Hospitalier Universitaire de Butare from September 2018 to February 2019.

**Results:** The study population mean age was 59.3 months (range 51.1 – 67.6months), and 58.3% were male. The majority were ASA1 (75%). The rate of Adenoidectomy, Adenotonsillectomy and Tonsillectomy was 4.2%, 80.6% and 15.3% respectively. Intraoperative complications were observed in 26.4% and were mainly respiratory (25%). Postoperatively, complications occurred in 37.5% and were mostly pain, desaturation, and PONV. A chi square test was done to identify association between different factors such as age, comorbidity, and occurrence of intraoperative and postoperative complications. Intraoperative complications were significantly associated with young age below 3 years O.R 0.12 [0.03 – 0.44] with a CI 95% p 0.001. We didn't identify any factor predicting postoperative complications.

### **Conclusion:**

Younger children undergoing adenotonsillectomy encounter more intraoperative complications, and as such they should be assessed and anesthetized by more skilled healthcare providers. We recognize that our sample size was small, and we recommend this study to be repeated on a larger scale. We would recommend regular daytime oximetry and specific cardiologist review for children presenting with severe OSA to assess for pulmonary hypertension as part of the preoperative evaluation.

**Key-words:** *Anesthesia, Tonsillectomy, Complications, Adenotonsillectomy, Adenotonsillar hypertrophy, Surgery*

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## **ABBREVIATIONS AND ACRONYMS**

<b>AH</b>	: Adenoid Hypertrophy
<b>AS</b>	: Adenoid Surgery (Adenoidectomy)
<b>ASA</b>	: American Society of Anesthesiologists
<b>ASTS</b>	: Adenoid Surgery and Tonsillar Surgery
<b>ATH</b>	: Adenotonsillar Hypertrophy
<b>CHUB</b>	: Centre Hospitalier Universitaire de Butare.
<b>CMHS</b>	: College of Medicine and Health Sciences
<b>EtCO<sub>2</sub></b>	: End-tidal Carbon Dioxide
<b>GIS</b>	: Geographic Information Systems
<b>GPS</b>	: Geographical positioning system
<b>ICD</b>	: International Classification of Diseases
<b>IQR</b>	: Inter-quartile range
<b>MoH</b>	: Ministry of Health
<b>NGO</b>	: Non-Governmental Organization
<b>P.H</b>	: Pulmonary Hypertension
<b>PONV</b>	: Postoperative nausea and vomiting
<b>TH</b>	: Tonsillar Hypertrophy
<b>TS</b>	: Tonsillar Surgery (Tonsillectomy)
<b>WHO</b>	: World Health Organization

## **OPERATIONAL DEFINITIONS OF KEY TERMS**

**Anesthesia:** Delivery of drugs to allow medical procedures to be conducted without pain. In some cases the patient is unaware during the act. There are a variety of types of anesthesia including general, locoregional and local anesthesia (1).

**Adenotonsillectomy:** adenotonsillectomy is a prevalent major surgery conducted in children (3). It's surgical ablation of both adenoids and tonsils.

Adenoids are removed by curettage, for tonsils a blunt dissection of peritonsillar space is done separating the tonsillar capsule and the muscular wall (2).

**Complications:** unfavorable evolution or consequence of a disease, a health condition or a therapy. The disease can become worse in its severity or show a higher number of signs and symptoms or new pathological changes become widespread throughout the body or affect other organ systems (4).

**Adenotonsillar hypertrophy** ATH is considered as the main cause of obstructive sleeping apnea syndrome OSAS in pediatric population. This mostly occurs during the climax age for adenoid and tonsillar hyperplasia which is 3-6 years of age (7, 8).

**Sleep-disordered breathing** SDB: is similar to obstructive sleep apnea and is characterized by abnormalities of respiratory pattern or the adequacy of gases exchange while sleeping. It includes snoring, mouth breathing and pauses in breathing (5, 6).

**Tonsillar disease:** *tonsillar disease is commonly subdivided into 4 categories: acute tonsillitis, obstructive tonsillar hyperplasia, recurrent tonsillitis and chronic tonsillitis* (2).

## **CHAPTER I: GENERAL INTRODUCTION**

### **1.1. Background**

For a long time Adenotonsillectomy was and is still a regularly performed surgery conducted in children (9). In 2006, in United States alone up to 530 000 tonsillectomies were done in children below 15 years and this type of surgery totaled a rate of 16% of all ambulatory surgeries (10).

A study conducted in Kenya stated that adenotonsillectomy was the most frequent otorhinolaryngologic procedure. Indications were obstruction of airways 61.3% recurrent tonsillitis 27.8% then airway obstruction plus infective tonsillitis 7.5%. Surgery was done in the acute stage of disease in 6.8% and the rate of post-tonsillectomy bleeding was 2.1% for all cases (11).

As stated above Adenotonsillectomy consists in the ablation of adenoids and tonsils. In Rwanda a current used method for Adenotonsillectomy is cold steel dissection followed by haemostasis achieved by meticulous gauze compression or by electrocautery.

