ACUTE OTORHINOLARYNGOLOGICAL INFECTIONS ASSOCIATED WITH FEBRILE SEIZURES AMONG PAEDIATRIC PATIENTS PRESENTING AT THE KENYATTA NATIONAL HOSPITAL

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A Dissertation submitted in partial fulfillment of the requirement for the award of Masters of Medicine degree in Otorhinolaryngology, Head and Neck Surgery in the University of Nairobi.

March 2022

STUDENT'S DECLARATION

This is my original work. It has not been presented for the award of degree in any other university nor has it been submitted for publication in any journal. Where I have used another person's work, I have carefully acknowledged and referenced.

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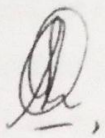

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Contents

LIST OF ABBREVIATIONS

AOM - Acute Otitis Media

CNS - Central Nervous System

ENT -Ear, Nose and Throat

FS - Febrile Seizures

GABA: - Gamma Aminobutyric Acid

GABS: - Group A Beta – hemolytic streptococcus.

KNH - Kenyatta National Hospital

ICU - Intensive Care Unit

IL -1β- Interleukin - 1β

ORL: -Otorhinolaryngology.

UON - University of Nairobi

URTI - Upper respiratory tract infection.

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OPERATIONAL DEFINITIONS

Child: A person aged between 6 months to 5 years presenting to the KNH paediatric unit for treatment.

Febrile Seizure: Febrile seizure (FS) is defined as an event triggered by fever in children between 6 months to 5 years of age without an underlying central nervous system disorder.

Fever: Increase in the normal body temperature over the normal value of an individual (greater than 38.0 degrees) axillary temperature.

Tonsillitis: Inflammation of the palatine tonsil glands as evidenced by presence of exudates, hyperemia, enlargement and pain.

ABSTRACT

Background: Febrile seizures (FS) are convulsions that are triggered by fever in children between 6 months and 5 years of age without an underlying central nervous system disorder. Acute Otorhinolaryngological infections have been observed as some of the causes of FS. This study aimed to identify acute otorhinolaryngological infections in patient presenting with FS in Kenyatta National hospital.

Broad objective: To describe the acute otorhinolaryngological infections in children presenting with febrile seizures at the Kenyatta national hospital.

Study population: The study involved children between the age of 6 months and 5 years presenting with FS.

Study Setting: The study was conducted at the Kenyatta National Hospital Paediatric acute care unit, paediatric medical wards and paediatric intensive care unit.

Methodology: This was a cross – sectional study involving 119 paediatric patients. Paediatric patients were recruited using consecutive sampling technique. Biodata was recorded in data collection sheet, history was taken and physical examination done with emphasis on ENT exam, type of seizure, files reviewed to identify other diagnosis made. Data was analyzed using descriptive statistics such as means and proportions and Pearson correlation test using SPSS version 22.

Results: There were 119 paediatric patients with age range of 6 months to 5 years. The prevalence of febrile seizures in paediatric patients with acute Otorhinolaryngological infections were 95.74% and 4.26% for simple and complex seizures respectively. The prevalence of acute otorhinolaryngological infections in paediatric patients with FS was 30.3%. Among acute otorhinolaryngological infections, pharyngotonsillitis was the commonest cause of FS at 34.04%. Others conditions were, acute pharyngitis, acute tonsillitis and acute otitis media. Most paediatric patients with acute otorhinolaryngological infection had simple febrile seizures at 95.74%.

Conclusion and recommendations: Acute otorhinolaryngological infections were the second commonest cause of FS in this study with pharyngotonsillitis accounting for majority of cases. The prevalence of acute otorhinolaryngological infections in paediatric patients with FS was 30.3%.

Simple FS were commoner than the complex FS accounting for 95% of the paediatric patients. Paediatric patients with acute otorhinolaryngological conditions were 22 times more likely to have simple than complex FS.

