COLLEGE OF MEDICINE AND HEATH SCIENCES

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DEPARTMENT: EAR, NOSE AND THROAT

Prevalence and risk factors of otitis media with effusion in patients with adenoid hypertrophy at Kigali University Teaching Hospital (CHUK)

An action research report submitted to the School of Medicine in partial fulfillment of the requirements for the award of Master degree in ENT head and neck surgery.

By

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DECLARATION

This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions. The work was done under the guidance of Dr MUGABO Rajab

Dr UMUTONI Josiane

DEDICATION

To my beloved family: my parents and my sisters

ACKNOWLEDGEMENT

I would like to express my sincere appreciation to:

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ABSTRACT

Background: Otitis media with effusion is a middle ear effusion without signs and symptoms of middle ear infections. It is mainly due to Eustachian tube dysfunction or sequelae of acute otitis media. There are different risk predisposing to OME, among them adenoid hypertrophy.

Objectives: To determine the prevalence and risk factors of otitis media with effusion in children with adenotonsillar hypertrophy.

Methodology: This was a prospective descriptive study were children presenting at CHUK with symptoms and signs of adenoid hypertrophy were included. They were from 1 year to 12 years of age. Parents/ guardian were asked to fill a questionnaire about the clinical presentation and about other known risk factors for otitis media with effusion. A physical examination was done with pneumatic otoscopy and fiberoptic nasopharyngoscopy to grade the size of adenoids. As investigation tympanometry was performed to confirm the presence of OME.

Results: 152 children met inclusion criteria.68.4% were male, the predominant age group was children from 1-4 years which account for 75%. The prevalence of otitis media with effusion was 46.1%. About other the risk factors associated with OME we found the age group 1-4 years was associated with OME P value 0.024, originating from the North and South of Rwanda was associated with OME, P value 0.02 and 0.01 respectively. Socio-economic status ubudehe category 2 and 3 were also associated with OME 0.01 and 0.03 respectively. History with a sibling with OME is a risk factor P value 0.2, and living in overcrowded home P value 0.002. Attending day care centers, parents with OME, previous AOM, smoking at home, bottle feeding and feeding while supine were not shown to be risk factors.

Conclusion: Otitis media with effusion is highly prevalent in children with adenoid hypertrophy. Proper examination is mandatory to prevent possible sequels from unnoticed OME.

Key Words: Adenoid hypertrophy, otitis media with effusion, risk factors.

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ACRONYMS AND ABBREVIATIONS

AH……..Adenoid hypertrophy

COME……..Chronic otitis media with effusion

OME……..Otitis media with effusion

CHUK……Kigali university teaching hospital

CHAPTER ONE: INTRODUCTION

1.1 Background

Adenotonsillar hypertrophy is a common disorder in pediatric patients. Many studies have shown that children with adenoid hypertrophy (AH) are more likely to have chronic otitis media with effusion (COME). However, not every child with AH has COME[1].

Otitis media with effusion is defined as the persistence of serous or middle ear effusion for 3 months or more[2]. In many case the cases the only symptoms of OME is fluctuating hearing status. OME is undetected until the doctor raise suspicion of it[3].up to 60 % of children with OME may present with hearing loss[4]. There are 2 theories about the pathogenesis of OME, first one being Eustachian tube dysfunction and the second one being the sequelae of acute otitis media. The rate of resolution after acute otitis media is high[5]. Children are predisposed to have Eustachian tube dysfunction as a result of horizontal and wider Eustachian tube, craniofacial abnormalities, and mechanical obstructions by growing adenoids[6].Anatomical (short, flaccid and horizontal) and physiological (dynamic opening and muco-ciliary function) characteristics of the Eustachian tube (ET) contribute to its function. [7].other risk factors include bottle feeding, feeding while supine, having a sibling with otitis media, attending daycare, having allergies to common environmental entities, having a lower socioeconomic status, living in a home in which people smoke, and having a parental history of otitis media with effusion[8], previous acute otitis media , male sex, and autumn season[9]. Humaid AH et al found that the presence of OME was dependent on age less than 8 years, family size of more than 4 years, mother education less than secondary school, recurrent otitis media and hearing loss. The disease was less likely to be associated with nasal discharge and snoring[10]. Elciora et al who investigated the risk of OME in patients with adenoid hypertrophy reported that adenoid hypertrophy with OME was highly associated with male sex, congenital disease and school attendance. Breast-feeding, bottle-feeding, familial predisposition, tobacco exposure, and allergies were not playing a role[11].