The three procedures Adenotonsillectomy, adenoidectomy and tonsillectomy are associated with complications, the severe ones are respiratory failure and bleeding(12).

Although benefits of Adenotonsillectomy are evident the following are the common complications: pain, respiratory compromise, postoperative nausea and vomiting, hemorrhage and rarely death (13); therefore we are interested to know the rate of perioperative complications of adenotonsillectomy in CHUB where we have relatively limited resources in terms of infrastructure and personnel.

An ordinary complication of adenotonsillectomy is perioperative bleeding. In published reports a rate of primary hemorrhage (during the twenty four hours) was from 0.2% to 2.2% and that of secondary hemorrhage (more than 24 hours after surgery) from 0.1% to 3%. Post-adenotonsillectomy hemorrhage can result in readmission for observation or reoperation to control hemorrhage (14, 15).

In their study Nono Ngoitsi et al. found following complication rates in some Nairobi hospitals: hemorrhage 2.1% respiratory complications 12.4%, delayed feeding of solid food 8.2% and anesthetic complications 3.1%. Adenoidectomy and adenotonsillectomy may be indicated in case of sleep disordered breathing SDB (11, 16).

Most complications occur either during induction of anesthesia or emergence from anesthesia.

Children suffering obstructing sleep apnea syndrome (OSAS) have a greater incidence of perioperative respiratory complications.

Children with sleep disordered breathing (SDB) had higher “Cormack–Lehane” scores probably due to larger tonsils or a lower oropharyngeal tone resulting in airway collapse therefore the visibility of the laryngeal inlet is reduced. They needed a longer time for induction but also had a prolonged emergence and time to extubation (14, 17).

In another study done in Brazil in 2014 by Martins et al, amongst children below 12 years of age with obstructive sleep apnea (OSA) they found a high apnea hypopnea index, a high oxygen desaturation index, lowest oxygen saturation on preoperative polysomnography and allergic rhinitis to be predictors of respiratory complications (18).

## **1.2.Statement of the Problem**

Anesthesia for adenotonsillectomy is a global challenge for anesthesiologists (14).

Various complications are encountered during adenotonsillectomy either intraoperatively or postoperatively.

Complications occurring during the intraoperative period include desaturation below 90% or more, laryngospasm, bronchospasm, unintended extubation. Laryngospasm is often a result of light anesthesia. Also tachycardia, bradycardia, and cardiac arrest occur as well (19).

If not treated adequately and in a timely manner it may induce a more dangerous negative pressure pulmonary edema. Another great challenge of this procedure the sharing of airways amid surgeons and anesthesiologists with potential respiratory complications either intraoperative or post-operative.

During the post-operative period patients can present post-tonsillectomy vomiting, hemorrhage, desaturation throat pain respiratory problems and airway obstruction.

If these complications are not diagnosed detected and treated promptly they may be followed by serious morbidity. With skilled provider morbidity and mortality should be low in adenotonsillectomy patients (20, 21). Various recent advances in airway management and early detection of postoperative adverse effects have been made to reduce the sequelae associated with adenotonsillectomy (11, 21).

Therefore we have interest in knowing the incidence of perioperative complications of pediatric adenotonsillectomy at CHUB in order to identify predictors of perioperative complications.

### **1.3.General Objective of the study**

The overall objective of the study was to determine the perioperative complications of adenotonsillectomy tonsillectomy, adenoidectomy at CHUB and the factors associated with those complications.

### **1.4.Specific objectives**

- To determine the rates of tonsillectomy, adenoidectomy and adenotonsillectomy in pediatric patients at University Teaching Hospital of Butare;
- To determine the rate of perioperative complications of tonsillectomy, adenoidectomy and adenotonsillectomy;
- To determine the factors associated with perioperative complications of a tonsillectomy, adenoidectomy and adenotonsillectomy.

## **CHAPTER II: LITERATURE REVIEW**

### **1.5.Theoretical literature**

The previous studies indicated that tonsillectomy had numerous complications including hemorrhage, anemia, transfusion, death, airway obstruction and edema, aspiration, hypoglossal nerve injury, lingual nerve injury recurrent laryngeal nerve injury, Grisel syndrome (a rare type of torticollis), dental injury, dislocation of the jaw, necrotizing fasciitis, taste disturbance, pharyngeal abscess and meningitis (12). Additionally other researchers have demonstrated vomiting, respiratory and eating disturbances, also arise among patients with adenotonsillectomy (9, 10). Airways complications consisted of stridor, laryngeal spasm, and edema. Respiratory adverse effects include atelectasis, pneumonia, apnea and respiratory failure. Cardiovascular related: tachycardia, bradycardia, hematemesis, hemorrhage and cardiac arrest (13).

The obstructive sleep apnea affects the heart from the increased pulmonary vascular resistance and the assessment of the cardiovascular function is of paramount importance. The routine treatment of children with adenotonsillar hypertrophy involves continuous positive airway pressure, nasal corticosteroids and anti-leukotrienes and also airway adjuncts (5).