We advise pediatricians and emergency medicine clinicians to make otorhinolaryngological examination routine for early identification of the cause of FS

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background

Febrile seizures (FS) are seizures accompanied by fever (temperature > 38°C), occurring in children between 6-60 months of age, with peak incidence at 2 years without a central nervous system cause (1,2,3). The hyperpyrexia is sometimes not apparent until after the post ictal phase (2). Febrile seizures are categorized into two subtypes, complex and simple. A Simple seizure occurs once a day, is generalized and lasts less than 15 minutes. Complex seizures are focal, last for at least 15 minutes and occur more than once in 24 hours (1,3,4).

The prevalence of FS in America is approximately 3%–4%, 6%–9% in Japan, and 5%–10% in India (2). In Togo, a prevalence of 8.4% was found while in East Africa, the prevalence was found to be 2% in Tanzania, and 0.88% in Kenya (5,6,7).

Febrile seizures are a cause of parenteral anxiety and significantly cause mortality and morbidity (1, 8). Febrile seizures can be self-limiting and benign, hence require minimal treatment, or may be a sign of a serious illness (9). Febrile seizures potentiate a risk for neurologic and cognitive impairment hence doubles the risk of developing epilepsy in children (10).

1.2 Risk Factors of Febrile Seizures

The etiology of febrile seizures is variable. An interplay between environmental factors and genetic predisposition has a major role (3,11,12,13). Enhanced excitability of neurons early during development can predispose the child to seizures. Furthermore, children less than 3 years have reduced threshold to development of seizures (12,13). Febrile seizures are more likely to occur in prematurely born children and those of low socioeconomic background. In addition, 50% of children who present with febrile seizures have no identifiable risk factors

(14,15,16). Administration of some vaccines such as combined tetanus toxoid-diphtheria-pertussis, inactivated polio virus may increase temporarily the risk of febrile seizures over a few days after the administration (16,17).

The mechanism of FS remains unclear. First, hyperpyrexia alters the functions of many neurons, such as temperature-sensitive ion channels. This has an influence on neuronal firing and results in increased chance of generating neuronal hyperactivity i.e., seizures. An inflammatory process that includes secretion of cytokine in the brain and periphery has been shown to be part of the cascade. Secondly, it has been shown that hyperthermia and fever share a common pathway in provoking seizures: interleukin-1β, a fever-promoting pyrogen contributes to the development of fever which then leads to the production of this cytokine in the hippocampus. Furthermore, acting through both GABA (gamma aminobutyric acid) and glutamate receptors, interleukin-1β has been shown to increase excitability of neurons. In vivo, interleukin-1β promotes the actions of seizure-provoking agents (16,17,18).

1.3 Treatment

Febrile seizures are common in children between the ages of 6 and 60 months. The prognosis of almost all children is excellent. The risk of recurrence can be reduced significantly by the use of continuous antiepileptic therapy such as valproic acid, phenobarbital and intermittent therapy with diazepam, though the potential toxicity associated with antiepileptics outweigh the risks incurred with simple febrile seizures. In situations where parental anxiety after febrile seizures is severe, oral diazepam, intermittently administered during febrile illness is effective in preventing recurrence. Antipyretics improve the child's comfort, but doesn't prevent febrile seizures (1,7,12).

1.4 Complications

The risk of development of epilepsy in children presenting with simple febrile seizures is doubled (1%) compared to that in the general population (0.5%). This occurs if febrile seizures are recurrent, severe, and prolonged (1,19).

1.5 Otorhinolaryngological Causes of Febrile Seizures

Acute otorhinolaryngological infections do present with fever. The inflammatory markers which are pyrogens have been linked to febrile seizures. An example is IL-1β. In our study, the main otorhinolaryngological causes of febrile seizures include: tonsillitis, acute pharyngitis, acute otitis media amongst others.

1.5.1 Acute Tonsillitis

Acute tonsillitis is defined as inflammation of the palatine tonsils, predominantly due to infection (20). Chronic recurrent tonsillitis is defined as episodes of tonsillitis occurring more than 7 times a year for one year, or more than 5 episodes per annum for the preceding 2 years, or more than 3 episodes a year in the preceding 3 years, as per the Paradise criteria (20,21). Tonsillitis occurs more frequently in younger people, though it affects all age groups. Both sexes are equally affected. The peak incidence is observed in children of school going age, but it may occur at any age (21,22). The main period of acquisition of the immunity continues until the age of 6, during which the palatine tonsils are physiologically hyperplastic. They then regress until the age of 12 years (23).