The tonsils are lymphoepithelial tissues located at the entrance of the upper aero digestive tract. They consist of nasopharyngeal (adenoids), palatine, lingual, tubal tonsils, and together they form the Waldeyer`s ring[12] . The tonsils increase rapidly in size between the first and third year of life with peaks in the third and seventh year. They involute

slowly before early puberty and finally disappear before the age of 20 years[12]. Adenotonsillar hypertrophy is the most common cause of sleep disordered breathing in children[13]. For diagnosis, a good history which includes history of open mouth breathing, snoring and sleep apnea. Apnea is defined as cessation of breathing in 10 seconds associated with desaturation. Apnea/ hypopnea index is calculated by the number of apnea divided by the hours of sleep. AHI below 1 is normal in children, 1-5 is very mildly increased, 5-10 mildly increased, 10-20 is moderately increased and greater than 20 is severely increased[14]. Excessive daytime sleepiness, aggressive behavior, attention deficit, and enuresis are also features of adenotonsillar hypertrophy[15]. Also caregivers complains of somnambulisme[16]. On physical examination we can find complications of adenotonsillar hypertrophy such us acute and chronic otitis media, rhinosinusitis, maldevelopment of upper jaw and poor physical and mental development due to chronic hypoxia and failure to thrive[12].Adenoid hypertrophy can be graded into 4 grades by using fiber endoscopic findings. The choanal opening is divided into 4 quadrants from the upper choanal border to the nasal floor. If adenoids obstruct only the upper quadrant, the obstruction is estimated at 25%, whereas the adenoids which touch the nasal floor are graded as grade 4.

Farhad J. Khayat et all showed at Rizgari Teaching Hospital/ Erbil shows that Among 120 patients age (3-12) years old with adenoid hypertrophy, 44 patients (36.7%) had OME, mean age was 6.5 years. Most common age group was (5-6) years (21) (47%).[1] Chibuike Nwosu, Department of Ear, Nose and Throat Surgery, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria demonstrated that the prevalence of OME among children with adenoid hypertrophy was quit high estimated at 55.9%[17]. In Kenya a study done by DR. ANTHONY MWANIKI KIAMA found that out of all the 52 children with obstructive adenoid disease 35 children had OME as compared with 8 children out of 52 in the control group giving an overall prevalence of 67.3% in the study group and 15.4% in the controls [6].

OME can be suspected clinically and later on it will be confirmed by tympanometry. A type B tympanogram with flat curve and normal canal volume is considered diagnostic of OME[14]. Orji FT1 showed in his study that Simple otoscopy produced 84.4% agreement with tympanometry in detecting OME. The agreement was better in older children than the younger ones[18] .The otoscopic findings in OME are mainly different combinations of retraction of the pars tensa and wide variations in color of the tympanic

membrane[19]. The socio- economic status in Rwanda is defined in 4 categories in ascending order according to the wealth (ubudehe Category 1, ubudehe category 2, ubudehe category 3and Ubudehe category 4).

In reference to literature review, we will evaluate the known risk factors of OME among patients with adenotonsilar hypertrophy. Currently, in Rwanda there are no documented risk factors of OME in general or among patients with adenotonsillar hypertrophy.

1.2 Justification of the Study

No study has been done in Rwanda to look at the prevalence and risk factors of OME among children with adenotonsillar hypertrophy.

1.3. Research Question

What is the prevalence and risk of otitis media with effusion in patients with adenotonsillar hypertrophy?

1.4. Objectives

1.4.1 General objectives

To determine the prevalence and risk factors of otitis media with effusion in children with adenotonsillar hypertrophy

1.4.2 Specific objectives

- To determine the socio-demographic distribution of patients
- To determine the clinical presentation of adenoid hypertrophy
- To determine the tympanometric findings in patients with adenoid hypertrophy
- To evaluate the risk factors of OME in patients with adenoid hypertrophy
- To evaluate the accuracy of pneumatic otoscopy compared to tympanometry in diagnosing otitis media with effusion

CHAPTER TWO: METHODS

2.1 Study Design

It was a prospective descriptive study

2.1.1 Study Area

KIGALI UNIVERSITY TEACHING HOSPITAL

2.1.2 Study population

All patients from 1 year to 12 years of age with a diagnosis of adenoid hypertrophy consulting at CHUK

2.2 Sample Size Calculation

Sample size calculation has been performed using Kelsey formula (http:// www.openepi.com SampleSize/ SSPropor.htm) using:

n =deff × (Npˆqˆ)/(d^2/〖1.96〗^2 (N-1)+pˆqˆ)

Where:

n=sample size

deff=design effect = 1

N=population size

pˆ=the estimated proportion

qˆ= 1- pˆ

p=desired absolute precision or absolute level of precision = 5%

Our preliminary data was obtained from the registry of outpatient clinic ENT/CHUK for eight months. It was found that the average of 24 children among 131 consulted each month have adenoid hypertrophy. This gave us an anticipated annual population of 288 children under 12 years of age with adenoid hypertrophy (N)