Causes of adenoidal and tonsillar hyperplasia are not well elucidated, symptomatic enlargement of tissues in upper airways is associated with factors like microbial stimulation allergy inherited genes and irritants (23). Adenotonsillectomy has various indications the most common being nasal and oral obstruction by hypertrophied adenoids and tonsils. Infection is second and comprises purulent adenoiditis and adenoid hypertrophy associated often with chronic otitis media with effusion OME and chronic otitis media with perforation. The third is recurrent acute tonsillitis (11) and surgery is indicated when six attacks per year or three episodes per year for two years. The fourth indication chronic tonsillitis: when symptoms and signs occur and persist for weeks. The fifth is peritonsillar abscess “Quincy” and the last is suspected neoplasia which manifest as asymmetrical tonsillar enlargement (11, 22).

### **1.6.Clinical review and research gap identification**

Based on the literature from the previous studies, adenotonsillectomy and its associated complications due to various factors like the surgical operation, drugs used for treating it and socio-demographic factors are the public health concern. The present study was the first to be conducted in Rwanda. There was no prior study for comparison within the country, and the findings are important for public health providers.

### **Recap of the literature review**

Considering the findings from the literature review of the previous studies, it can be said that pediatric patients with adenotonsillectomy are significantly exposed to intra-operative and post-operative complications that included vomiting, bleeding, airway obstruction, respiratory problems, eating and sleeping disturbances, desaturation, physical pain and hemorrhage. It showed how effective and appropriate early interventions and treatments of those complications could be applied in the adenotonsillectomy patients within the medical settings. The literature indicated that efforts are required by everyone including caregivers, health providers, health facilities leaders, local leaders, Non-Governmental Organizations, national and international institutions in charge of promoting wellbeing of the pediatric patients. There was the need to reinforce and provide some appropriate and effective interventions after conducting regular evaluations and follow-up to the pediatric patients who seek the surgical operations related to adenotonsillectomy.

## **CHAPTER III: PATIENTS AND METHODS**

This chapter describes the methods and materials used for conducting the study within the medical setting. In addition to the methods and tools used, study population and settings, the data collection, sampling, descriptive and analytical data analysis and ethical considerations are discussed.

### **3.1. Study design**

The prospective observational study design was conducted among the pediatric patients aged 0-15 years who were seeking treatment at CHUB after being diagnosed with adenoidal hypertrophy, adenotonsillar hypertrophy or recurrent tonsillitis. Data was collected from September 2018 to February 2019. This study is a prospective observational cohort study evaluating the perioperative complications of pediatric patients coming for adenoidectomy alone, tonsillectomy alone or both.

### **Research approach**

The research strategy followed during the research was the inductive one. Using this approach, researchers commence by specific observations, which are used to generate theories and conclusions drawn from the research. The justification for utilizing an inductive approach was that it considers the context where research effort is active, while it is also most appropriate for small samples that produce qualitative data. However, the main weakness of this strategy is that it produces conclusions grounded only on a small number of observations, therefore the reliability of the results can be questionable (24).

### **Study settings**

Centre Hospitalier Universitaire de Butare (CHUB), one of the 4 referral hospitals in Rwanda has a capacity of 500 beds. It is situated in the southern province, Huye district, Ngoma sector, Mamba road. CHUB exists since 1928. At that time, it was the Butare Hospital. The Butare Hospital turned into University Teaching Hospital in 1966. In 2000, an organic law established the CHUB as an institution with autonomous status. CHUB is tertiary level teaching hospital where all the patients with complicated conditions are transferred from 17 district hospitals from western and southern provinces. The mission of CHUB is to provide quality health care according to the highest standards, train health personnel, conduct high level research and provide technical support to the healthcare system.



## **1.7.Study population**

The population of this study met the following inclusion criteria: pediatric surgical patients aged 0 to 15years admitted for Adenoidectomy, Tonsillectomy and adenotonsillectomy at CHUB from September 2018 to February 2019. Preoperatively children were assessed by the anesthesia team, educated and enrolled in the research one day prior to surgery.

The study excluded the pediatric patients who were scheduled for additional procedures such as circumcision. The patients who were older than 15years were also excluded.

## **1.8.Sampling**

### **Sample size**

All adenoidectomy, adenotonsillectomy and tonsillectomy pediatric patients admitted at CHUB from September 2018 to February 2019. Participants were neonates (0-30 day) up to 15-year-old.

We did not calculate the sample size using a formula, but we selected all pediatric patients who were available during the research period.

### **Sampling strategy**

All available participants who were present during the study conduction and met inclusion criteria were randomly recruited to participate since they had the same chance to be selected.

## **1.9.Data collection**

For the purposes of the research, closed questionnaires were used during the data collection from September 2018 up to February 2019. The data collection included demographics (age, gender and sex), clinical variables (including weight, weight for age, American Society of Anesthesiologists classification, procedures).

The outcome variables were intra-operative and post-operative complications.

Complications were subdivided in two: intra-operative complications that included bleeding, accidental extubation, desaturation and laryngospasm and post-operative complications which were bleeding, pain, vomiting, respiratory complications including desaturation <92%, stridor, laryngospasm, pneumonia, atelectasis, apnea, respiratory failure and cardiovascular-related including, tachycardia, bradycardia and cardiac arrest.