The etiology of acute tonsillitis is viral in 50-80% of cases, for example; influenza, human adenoviruses, herpes simplex, rhinovirus and Epstein-Barr virus. The Lance field Group A beta-hemolytic streptococci are the commonest bacterial cause of acute tonsillitis accounting for 5-36% of cases. Hemophilus influenza and Neisseria gonorrhoeae are examples of other bacterial causes (22). Different types of pathogens are found depending on the age of the patient. In immunocompetent children, the commonest bacterial etiology is Streptococcus pyogenes (20–30%) (22,23). Candida species, a fungi can also cause sore throat in immune

deficient paediatric patients (20,24). The prevalence of bacterial tonsillitis, specifically beta-hemolytic streptococci, in Tanzanian children with sore throat is 15% to 30% (25). Symptoms of acute tonsillitis include, hot body, sore throat, dysphagia, odynophagia, ear pain, headache, malaise and odynophagia (22, 24). The signs include; fever, cervical lymphadenopathy, enlarged tender and hyperemic tonsils with tonsilloliths or tonsillar exudate. (25). Acute tonsillitis is a clinical diagnosis (20, 22).

Treatment entails analgesics and antipyretics for control of pain and fever respectively. Antibiotics are prescribed once bacterial infection is confirmed. Tonsillectomy is done for paediatric patients who do not respond to medical therapy (22,23,24).

1.5.2 Acute Otitis Media

Acute otitis media (AOM) is defined as an inflammation of the middle ear mucosa occurring within a period of two weeks (26). AOM is known to be the most common bacterial infection in children and hence, a common indication for antibiotic administration in this age group. Reports from Europe and the US indicate that approximately 62% of children up to the age of 1 year and 83% of children below the age of 3 years have had at least one episode of AOM (27). Peak incidence is noted between 6 and 15 months (28). Outcomes of AOM are varied ranging from a self-limiting infection to development of serious complications (27). Before the advent of antibiotics, complications of acute otitis media were a significant cause of child morbidity and mortality. The commonest bacterial etiology include: Streptococcus pyogenes, Streptococcus pneumoniae, Moraxella catarrhalis and Hemophilus influenzae. Streptococcus pyogenes and Streptococcus pneumoniae being the most common in paediatric patients presenting complications (26,28). The bacteria that colonize the nasopharyngeal region migrate to the middle ear through the pharyngotympanic tube, especially so during common cold and other viral infections. Approximately 10-15% of all children have had recurrent infections, defined as at least 3 bouts in 6 months or at least 4 bouts in a year (27).

Risk factors for AOM can be classified into environmental and host factors. Host factors include race, gestational age, craniofacial abnormalities and birth weight, while environmental factors include; socioeconomic status, passive smoking, pacifier use, breast-feeding and daycare attendance. The Frequency of infection with airway flora was shown to be associated with otitis media in the earlier years of life (26,27,29).

Diagnosis of AOM as per clinical guidelines:

a) A history of acute onset of symptoms and signs,

b) Presence of fluid in the middle ear, with a bulging tympanic membrane and absent or limited tympanic membrane mobility or presence of otorrhea or air-fluid level medial to the tympanic membrane.

c) Symptoms and signs of middle-ear infection such as, erythematous tympanic membrane, otalgia that interferes with sleep or normal activity (26,28).

Acute otitis media is an illness with a variable clinical sequela, ranging from a self-limiting illness to a fulminant infection with life-threatening complications. The main reason for antibiotic treatment of AOM, is to prevent complications (29). Over the past 25 years, guidelines for treatment of AOM in most countries have advocated for watchful waiting in most cases of AOM. (28,29)

Prescription of adequate analgesia is a universally agreed upon concept in the treatment of AOM. Some patient's groups have been shown to benefit more from antibiotics than others. These include: children under 6 or 12 months of age, paediatric patients with perforated ear drum and children less than 2 years of age with bilateral AOM (26,28,29).