Regarding the prevalence of OME in children less than 12 years, studies from African countries like , Nigeria, and Kenya show a prevalence of around 50%[17],[6]. This has

been used as the estimated proportion (pˆ). A 95% CI will require a sample size (n) of 165 subjects**.**

2.3 Inclusion Criteria

- Parent or guardian who consented for the study
- Patients who was cooperative during the examination process

2.4 Exclusion Criteria

- Patients with chronic suppurative otitis media
- Patients who have had previous adenoid surgery
- Patients with upper respiratory tract infection

2.5 VARIABLES

2.5.1 Dependent variable

- Otitis media with effusion which is the binary variable with two responses

2.5.2 Independent variables

- Age
- Sex
- Province of origin
- Clinical presentation of adenoids hypertrophy
- Grade of adenoids
- Type of tympanogram
- Risk factors of otitis media with effusion (**bottle feeding, feeding while supine, having a sibling with otitis media with effusion, attending daycare, having allergies to common environmental entities, frequent nasal obstruction, rhinorrhea, sneezing , having a lower socioeconomic status, living in a home in which people smoke, previous acute otitis media , Parent with a history of OME , Overcrowded homes : more than 2 people in one room according to WHO**

2.6 Data collection and analysis

Data collection was done by filling the questionnaire by the consulting doctor. Data entry tool was Epi Data and analysis was done using SPSS 20.

Univariate analysis was done to compute frequency of different factors among study participants. P value and odd ratio also was calculated .

2.7 Ethical consideration and confidentiality

Consent from patients was obtained. The study was conducted after approval from ethical committee of the college of medicine and health sciences. Collected data was kept in a secured place to ensure its confidentiality. No data of private nature was collected

CHAPTER THREE RESULTS

3.1. Socio-demographic description

According to the Socio-demographic characteristics, 68.4% of participants were males and 31.6% female. 75 % were less than 4 years old and only 1.3% older than 8 years. 63.2% of consulting children belong to the third category of Ubudehe which is the category of the well to do families. Kigali City were had majority of the study participants 69.7%.

Table 1: Socio-demographic characteristics of participants

Chracteristics	Frequency	Percent
Gender		
Female	48	31.6
Male	104	68.4
Age group		
≤ 4 YO	114	75
4-8 YO	36	23.7
≥ 8 Y	2	1.3
Ubudehe category		
Category 1	14	9.2
Category 2	42	27.6
Category 3	96	63.2
Province of origin		
Kigali City	106	69.7
Eastern province	20	13.2
Southern Province	9	5.9
Western province	5	3.3
Northern Province	12	7.9

3.2. Clinical presentation of patient with adenoid hypertrophy

According to clinical presentation of patients with adenoid hypertrophy , 96.7% of participants had snoring, 94.1% had sleep apnea , enuresis was present 26.3%, diaphoresis 41.4%, drooling 44.1 % , night time mouth breathing 88.2%, daytime somnolence 13.8 %. Morning headache, dry mouth, halitosis, hyponasal speech, daytime

open mouth breathing and poor weight gain were present at 3.3%, 30.3%, 46.1%, 53.3%, 82% and 22.4% respectively (table 2).

Table 2: Clinical presentation of patient with adenoid hypertrophy

Characteristics	Frequency	Percent
Snooring		
yes	147	96.7
No	5	3.3
Sleep apnea		
yes	143	94.1
No	9	5.9
Enuresis		
yes	40	26.3
No	87	57.2
NA	25	16.4
Diaphoresis		
Yes	63	41.4
No	89	58.6
Drooling		
yes	67	44.1
No	85	55.9
Night time mouth breathing		
yes	134	88.2
No	18	11.8
Daytime somnolence		
yes	21	13.8
No	114	75.0
NA	17	11.2
Morning headache		
Yes	5	3.3
No	97	63.8
NA	50	32.9

Characteristics	Frequency	Percent
Dry mouth		
yes	46	30.3
No	66	43.4
NA	40	26.3
Halitosis		
yes	70	46.1
No	82	53.9
Hyponasal speech		
yes	81	53.3
No	40	26.3
NA	31	20.4
Day open mouth breathing		
yes	126	82.8
No	26	17.1
Pooor weight Gain		
yes	34	22.4
No	117	76.9
NA	117	76.9