The intraoperative portion of the questionnaire was completed by the anesthesia provider (non-physician anesthetist, anesthesia resident) who anesthetized the patients or one medical student.

Postoperative data collection was done by the recovery room trained nurses or non-physician anesthetist in the recovery period.

Recovery room nurses and anesthesia providers attended training for one day; where we used presentation and group discussion to teach the correct filling of questionnaire. The principal investigator was not involved in data collection preoperatively to minimize data bias during the data collection.

The anesthesia providers obtained consent and confirmed validity of the inclusion criteria. The anesthesia providers and general nurses recorded study measures intraoperatively and in the post-anesthesia care unit during recovery.

### **1.10. Data analysis**

Data analysis of the findings was composed of descriptive and analytic analysis. In the descriptive mean, percentage and range were used to represent and summarize the findings of the study. Tables were used to summarize the statistical results. In the analytical analysis, the association between the variables was computed using the chi-square and the significance level was presented at  $p$  value  $< 0.05$ . The logistic regression at 95% confidence interval were analyzed to determine independent factors of complications.

### **1.11. Ethical consideration**

The present research was reviewed and approved by the research committee of University of Rwanda via Institutional Review Board (IRB). It was subject to certain ethical issues.

Participants aged between 7 and 15 provided verbal assent and their caregivers gave their written acceptance regarding their participation in the research, through a signed consent. For the participant aged less than 7 years, their caregivers provided oral and written consents. The aim of the consent process was to assure participants that their participation in the research was voluntary and that they were free to quit it at any point and for any reason.

Before starting the data collection with the participants, the pediatric patients were explained the purpose of the study, its potential benefits and risks. Both patients and their caregivers were explained that the privacy and confidentiality would be respected. The questionnaire used was written in both Kinyarwanda and English.

### **1.12. Data management**

Paper data forms were secured, and only study staff had access. Patient names and medical identifications were not collected on data forms. Data were kept confidential in an electronic database that is safeguarded with password protection.

### **1.13. Data dissemination**

The findings of the present study were disseminated after being presented in the academic areas. Through the comments of the panel, the investigators disseminated the findings among the audience including the health providers or representatives of the health facilities. The planners and the decision makers as will be invited to the dissemination event for sharing the new knowledge and providing the appropriate recommendations.

### **1.14. Limitation and challenges**

The small sample size during the study was due to the few numbers of pediatric patients undergoing adenotonsillectomy. This methodological limitation could be source of systematic errors. Therefore, the study was limited to the generalization of the findings. As the study was conducted in the specific area using small sample size, the results were representative of this medical setting.

## CHAPTER IV: RESULTS

This chapter consisted of the presentation of the results from descriptive and analytical analyses that were used to determine the incidence of tonsillectomy, adenoidectomy or both in pediatric patients at CHUB; determine the incidence of perioperative complications, risk factors and comorbidities in adenotonsillectomy.

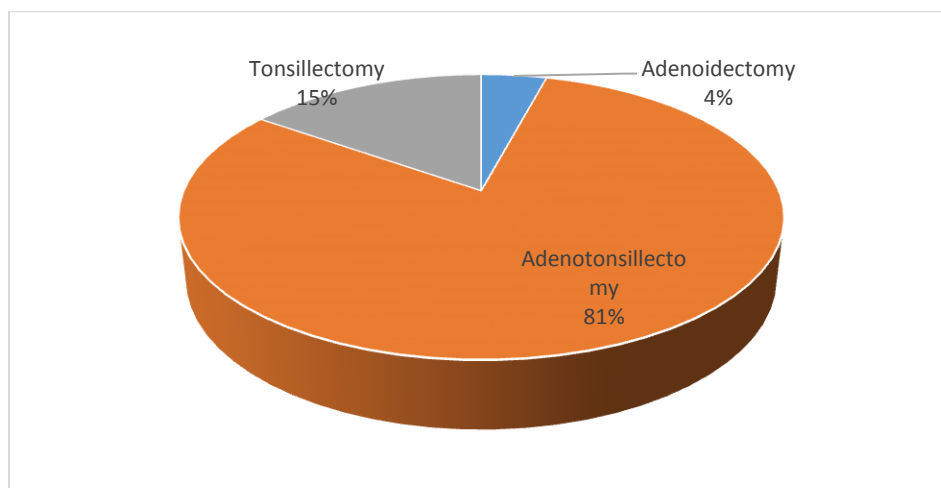
*Table 1: Patients demographic characteristics*

Ages (months)	Number	Percentage (%)
<b>0-23months</b>	9	12.5
<b>24-59months</b>	36	50
<b>60months - 15years</b>	27	37.5
Sex		
<b>Male</b>	42	58.3
<b>Female</b>	30	41.7
Province of residence		
<b>Southern</b>	59	81.9
<b>Western</b>	11	15.3
<b>Other</b>	2	2.8
Medical Insurance		
<b>CBHI</b>	51	70.8
<b>Private</b>	17	29.2
Weight for Age percentile		
<b>&gt; 95percentile</b>	1	1.4
<b>05-95 percentile</b>	53	73.6
<b>&lt;5 percentile</b>	18	25
ASA classification		
<b>ASA 1</b>	54	75
<b>ASA 2</b>	14	19.4
<b>ASA 3</b>	4	5.6