1.5.3 Acute pharyngitis

Pharyngitis is inflammation of the pharynx and surrounding structures. It is characterized by inflammation of the nasopharyngeal, tonsillar and pharyngeal tissues. It accounts for at least 2% and 5% of all outpatient visits for adult and paediatric paediatric patients respectively.

The most commonly implicated bacteria are Group A beta-hemolytic streptococcus (GABHS). Viruses account for 80% of the cases, while the remainder are caused by bacterial and rarely fungal infections. Whereas viral pharyngitis is typically self-limiting with minimal sequalae, fungal and bacterial infections tend to be more severe. (30)

A comprehensive history and examination are key in diagnosing pharyngitis. Symptoms include, odynophagia, sore throat and fever. These symptoms typically peak within 3 to 5 days with resolution by day 10. Physical findings include; erythema, tonsillar hypertrophy and “cobble stoning” of the posterior pharyngeal wall which is suggestive of a viral etiology (31).

Symptoms of sore throat, acute onset of fever greater than 38 degrees, and exposure to Streptococcus in the preceding 2 weeks suggest GABHS. Pharyngeal erythema or exudates and cervical lymphadenopathy are common signs. Palatal ecchymosis is a highly specific sign but uncommon and a swollen uvula is at times noted. (30,31)

Laboratory investigation involves throat swab and culture, which is 90-95% sensitive. A full blood count reveals leukocytosis and neutrophilia in bacterial causes. Streptococcal antibody titers are not routinely recommended for diagnosis of streptococcal pharyngitis.

The Centor criteria for group A streptococcal pharyngitis includes enlarged and tender anterior cervical lymph nodes, tonsillar exudates, hyperpyrexia greater than 38.0°C and absence of cough. Modified Centor criteria included ages between 3 and 14 years as a predictive factor. Recent literature confirms the ineffectiveness of Centor criteria as a predictive factor for absence or presence of GABHS. (30,32,33)

Pharyngitis is self-limiting and resolves within a few days, even without treatment. Arguments for antibiotic treatment include; reduced communicability, acute symptomatic relief and prevention of suppurative or non-suppurative complications. Antibiotics also

shorten symptom duration by 16 hours and reduce the incidence of acute rheumatic fever. (32)

Complications are classified as suppurative and non-suppurative. Suppurative complications include; septic jugular vein thrombophlebitis, peritonsillar abscess, and Vincent angina while non suppurative complications include; acute glomerulonephritis, myocarditis, valvular heart disease, acute rheumatic fever, and pediatric autoimmune neuropsychiatric disorders. (31,32,33)

2.0 CHAPTER TWO:

2.1 Literature review

Otorhinolaryngological conditions are postulated to be an important source of infection in children presenting with febrile seizures. Common conditions associated with febrile seizures include tonsillitis, pharyngitis and otitis media.

There is however a paucity of studies especially in Africa on otolaryngological causes of febrile seizures in children (34)

Kinsella et al, in 1995 conducted a prospective study in two Dublin hospitals. The study, involved 47 children diagnosed with simple febrile seizures. The paediatric patients were reviewed by an ENT resident at least 6 hours after admission. Results indicated that 63 % of paediatric patients with febrile seizures had an otorhinolaryngological cause i.e., 18/47 (42%) children had acute tonsillitis while 9/47 (21%) children had ASOM (Acute Suppurative Otitis Media). In addition, the examination findings of the otolaryngology resident on the state of the throat and ears mostly differed with that of the admitting pediatric resident (34). In West Africa, Obi et al in a pediatric emergency unit at the university of Benin in Nigeria examined the pattern of febrile seizures. He did a 9-month prospective study of 1046 children. Otorhinolaryngologic causes (otitis media and upper respiratory tract infections) accounted for 18% of all causes of febrile seizures only second to malaria which accounted for 66%. The male to female ratio was 1.3:1. This was noted to be due to the premium attached to the male gender in the community, which lead parents to seek medical attention earlier for boys. The peak ages of incidence were 13 and 24 months (35).