3.3. Prevalence of otitis media with effusion

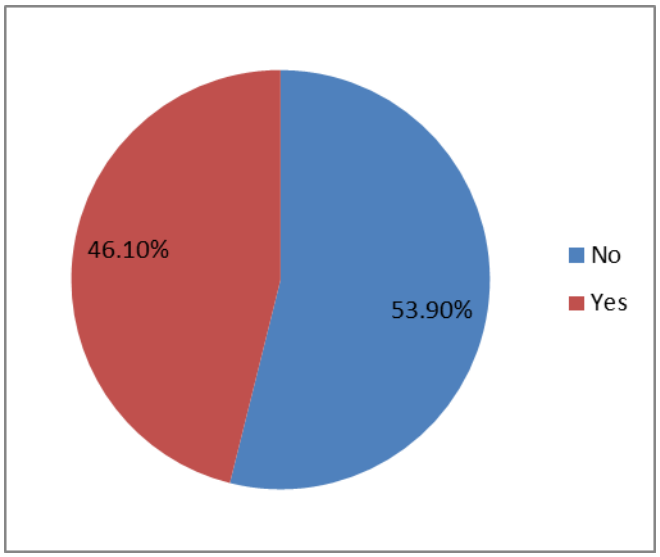

Figure 1: prevalence of OME

According to tympanometry on the right 49 % were type A, see details on figure 1

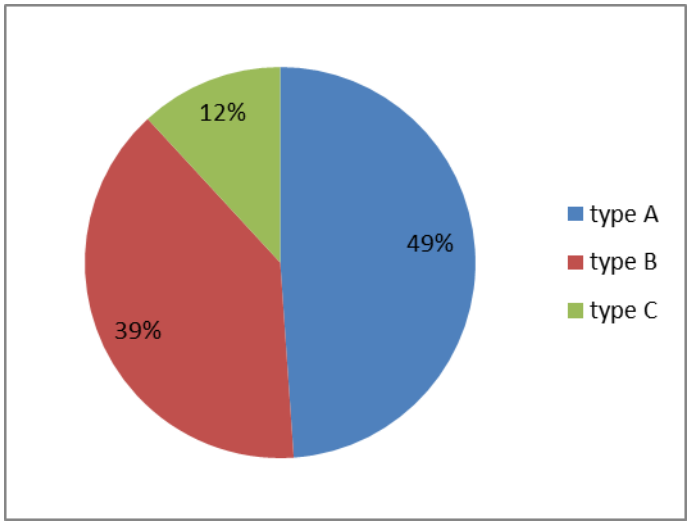

Figure 2: tympanometry results on the right

According to tympanometry on the left, 49.3% was type A, see details on figure 3

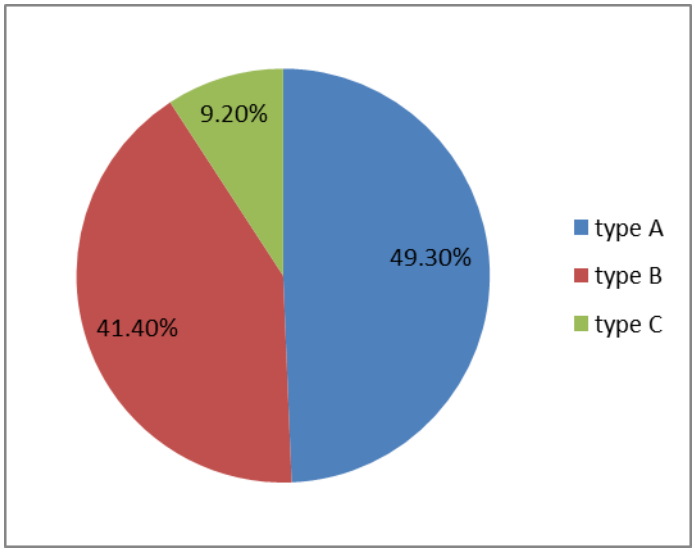

Figure 3: tympanometry result on the left

3.4. Risks factors for otitis media with effusion

In bivariate analysis, age group, province of origin, ubudehe category, history of sibling with Otitis media and overcrowded at home were showed to be associated with otitis media with effusion. But for multivariate analysis characteristics associated with otitis media with effusion were: age group with Comparably to Ubudehe category 1, Ubudehe category 2 OR: 45.391, [95% CI (1.444-36.539), P-value=0.003] and Ubudehe category 3 with OR: 29.378, [95% CI (1.444-36.539), P-value=0.008] and history of sibling with

Otitis media OR: 14.073, [95% CI (2.392-82.817), P-value=0.003]. However, patients with two characteristics were protected against otitis media with effusion: these are group of age of 4-8 years old comparably to patients below 4 years old with OR: 0.273, [95% CI (0.088-0.846), P-value=0.024], and being overcrowded at home with OR: 0.093, [95% CI (0.025-0.397), P-value=0.001] See details on table 3 below.