**Table 2: Anesthesia Provider Type of Operation.**

Pre-Anesthetic Assessment	Number	Percentage (%)
<b>Anesthesiologist</b>	25	43.7
<b>NPA</b>	47	65.3
Anesthesia Provider		
<b>Anesthesiologist</b>	38	52.8
<b>NPA</b>	34	47.2
Type of Operation		
<b>Adenoidectomy</b>	3	4.2
<b>Adenotonsillectomy</b>	58	80.6
<b>Tonsillectomy</b>	11	15.3

**Figure 1. Type of operation**



During the study period from September 2018 to February 2019, a total number of 72 children under 15 years were admitted to the ENT service and underwent adenoidectomy, tonsillectomy or both. Their mean age was 59.3 months, and 58.3% were male. A quarter of them were underweight as they had a weight for age percentile inferior to 5.

Most of the cohort were residents of Southern province at 81.9% followed by residents of Western province 15.3%; the 2 provinces constitute the catchment area of CHUB. All patients possessed an insurance; those with Community Based Health Insurance were 70.8% and the remaining had private insurance.

At admission prior to surgery 43.7% of the patients were assessed by an anesthesiologist and the remaining 65.3% by a non-physician anesthetist. During surgery anesthesia was provided by an anesthesiologist in 52.8% and the remaining patients were anesthetized by a NPA.

The ASA (American society of anesthesiologist) classification of the cohort, 3 classes were recorded, 75% of patients were in ASA 1, then 19.4% in ASA 2 and 5.6% in ASA 3. No patient was operated as an emergency case.

**Table 3: Rate of perioperative complications of adenotonsillectomy**

Variables	Frequency	%
<b>Intraoperative complications</b>		
Accidental extubation	1	1.4
Desaturation	15	20.8
Laryngospasm	2	2.8
Bleeding	1	1.4
<b>Post-operative complications</b>		
Bleeding	3	4.2
Desaturation	4	5.6
Unplanned ICU admission	2	2.8
Pain	15	20.8
NVPO	3	4.2

Complications occurred during the intraoperative and postoperative periods. Intraoperatively they occurred at a rate of 26.4% and were mainly respiratory at 25%, including oxygen desaturation below 92% in 20.8%, laryngospasm in 2.8%, extubation in 1.4% and bleeding in 1.4%.

Postoperative complications were observed in 37.5% of patients. Pain occurred at a rate of 20.8%. For 64.3% of those patients' pain was severe and they received morphine in the recovery room while the remaining number received Paracetamol suppository. None of the patients who received morphine intraoperatively developed pain and only 12.5% of those who received intraoperative dexamethasone developed pain. The rate of desaturation below 92% was 5.6%, vomiting 4.2%, bleeding 4.2% and 2.8% of patients were admitted to ICU after failing extubation. Postoperative bleeding observed in this study was minimal and did not require intervention or reoperation.

**Table 4: Presence of intraoperative complications and associated factors**

Category		Number	Present	Absent	P value
Age (years)	≤ 3	16	9	7	0.001*
	> 3	56	7	49	
Weight for age (percentile)	≤ 5	23	7	16	0.362
	>5	49	9	40	
Comorbidity*	present	16	11	5	0.068*
	absent	56	24	32	
ASA Class	1	42	7	35	0.185*
	2 and 3	30	9	21	
Anesthesia provider	NPA	34	5	29	0.396
	Anesthesiologist	38	11	27	
Opioid use	Fentanyl, Morphine	6	2	4	0.609
	Fentanyl	66	14	52	
Dexamethasone use	None	16	4	12	0.553
	Used	56	20	36	

\*The term **comorbidity** includes allergic rhinitis, pulmonary hypertension, and underweight.

After reviewing the complications, we did a chi square test to see if there are significant associations between different factors such as age, comorbidity, ASA class of the patient, the level of the anesthesia provider, the use of Morphine on top of fentanyl and dexamethasone and occurrence of intraoperative and postoperative complications.

As seen on the above table a significant association was found between age groups of the pediatric patients and occurrence of intraoperative complications with a p= 0.001. We did also a chi square test for these same factors for postoperative complications but the p values are all above 0.3.

**Table 5: Logistic regression for predictors of intraoperative complications.**

Category	OR [ 95%]	P value
<b>Age(years)</b>	$\leq 3$	Ref.
	$> 3$	0.12 [ 0.03 – 0.44]
<b>ASA Class</b>	1	Ref
	2 and 3	2.14 [ 0.69 – 6.61]
<b>Comorbidity</b>	absent	Ref.
	present	2.93 [0.90 – 9.57]

We did a logistic regression for factors with a  $p < 0.2$  and the age presented an Odd Ratio of 0.12 at confidence interval of 95% and a significant  $p < 0.001$  meaning that the age group below 3 years old is more prone to experience complications during adenotonsillectomy. Older children present less intraoperative complications during adenotonsillectomy.