Farwell et al, in Seattle Washington conducted a multicenter retrospective study involving 28 hospitals. They reviewed information gathered on first febrile seizures and to describe the characteristics of the child, the seizure and the illness. The male to female ratio was 2:1. The average age at first febrile seizure was 23.3 months. Otorhinolaryngologic causes of FS

accounted for 44% of the cases. Otitis media accounted for 32%, tonsillitis accounted for 12%). Febrile seizures were more common in the second year of life than any other time (36).

Pancharoen et al, in Thailand conducted a prospective study to evaluate the etiologies of pyrexia in children presenting with their first febrile seizure. Results indicated that URTI (Upper Respiratory Tract Infections), was the commonest cause of first febrile seizure (57.3%) in children aged between 3 months and 3 years (37).

Eskandarifar et al, in a cross-sectional study in Iran, involving 334 children aged 6-60 months found that URTI was the commonest (42.8%) cause of fever and seizures (38).

Assogma et al, from Togo conducted a multi-Centre prospective study among 308 paediatric patients. They found that Falciparum malaria contributed 52%, bacterial meningitis 14.95% while URTI contributed 10.4% of cases of FS (5).

In Tanzania, Storz et al conducted a prevalence study on 160 children between the age of 2 months and 7 years. In their study, they found the major causes of febrile seizures were mainly URTI 36%, followed by malaria (34%) and gastrointestinal causes at 19%. (6)

Idro et al did a prospective study in Kenya involving 879 paediatric patients. Their study showed that Falciparum malaria contributed to majority of cases of febrile seizures at 58%. Other associated illnesses were pyogenic meningitis, URTI, though the incidence was not reported. (7).

2.2 Study Justification

Febrile seizures are a significant cause of morbidity and mortality in children and may be the first indicator for seeking medical intervention in active infection. Otorhinolaryngological infections are a major cause of febrile seizure globally. This study provides data about these acute otorhinolaryngologic infections and association with febrile seizures among Kenyan Children, hence assist in algorithms used in diagnosis of febrile seizures by pediatricians.

Increase in awareness of otorhinolaryngological causes of febrile seizures results in prompt ENT consultations thus giving timely and comprehensive care to the paediatric patients. Also, the data contributes to the pool of knowledge on this condition, as such a study has not been done in Kenya before.

2.3 Utility of the Study:

This study determined the association between otorhinolaryngological infections and febrile seizures, hence provides pediatricians with a basis for searching for these conditions in children presenting with febrile seizures, with resultant prompt treatment, reduction of morbidity and timely referral to the otorhinolaryngologist when needed to.

2.4 Research Question

What are the acute otorhinolaryngological infections in paediatric patients presenting with febrile seizures in KNH?

2.5 Broad Objective

To describe the acute otorhinolaryngological infections in paediatric patients presenting with febrile seizures in KNH.

2.6 Specific Objectives

a) To determine the prevalence of acute otorhinolaryngological infections in paediatric patients presenting with febrile seizures.

b) To determine the types of acute otorhinolaryngological infections in paediatric patients presenting with febrile seizure at KNH.

c) To determine the types of febrile seizures seen in paediatric patients with acute otorhinolaryngological infections.

d) To correlate the type of febrile seizure with the presenting acute otorhinolaryngological infection.

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

This was a hospital based cross-sectional study.

3.2 Study Area

The study was conducted at the Kenyatta National hospital paediatric care units. The units included: paediatric acute care unit, paediatric ward and paediatric ICU (Intensive Care Unit)

3.3 Study Population

The study involved children between the ages of 6 months and 5 years presenting with febrile seizures.

3.3.1 Inclusion Criteria

1. Children with febrile seizures whose parents or guardians gave consent.
2. Children between the ages of 6 months and 5 years.