Table 3: Risks factors for otitis media with effusion

Characteristics	Frequency	Patients with OME(%)	*Bivariate analysis*			*Multivariate analysis*		
			OR	*(95%CI)*	*P*	*OR*	*(95%CI)*	*P*
Sex of participants								
Female	48	22(45.8)	1			***1***		
Male	104	48(46.2)	1.013	(0.510-2.012)	0.971	***0.599***	(0.248-1.444)	***0.253***
Age group								
Under 4 years old	114	59(51.0)	1			1		
4-8 years old	36	11(30.6)	**0.410**	**(0.185-0.992)**	**0.029**	**0.273**	**(0.088-0.846)**	**0.024**
Over 8 years old	2	0	-	-				
Province of origin								
East	20	5(25)	1			1		
Kigali	106	47(44.3)	2.390	(0.810-7.053)	0.115	0.681	(0.184-2.518)	0.565
North	12	8(88.7)	**6.000**	**(1.248-28.84)**	**0.025**	5.614	(0.680-46.360)	0.109
South	9	7(77.8)	**10.500**	**(1.620-68.072)**	**0.014**	6.910	(0.893-53.492)	0.064
West	5	3(60)	4.500	(0.576-	0.152	3.289	(0.264-40.967)	0.355

				35.153)				
Ubudehe category								
Category 1	14	2(14.3)	1			1		
Category 2	42	23(54.8)	**7.263**	**(1.444-36.539)**	**0.016**	**45.391**	**(1.444-36.539)**	**0.003**
Category 3	96	45(46.9)	**5.294**	**(1.124-24.935)**	**0.035**	**29.378**	**(2.381-362.481)**	**0.008**
Attending day care								
Yes	85	41(48.2)	1					
No	67	29(46.8)	*0.943*	*(0.490-1.817)*	*0.861*			
Sibling with OME								
No	102	42(41.2)	**1**			**1**		
Yes	13	9(62.1)	0.311	(0.090-1.077)	0.065	**14.073**	**(2.392-82.817)**	**0.003**
NA	37	19(51.4)	0.469	(0.123-1.796)	0.269	1.724	(0.669-4.444)	0.260
Parents with OME								
No	146	68(46.6)	**1**					
Yes	1	0	-	-				
NA	5	2(40.0)	0.765	(0.124-4.713)	0.772			

Previous AOM								
No	117	55(47.0)	1					
Yes	32	15(46.9)	0.995	(0.454-2.177)	0.989			
NA	3	0	-					
Smoking at home								
No	143	64(44.8)	1					
	9	6(66.7)		(0.594-				
Yes			2.469	10.260)	0.214			
Overcrowded at home								
No	19	16(84.2)	1			1		
Yes	132	54(40.9)	**0.130**	**(0.036-0.467)**	**0.002**	**0.099**	**(0.025-0.397)**	**0.001**
NA	1	0	-			-		
Bottle feeding								
No	36	16(43.2)	**1**					
Yes	2	0	-					
NA	114	54(48.6)	1.243	(0.588-2.631)	0.569			
Feeding while spine								
No	37	13(35.1)						
	4	3(75.0)		(0.522-				
Yes			5.538	58.756)	0.155			

NA	111	54(48.5)	1.749	(0.809-3.780)	0.155

3.5. Accuracy of otoscopy compared to tympanometry.

3.5.1 Sensitivity and specificity in detecting a diseased ear

The sensitivity and specificity were calculated according to the table below

Table 4: Right ear

	Tympanometry	
Pneumatic otoscopy	Positive	Negative
Positive	TP= 59	FP= 16
Negative	FN= 19	TN= 58

Table 5: Left ear

	Tympanometry	
Pneumatic Otoscopy	Positive	Negative
Positive	TP= 43	FP= 16
Negative	FN= 34	TN= 59

Specificity and sensitivity in detecting diseased ear

Senisivity on the right ear : 59/ (59 +19)= 75% sensitivity on the left ear: 43/(43+34)= 55%

Specificity on the left ear: 58/ (58+16) = 78 % specificity on the right ear: 59/ (59+16)= 78%

Sensitivity in general : 55%-75%

Specificity in general : 78%

Positive predictive value: 72.8%-78.6%

Negative predictive value: 63.4%-75%

3.5.2 Sensitivity and specificity in detecting OME

Sensitivity and specificity were calculated according to the below tables:

Table 6: Right ear

Pneumatic Otoscopy	Tympanometry	
	Positive	Negative
Positive	TP= 44	FP= 24
Negative	FN= 16	TN=68

Table 7: Left ear

Pneumatic Otoscopy	Tympanometry	
	Positive	Negative
Positive	TP= 41	FP= 17
Negative	FN= 22	TN= 72

sensitivity and specificity in detecting OME

Sensitivity : 65%-73%

Specificity: 73.7%- 80.8%

Positive predictive value: 64,7%-70.6%

Negative predictive value: 76.5%-80.9%

CHAPTER FOUR: DISCUSSION

In this study we found that 46.1% of patients were having OME. Chibuike Nwosu in Nigeria demonstrated an incidence of 55.9% and DR. ANTHONY MWANIKI KIAMA in Kenya showed an incidence of 67.3%. Comparing our findings to those two countries, we have a lower incidence of OME.One reason our prevalence is low is the fact that for the study done in Kenyatta the study population was from 1-8 years of age where the OME is common. The second reason the study done by Chibuike NWosu type B together with type C were considered as OME, this increases the incidence. Considering only type B the incidence was evaluated at 35%.