## CHAPTER V: DISCUSSION

The mean age of 59.3 months of our cohort was similar to two previous studies findings by Amoils et al, in California with a mean age of 64.8 months and Nono Ngoitsi in Nairobi national hospitals where a mean age of 56.76 months (11, 13) was found. Amid age group of 2 to 5 years, the symptoms of preoperative airway obstruction are more manifest like lower oral intake due to dysphagia, nocturnal sleep disturbances therefore parents and otolaryngologist are eager to do surgery.

The fact that CHUB covers the totality of southern province and half of western province and the patients followed are mainly from southern province at 82% may mean that there is some inaccessibility of the service to the patients from western province.

When untreated severe sleep disordered breathing (SDB) is often complicated by two main complications: one is growth retardation and the other is pulmonary hypertension. In her pilot study done on pediatric patients of an urban area of New York published in 2006 Bonuck et al, found that in children who underwent adenotonsillectomy among children below 6 years, 21% were either below 5th percentile in height and/or in weight (25).

In fact in our present study children also found a similar trend because 25% of study population were below 5 percentile in weight meaning underweight.

Our findings revealed also a rate of pulmonary hypertension in 5.6% confirmed by sonography done by a cardiologist. This value may be an underestimation for this condition because a research done by Marangu et al done in Kenyatta national hospital in 2011 showed the rate of 21.1% of pulmonary hypertension in 123 children with adenoidal or adenotonsillar hypertrophy followed in ENT service. (23).

In this study they emphasized that although daytime oximetry has a poor correlation with severity of obstructed sleep apnea daytime oxygen saturation was significantly lower in children suffering from P.H vis-à-vis to those who don't have it.

The complications which occurred during the intraoperative period prevailed at 26.4% and were mainly respiratory at 25%.

For postoperative complications the rate was 37.5% mostly pain desaturation below 92% PONV and bleeding.

On bleeding we mention that any bleeding event signaled by staff was considered as such regardless of the surgical judgement and none required reoperation (16).

We did Chi square tests for both intra and postoperative complications and only one significant value was found within age groups below and above three years  $p=0.001$ , 95% C.I. Logistic regression analysis showed that young age below three years is significantly associated with intraoperative complications O.R 0.12 [0.03 0.44]. This correlates with previous studies like the one done by Amoils et al where they found the highest O.Rs for airway and respiratory complications in the youngest cohorts (13).

We did not identify any factor predicting postoperative complications because on the chi square test obtained p values were all above 0.3 therefore in our research the only independent factor predicting complications is the age of pediatric patient.

## **CHAPTER VI: CONCLUSION AND RECOMMENDATIONS**

We found the rate of Adenoidectomy, Adenotonsillectomy and Tonsillectomy to be 4.2%, 80.6% and 15.3% at CHUB.

We found rates of Intraoperative complications of 26.4% and postoperatively complications of 37.5%.

We found that Children younger than 3 years children undergoing adenotonsillectomy are prone to encounter more intraoperative complications. They should be assessed and anesthetized by more skilled healthcare providers. We recommend that anesthesiologist be present for all adenoidectomy adenotonsillectomy and tonsillectomy in children under 3 years.

We recognize that our sample size was small, we recommend this study to be repeated on a larger scale.

Based on the likely presence of undiagnosed pulmonary hypertension in OSA patients we recommend regular daytime oximetry as screening test and cardiologist evaluation for children presenting with severe OSA to assess for pulmonary hypertension.

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## **Appendixes**

### **Assent for the Pediatric Participants**

I, **NTAGARUKANWA Jean Claude**, am conducting the research entitled “Anesthetic Management of Tonsillectomy at University Teaching Hospital of Butare (CHUB)” among the pediatric patients younger than 6 years. The study aims at investigating the possible complications of adenotonsillectomy and the relationship between this surgical operation and the intra and post-operative complications. Another objective of the current study is to analyse Anesthetic Management of Tonsillectomy at University Teaching Hospital of Butare. After gathering the information from all the pediatric patients, the statistical analyses were performed to explore how the medications, surgical operations and socio-demographic data are related with the adenotonsillectomy complications in BUTH.

There are no direct benefits to be provided to you from this research but your participation was crucial in providing the recommendations to the decision makers and the planners for improving the pediatric health among the adenotonsillectomy patients. When you accept to play the role within the current study, the confidentiality and respect are respected and there are no risks that may happen to you. You are selected for participating because you are seeking treatment at the anesthetic department and you are in the category of target age of the participants. During the study you may withdraw at any time and you are not asked to give any reason about your withdrawal during the study.

Moreover, you can ask questions any time, now or later. You can talk to the doctors, your family or someone else. You do not have to be in this study, no one is made at you if you don't want to do this. We also asked your parents if they would like you to be in the study. Even if you say yes now, you can change your mind later.

When we are finished with this study, we wrote a report about what was learnt. This report did not include your name or that you were in the study.

**ASSENT**

I want to take part in this study. I know I can change my mind at any time.