3.3.2 Exclusion Criteria

a) Children whose ages were below 6 months and above 5 years.

b) Children with neurological conditions for example cerebral palsy, epilepsy. These paediatric patients present with seizures commonly from a central nervous cause. According to the definition of febrile seizure, this should be excluded.

c) Children with congenital craniofacial syndromes.

d) Children with history of head injury and intracranial surgery.

3.4 Sampling Technique

Paediatric patients were recruited using consecutive sampling technique.

3.5 Sample Size Determination

Sample size was calculated using the Cochran formula (39),

$$n = \frac{Z^2 x\ P(1-P)}{d^2}$$

Where,

n = Desired sample size

Z = value from standard normal distribution corresponding to desired confidence level

(Z=1.96 for 95% CI)

P = expected true proportion (estimated at 8.4 %) from a study conducted by Assogba

et al (5).

d = desired precision (0.05)

$$n_0 = \frac{1.96^2 x\ 0.084(1-0.084)}{0.05^2} = 118$$

A total of 119 participants were recruited into the study which represents more than 100% of sample size.

3.6 Study Procedure/Recruitment

Paediatric patients who presented with febrile seizures at the paediatric care units were recruited into the study. The parents/guardian of these paediatric patients were informed of the study and informed consent sought as per appendix 1. Those children whose parents gave consent proceeded to have their clinical history obtained from the parents/guardian and physical examination including a focused ENT examination conducted on the patient and file reviewed. Covid protocols were observed (3.11). The following information was captured in the data collection sheet (appendix 2): Age, sex, temperature, type of seizure, episodes of

seizures, acute otorhinolaryngological infections and non-acute otorhinolaryngological infection.