In evaluating the risk factors of OME in our study population, the age group (1-4 years) representing 59% of all patients and among them 51% was having OME. This group was highly associated with OME P value 0.024, this is the same finding to what A. K.LALWANI published, where the peak incidence of OME in his study was the group of 2-5 years.[2] In contrast Farhad J. Khayat et al showed a peak incidence at 5-6 years.[1]. The Group over 8 years is protected from OME this was similar to the study done by Humaid AH, he showed that presence of OME was dependent on age less than 8 years. It is physiologically explained why children over 8 years are protected as since 6 years of age adenoids tissue start to atrophy hence the function of Eustachian tube is improved.

The province of origin was also associated with OME. Kigali City accounted for 47% of the study population and among them 44.3% were having OME. CHUK is located in Kigali and this may explain why majority of the children were coming from the city due to the close proximity. However, children from Northern Province and Southern Province were having a high prevalence of OME, 88 % and 77% respectively. This can be due to the delay in consultation as they are coming from a remote area. Among category of Ubudehe in Rwanda; Categories representing economic status, the first three categories were represented in our study, and there are categories of the less rich people. , Ubudehe category 2 was with a P-value=0.003and Ubudehe category 3 with a P-value=0.008. Low socio-economic status, together with having a sibling with OME is associated with having OME which is comparable to the literature. (6) Factors like having a parent with OME, having a previous episode of AOM, smoking at home, bottle feeding and feeding while supine was not associated with OME. This can be due to the

small size of the sample. Living in an overcrowded home was also associated with developing OME.In multivariate analysis, OME was associated with the (1-4) age group, living in an overcrowded home, and having a sibling with otitis media with effusion. There were no association with place and sex.

Most prevalent symptoms for adenoids hypertrophy were snoring, sleep apnea, mouth breathing, hyponasal speech and daytime open mouth breathing at 96.7%, 94.1%, 88,2%, 53.3% and 82.5% respectively. Moderately presenting symptoms include diaphoresis 41.4%, drooling 44.1% and halitosis 46.1%. In less presenting symptoms, there is morning headache 3.3%, daytime somnolence 13.8%, poor weight gain 22.4 %, enuresis 26.3%. And less presenting symptoms were enuresis 26,3%, daytime somnolence 13.6%, morning headache 3.3%, dry mouth 30.3% and poor weight gain 26.4%. Knowing the frequency of prevalence can help in making the history clear after asking about the most presenting symptoms.

Orji FT1 showed in his study that pneumatic otoscopy produced 84.4% agreement with tympanometry in detecting OME. In our study we found a sensitivity ranging between 65%-73% and a specificity of 73%-80.8%. A positive predictive value of 64.7%-70.6% and a negative predictive value of 76.5%-80.9%. It is visible that the accuracy of excluding otitis media with effusion is elevated than the accuracy to confirm it. 68 patients were suspected to have OME by pneumatic otoscopy which show a dull tympanic membrane or bulging tympanic membrane. Among them 44 patients had a type B tympanic membrane, meaning 64%.

4.1 Conclusion:

Otitis media with effusion is highly prevalent in children with adenoid hypertrophy. Clinical examination can be reliable to exclude otitis media with effusion, hence OME can be diagnosed in even remote areas where there is no equipment to do tympanometry for confirmation. Adenoidectomy with ventilation tube insertion are the proper management of those patients.

4.2 Recommendations:

- **To ENT specialist and medical officers:** All patients presenting with features of adenoid hypertrophy should be evaluated for otitis media with effusion

- **To the ministry of health**: Awareness should be created in the general population about the risk factors for otitis media with effusion

REFERENCES

[1] F. J. Khayat, "Incidence of otitis media with effusion in children with adenoid hypertrophy," vol. 15, no. 2, 2011.

[2] P. Vanneste and C. Page, "Otitis media with effusion in children: Pathophysiology, diagnosis, and treatment. A review," *J. Otol.*, vol. 14, no. 2, pp. 33–39, 2019.

[3] A. Hiu, C. Chow, T. Cai, B. M. Id, and F. Y. Id, "Otitis media with effusion in children : Cross- frequency correlation in pure tone audiometry," pp. 1–13, 2019.