Name of the child: ..... Age: .....

Verbal assent given: Yes                      No

Date:..... Start time:.....hr...min..... Close time: .....hr.....min.....

I confirm that I have explained the study to the participant to the extent compatible with the participant understands, and that the participant has agreed to be in the study.

Name of person obtaining the assent and signature:

.....

Date: .../.../.....

**ICYEMEZO CYUBURENGANZIRA BWO KWINJIRA MUBUSHAKASHATSI (7-15)**

Umutwe w’ibygwa: “kumenya uko abana baza kubagwa “angine (cyangwagapfura)” bahabwa ikinya mu bitarobya CHUB”.

Ukora ubushakashatsi: Dr. NTAGARUKANWA Jean Claude.

Telefoni: 0788426054

Email :[jcntagarukanwa@yahoo.fr](mailto:jcntagarukanwa@yahoo.fr)

Turakora ubushakashatsi bugamije kumenya byimbitse (binononsoye) uko abana baje kubagwa “angine” basinzirizwa. Niwemera kwitabira ubu bushakashatsi, uzashyirwa mu cyiciro cy’abashobora gukorerwaho ubu bushakashatsi.

Ushobora kubaza abaganga cyangwa umuryango wawe, cyangwa undi muntu uwo ariwe wese, igihe icyo aricyo cyose.

Ntabwo ari itegeko kwitabira ubu bushakashatsi. Ntawe uzakurakarira nuba utabyitabiriye. Tuzabaza n’ababyeyi bawe niba bemera ko witabira ubu bushakashatsi. Nubwo wakwemera ubu, wemerewe kuva muri ubu bushakashatsi igihe cyose ushakiye.

Niturangiza ubu bushakashatsi, tuzandika amakuru y’ibyo twabonye ariko izina ryawe ntaho rizagaragara.

Icyemezo: Nemeye kwitabira ubu bushakashatsi

Izina ry’umwana.....

Yabyemeye mu mvugo: Yego Oya.

Itariki ..... / ..... /.....

Ndemeza ko nsobanuriye uwitabiriye ubu bushakashatsi ku rwego abisobanukirwa bituma yemera kwitabira.

Amazina n’umukono by’ uwasobanuriye umwana:

.....  
.....

Itariki: ...../...../.....



# CONSENT FORM

## English Version

Consent form

Date-----Month-----Year-----

I -----, have been given information and explained about *Anesthetic Management of Pediatric Tonsillectomy study*, I accept voluntary for my child to participate in the study.

I have right to refuse the consent without any consequences to the care of my child or myself.

Patient's name -----

Parent's name-----

Signature-----

Health provide/Research assistant-----

Signature-----

**Kinyarwanda**

Amasezerano yo kwemera gukorerwaho ubushakashatsi

Italiki-----,Ukwezi-----,Umwaka-----

Ngewe-----,nahawe amakuru nasobanurirwa ibijyanye n’ubushakashatsi bugamije kumenya byimbitse (binononsoye) uko abana baje kubagwa “angine (gapfura)” basinzirizwa, nemeye kubushake ko umwana wanjye/ umurwayi wanjye ajya muri ubwo bushakashatsi.

Mfite uburenganzira bwo kwanga ko umurwayi wanjye ajya mu bushakashatsi ntibingireho ingaruka ku buvuzi nemerewe.

Amazina y’umurwayi-----

Isinya-----

Amazina y’ababyeyi-----

Isinya-----

Umuganga /umushakashatsi-----

Isinya-----

**Budget:**

<b>N°</b>	<b>ITEM</b>	<b>QUANTITY</b>	<b>UNIT PRICE (in FRW)</b>	<b>TOTAL PRICE (in FRW)</b>
<b>01</b>	Transport to the hospital (180 days)	64	Average of 500 both ways (Aller-retour)	32,000rwf
<b>02</b>	Communication with data collectors	2 data collectors	6 000 / month	96,000rwf
<b>03</b>	Internet connection subscription	8 months	5 000	40,000rwf
<b>05</b>	Flash disk	1	15 000	15,000rwf
<b>06</b>	Pens	40	150	6,000rwf
<b>07</b>	Reams of paper	5	3 000	15,000 rwf
<b>08</b>	Printing data collection sheets	1 sheet of 6 pages	100	600 rwf
<b>9</b>	Photocopies for data collection sheets	6pages x 100 patients = 600	15	9,000 rwf
<b>10</b>	Folders	2	2 000	4,000 rwf
<b>11</b>	Per diem for Study Dactylographer	50 pages	500frw/page	25,000frw
<b>12</b>	Printing of the study	50 pages x 5 books	100/page	25,000rwf
<b>13</b>	Binding	5	1000	50,00rwf
	<b>TOTAL</b>			<b>272,600 rwf</b>

**Data collection tool:**

**1. Patient Identification:**

Age: \_\_\_\_\_ Weight: \_\_\_\_\_ Height \_\_\_\_\_

Sex:  M  F

**2. Type of Operation (tick and precise):**

- Tonsillectomy
- Adenotonsillectomy

**3. Type of Urgency**

- Scheduled
- Emergency

**4. Fasting duration-----**

**5. Indications**

- Recurrent tonsillitis
- Adenoidal hypertrophy
- OSA (obstructing sleep apnea)
- Pharyngeal or peritonsillar abscess