2.7. Study flow chat.

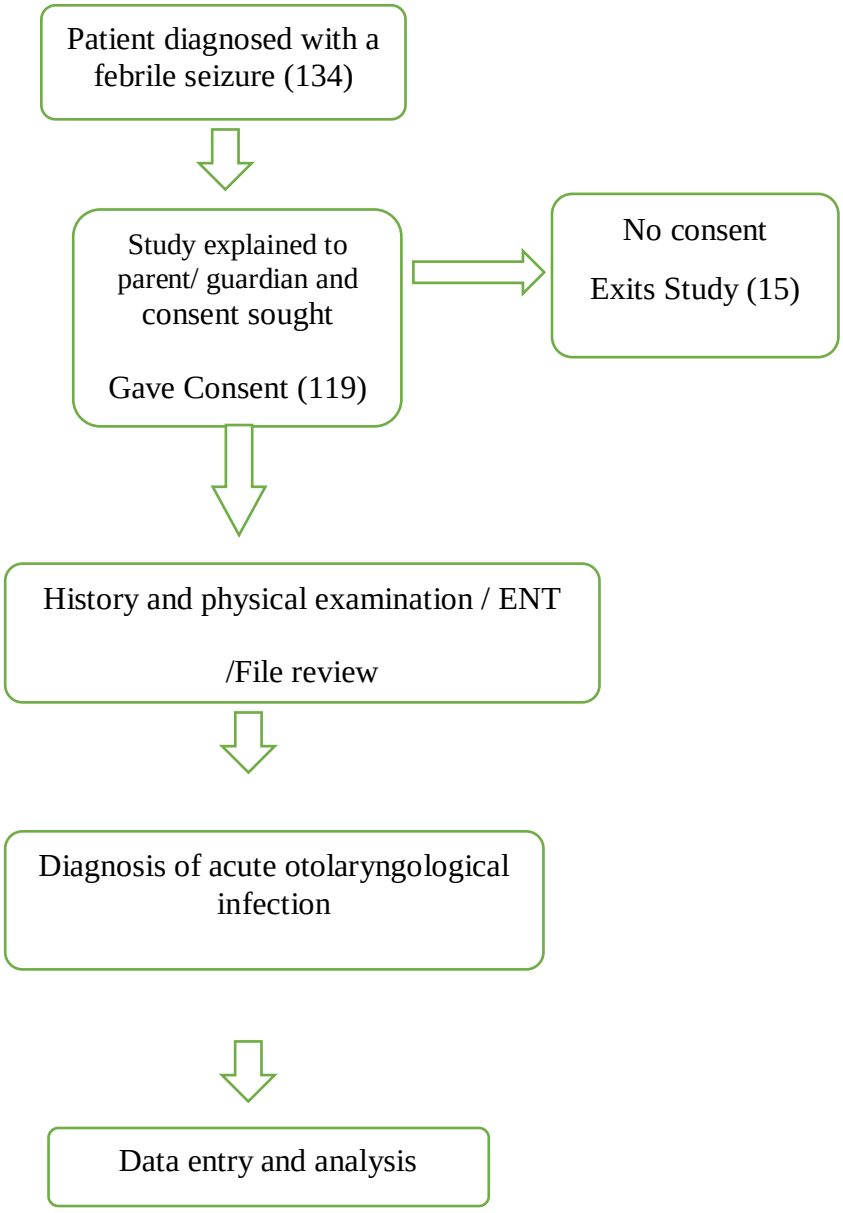

Figure 2 Study flow chart

3.8 Data management and analysis

Collected data was sorted cleaned, categorized and entered into STATA 22 for analysis. Biodata was analyzed using percentage and means. This was presented in form of charts and tables. Descriptive statistics such as means and proportions was used to describe the characteristics of the study population such as the spectrum of acute otorhinolaryngological infections and types of febrile seizures. The prevalence of acute otorhinolaryngological infections in paediatric patients presenting with seizures was presented as a proportion of all the paediatric patients presenting with seizures. Types of acute otorhinolaryngological infections were analyzed in percentages and presented in form of bar chart. The types of febrile seizures were analyzed in form of ratios to each other. To correlate the type of febrile seizure with the presenting otorhinolaryngological infections, Pearson correlation test was used. P values of <0.05 was considered statistically significant. Data was presented in tables, pie charts and bar-graphs.

3.10 Ethical Considerations

The study was carried out after approval by the KNH/UON (university of Nairobi) Ethics and Research Committee. Authority or permission was sought from the KNH administration after ethics approval. The study was explained to the parent and guardian. Informed consent was obtained once the parent or guardian had understood the objectives of the study. Those who were unwilling to participate in the study, continued receiving care without any discrimination. Data collected was kept confidential and used for research purposes only. Anonymity was maintained by using patient codes which have no similarity to patient names, phone numbers or any such identification. Results of the study will be made available to KNH, presented in medical conferences and published in medical journals for the benefit of

the medical profession. A soft copy of the dissertation will be available at the UON e-repository on the website (http:/erepository.uonbi.ac.ke).

There shall be no conflict of interest in this study.

3.11 COVID PREVENTION MEASURES

The study was conducted adhering to the COVID prevention measures strictly. The principal researcher, parents, guardian and children above two years were wearing face masks during the research process. During history taking, the patient and guardian maintained a distance of not less than 1.5m from the principal researcher. The principal researcher ensured he washed his hands with soap and water from one patient to another, before and after examination. Disposable gloves were worn during the examination. Physical contact was only when necessary and specifically during examination of the paediatric patients.

4.0 RESULTS

4.1 Distribution of paediatric patients according to gender.

Males accounted for majority of the paediatric patients at 69 (58%) while females accounted for 50 (42%) of paediatric patients as depicted in the pie chart below.

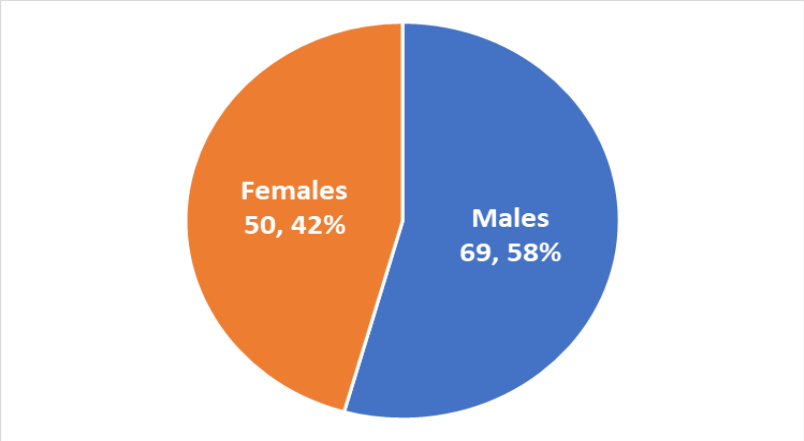

Figure 2: Gender of participants.