[4] F. Blanc, D. Ayache, M. N. Calmels, O. Deguine, M. François, N. Leboulanger, E. Lescanne, R. Marianowski, J. Nevoux, R. Nicollas, S. Tringali, N. Tessier, V. Franco-Vidal, P. Bordure, and M. Mondain, "Management of otitis media with effusion in children. Société française d'ORL et de chirurgie cervico-faciale clinical practice guidelines," *Eur. Ann. Otorhinolaryngol. Head Neck Dis.*, vol. 135, no. 4, pp. 269–273, 2018.

[5] E. M. Mandel and M. L. Casselbrant, "Antibiotics for otitis media with effusion," *Minerva Pediatr.*, vol. 56, no. 5, pp. 481–495, 2004.

[6] A. M. Kiama, "PREVALENCE OF OTITIS MEDIA WITH EFFUSION IN CHILDREN WITH OBSTRUCTIVE ADENOID DISEASE COMPARED WITH NORMAL CONTROLS AT KENYATTA NATIONAL HOSPITAL .," 2014.

[7] M. P. Orlando, M. A. Bonanno, F. Y. Russo, M. Ralli, R. Turchetta, F. M. Passali, A. Minni, A. Greco, M. D. E. Vincentiis, and M. Tattoli, "Correlation between otitis media with effusion and cranial deformation in children," *Eur. Rev. Med. Pharmacol. Sci.*, vol. 23, no. 1, pp. 55–59, 2019.

[8] O. Celebi, "prevalence of otitis media with effusion among primary schoool children in Black Sea, in Turkey and the effect of smooking in the development of otitis media with effusion,"India J otolaryngol head and neck surg ,vol.64 (1), pp. 17–21.

[9] O.-P. Alho, H. Oja, M. Koivu, and M. Sorri, "Risk Factors for Chronic Otitis Media With Effusion in Infancy: Each Acute Otitis Media Episode Induces a High but Transient Risk,"

Arch. Otolaryngol. - Head Neck Surg., vol. 121, no. 8, pp. 839–843, 1995.

[10] "Prevalence and risk factors of Otitis Media with effusion in school children in Qassim Region of Saudi Arabia. Humaid AH1, Ashraf AH2, Masood KA1, Nuha AH1, Saleh AD1, Awadh AM1. Author information," pp. 67–68.

[11] "risk factors of otitis media with effusion in children with adenoid hypertrophy," p. 2014, 2014.

[12] W. A. Adegbiji, S. K. Aremu, C. C. Nwawolo, and C. N. Asoegwu, "Current trends of adenotonsillar hypertrophy presentation in a developing country , Nigeria," vol. 3, no. 3, pp. 501–505, 2017.

[13] M. S. Ahmadi, "effect of adenotonsillar hypertrophy on paediatrics Nocturnal Enuresis," vol. 84, pp. 0–5,2013

[14] P. w FLINT., *CUMMINGS otolaryngology - head and neck surgery 5th edition volume 1 part1*. .

[15] F. Horiuchi, Y. Oka, K. Komori, Y. Tokui, T. Matsumoto, K. Kawabe, and S. Ueno, "effect of adenotonsillectomy on neurocognitive function in paediatrics obstructive sleep apnea syndrome," 2014.

[16] M. Morais-Almeida, G. F. Wandalsen, and D. Solé, "Growth and mouth breathers," *J. Pediatr. (Rio. J).*, vol. 95, pp. 66–71, 2019.

[17] C. Nwosu, M. U. Ibekwe, and L. O. Onotai, "Tympanometric Findings among Children with Adenoid Hypertrophy in Port Harcourt , Nigeria," vol. 2016, 2016.

[18] "Otoscopy compared with tympanometry : an evaluation of the simple otoscopy," vol. 16, no. 1, p. 17563970, 2007.

[19] K. Anwar, "Accuracy of tympanometry in detecting fluid in the middle ears of children at myringotomies," vol. 32, no. 2, pp. 466–470, 2016.

APPENDICES

Appendix one: Consent Form

Introduction:

We are conducting a research on prevalence of otitis media among patient with adenotonsillar hypertrophy. We would like your contribution. If you encounter any problem through the series of this questionnaire do not hesitate to ask us.

Purpose of the research

In order to improve health care, it is important to know the prevalence of diseases so that adequate measures for diagnosis can be adopted. It is for this reason we are conducting this research in order to know the prevalence of otitis media with effusion among children with adenotonsillar hypertrophy. This study will focus mainly on children from 1 year -12 years.

- To participate in the study you have to respond to a series of question on the following page
- The participation in the study is voluntary. There will be no negative consequences for not participating in the study
- It will take about 20 minutes to respond to the questions and have your child examined
- Participating in this research can be helpful by detecting otitis media with effusion in your child
- The information you will give will be kept in confidential, no one beyond the research team will have access your information

After understanding what the research is about and getting the time to ask about my concerns I accept to participate in the study.