Adenotonsillar hypertrophy grade-----

Other specify-----

**6. Past history/comorbidity**

- i. HIV
- ii. TB
- iii. DM
- iv. HF/Pulmonary HTN
- v. Malnutrition/Failure to thrive
- vi. Rhinitis/Sinusitis
- vi. Congenital malformation

**7. Airway management**

- i) Mallampati
- ii) Attempts with ETT
  - One
  - Two
  - Three attempt

More than 3

iii) Complication during Intubation

None

Laryngospasm

Bronchospasm

Bleeding mucosa

Teeth removal

Other-----

Yes       No

If yes specify -----

**8. Pre Anesthetic Laboratory Test:**

No labs

Full blood count:

Hb: \_\_\_\_ g/dl    Hematocrit: \_\_\_\_%    Platelets: \_\_\_\_

**9. ASA Classification Score:**

1     2     3     4     5    E

**10. Type of Anesthesia:**

General Anesthesia (G.A)

IV induction

Inhalation Induction

Sedation

Other (specify): \_\_\_\_\_

**11. Anesthesia provider**

NPA alone

Resident alone

Anesthesiologist alone

Anesthesiologist + NPA

NPA+ Anesthesia Resident

NPA + Anesthesiologist + Resident

**12. Surgery provider**

- ENT specialist alone
- ENT Specialist+ GP
- GP alone

**13. Duration of Surgery** (time installation of mouth opener to removal of throat pack) ..... min.

**14. Duration of Anesthesia** (preoperative oxygenation to extubation) ..... min.

**15. Intra-Operative Events** (Complications):

**Equipment Problems:** Yes No

**If yes, which kind of problem:**  ETT kinked  obstructed

- Accidental extubation  Suction absent  Suction malfunction
- Hypotension
- Hypertension
- Bradycardia
- Tachycardia
- Cardiac arrest
- Other (precise): \_\_\_\_\_

**Respiratory**

- Hypoxemia  (SpO<sub>2</sub><92%)  (SpO<sub>2</sub>< 85%)
- Bronchospasm
- Selective Intubation
- Esophageal Intubation
- Laryngospasm
- Aspiration/Vomitus
- Hypercapnia (PaCO<sub>2</sub>>50mmHg)
- Accidental Extubation
- Unplanned reintubation
- Other (precise):** \_\_\_\_\_

**Others:**

Anaphylaxis stages  No  Yes

If yes stages 1. 2. 3. 4.

- Prolonged muscle relaxation.
- Medication errors:
  - Error on drug name
  - Error on drug dose
- Nausea and vomiting
- Hypothermia (<35°C)
- Hyperthermia (>38°C)
- Death on table
- Other (precise):

**16. Intraoperative fluids**

Types

Amount of fluids received

**17. Monitor**

- Spo2
- Temperature
- NIBP
- ECG
- Capnography

**18. Disposal after the operation:**

- ICU
- Recovery room

**19. Surveillance after the Operation/Recovery/PACU:**

**19.1. Monitoring in PACU**

- |                     |                              |                             |
|---------------------|------------------------------|-----------------------------|
| Pulse (heart rate): | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Blood Pressure:     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| EKG:                | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| SpO2:               | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Temperature:        | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Bleeding            | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Suction  Yes  No  
Oxygen supply  Yes  No  
Other (specify): \_\_\_\_\_

**19.2. Staffing in PACU**

- Nurse
- Nurse Anesthetist
- Anesthesia resident
- Anesthesiologist

**19.3. Analgesia postoperative**

Preemptive analgesia  Yes  No  
If yes which Paracetamol suppo  Yes  No  Dosage:.....  
Dexamethazone IV (.15 mg/kg)  Yes  No  
Morphine  Yes  No  
If yes titration (1mg at 0 min, 1mg after 5min according to pain score)  
Paracetamol  Yes  No If yes routes:  IV  suppository  
Ibuprofen syrup  Yes  No  
Tramadol  Yes  No

**19.4. IV Fluids PACU specify amount**

NS  Yes  No  
RL  Yes  No  
D5%  Yes  No  
D50%  Yes  No

**19.5. Criteria to discharge from PACU to Ward according to Aldrete score**

Yes  No

**19.6. Who discharge from PACU?**

- Nurse
- No Physician Anesthetist
- Anesthesia resident/Anesthesiologist



Then to where:  ENT ward       Pediatrics       Private clinic

**20. Post op follow-up**

Discharge day:

Day of first oral intake:

Breastfeed       Soft drinks       Mashed food (puree, potage)       solid food.

Day/s of hospital stay after operation.....

Died

**21. Postoperative complications**

Bleeding

Pain for more than 48 hours (Wong-Baker pain scale or FLACC)

Treatment given:.....

Re-operation from the PACU or from the ward specify the day after surgery:.....

Severe pain

Respiratory failure

**22. Overall outcome.**