NAMES……..

SIGNATURE……

DATE…….

I confirm that I explained well to the participant about the study.

NAMES……. SIGNATURE……..

Kwemera kujya mu bushakashatsi

Turi gukora ubushakashatsi ku ndwara z`amatwi ku bana bafite ibibazo byo guhumeka cyane cyane nijoro iyo baryamye. Twifuzaga ko mwabugiramo uruhare. Muramutse muhuye n`ikibazo icyo aricyo cyose ntimutindiganye kutubaza.

Kugira ngo duteze imbere ubuvuzi ni ngombwa kumenya ingano y`ubwoko ubu n`ubu bw`indwara kugira ngo ingamba zo kuyisuzuma no kuyivura zirushweho kunozwa. Ni muri urwo rwego turi gukora ubushakashatsi ku ngano y`indwara y`amatwi mu bana bafite ibibazo byo gufungana amazuru cyane cyane igihe basinziriye. Ubu bushakashatsi buzibanda ku bana bafite umwaka 1 kugeza ku myaka 12.

- Kwinjira mu bushakashatsi bisaba gusa gusubiza uruhererekane rw`ibibazo bikurikira
- Kujya mu bushakashatsi ni ubushake, nta ngaruka nimwe byakugiraho uramutse utagiye mu bushakashatsi
- Biragusaba iminota 10 kugira ngo usubize ibibazo ubazwa
- Kwemera kujya mu bushakashatsi bishobora ku kugirira akamaro byumwihariko. Hashobora kuboneka uburwayi by` amatwi ku mwana butari busanzwe buzwi
- Amakuru yose utanga azagirwa ibanga

Maze gusobanukirwa n`icyo ubushakashatsi no kubaza ibibazo byose nari mfite nemeye kujya mu bushakashatsi

AMAZINA NA SINYATIRE

ITARIKI….

Ndemeza ko nasobanuriye neza ushaka kujya mu bushakashatsi.

AMAZINA NA SINYATIRE

ITARIKI……

Appendix two: Questionnaire

1. Identification

- Hospital number
- Age
- Sex
- District

2. Diagnosis

a. History

a.1. symptoms during sleep:

- ✓ Snoring yes ☐ no ☐ N/A ☐
- ✓ Sleep apnea yes no N/A
- ✓ Enuresis (secondary enuresis) (general population) yes no N/A
- ✓ Diaphoresis yes no N/A
- ✓ Drooling yes no N/A
- ✓ Mouth breathing yes no N/A

a.2. Symptoms during the day

- ✓ Daytime somnolence yes no N/A
- ✓ Morning headache (above 3 yrs) yes no N/A
- ✓ Dry mouth yes no N/A

- ✓ Halitosis yes no N/A
- ✓ Hyponasal speech yes no N/A
- ✓ Open mouth breathing yes no N/A
- ✓ attending daycare yes no N/A
- ✓ nasal obstruction yes no N/A
- ✓ watery or purulent rhinorrhea yes no N/A
- ✓ sneezing yes no N/A
- ✓ poor weight gain yes no N/A

a.3.Behavioral symptoms

- ✓ Attention deficit (above 3 yrs) yes no N/A
- ✓ Aggressive behavior (above 3 yrs) yes no N/A
- ✓ Problem with academic performance (above 3yrs) yes no N/A

a.4. Ear related history

- ✓ having a sibling with otitis media yes no N/A
- ✓ previous acute otitis media yes no N/A
- ✓ Parent with a history of OME yes no N/A
- ✓ Hearing loss yes no N/A

a.4. Social history

- ✓ Economic status : icyiciro cy` ubudehe yes no N/A

- ✓ living in a home in which people smoke yes no N/A
    - If yes, how many _____
- ✓ overcrowded home: more than 1 person in room yes no N/A
- ✓ bottle feeding, yes no N/A
- ✓ feeding while supine yes no N/A

b. physical examination

b.1. general status :

- Craniofacial abnormalities yes no N/A

b.2 ENT examinations

- Adenoids grading
    - Grade I
    - Grade II
    - Grade III
    - Grade IV
- Tonsil grading
    - Grade I
    - Grade II
    - Grade III
    - Grade IV
- otoscopic findings
    - Normal tympanic membrane
    - Bulging of the tympanic membrane
    - Dull tympanic membrane
    - Mild tympanic membrane retraction
    - Severe tympanic membrane retraction

- Air-fluid levels

c. Tympanometry

-external auditory canal volume:

- Children 3-5 yrs: 0.4cc to 1.0cc
- Adult: 0.6cc to 1.5 cc

-type of tympanogram

- Type A
- Type B
- Type C