4.2 Distribution of paediatric patients according to age.

The age range of the paediatric patients was from 6 to 60 months, with a median age of 32 months. The mean age was 36 months (3 years). Children with age range of 25 – 36 months accounted for the majority of paediatric patients at 45.4%.

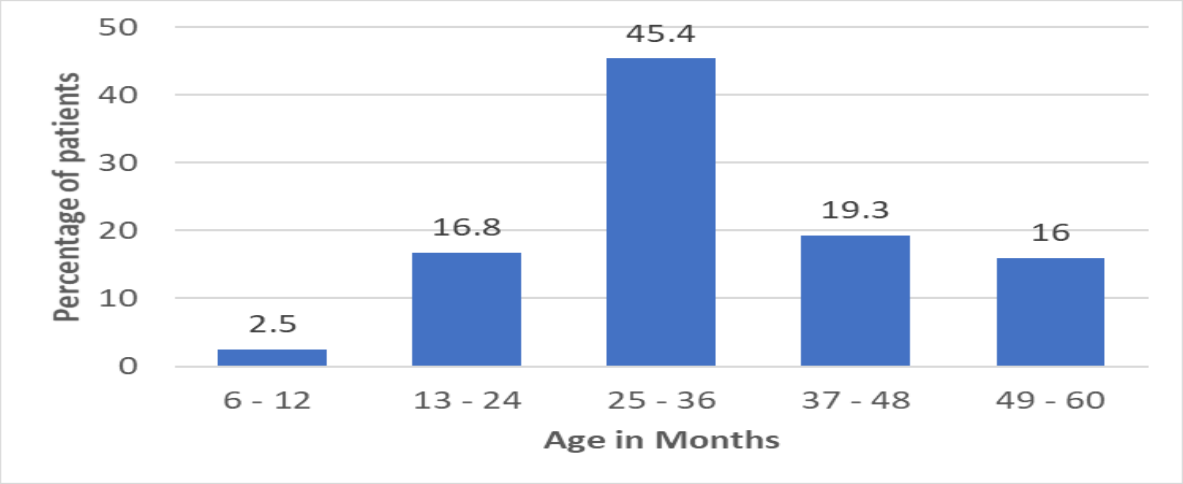

Figure 3: Age of paediatric patients

4.3. Causes of febrile seizures among paediatric patients.

4.3.1 Classification of causes of febrile seizures among paediatric patients.

Non otorhinolaryngological infections accounted for majority of cases at 53.8%. Some paediatric patients had a combination of otorhinolaryngological and non-otorhinolaryngological causes. An example is a patient with pharyngitis also presenting with pneumonia. Also, a number of paediatric patients did not have a clear identifiable cause. These accounted for 6.7% of participants as shown in table 3 below.

Table 3: **Classification of causes of febrile seizures among paediatric patients**.

CAUSES OF FEBRILE SEIZURES		
	Frequency	Percent
Acute otorhinolaryngological infection	36	30.3
Non Otorhinolaryngological infection	64	53.8
Combined Acute ORL infection and Non ORL cause	11	9.2
No identifiable cause	8	6.7
Total	119	100

4.3.2 Specific causes of febrile seizure among paediatric patients.

Malaria and pneumonia were the major causes of febrile seizures accounting for 15.27% each. The commonest otorhinolaryngological cause was pharyngotonsillitis accounting for 12.21%. It is of importance to note that Pharyngotonsillitis, acute tonsillitis, acute pharyngitis, which are also classified under upper respiratory tract infections accounted for the majority of paediatric patients cumulatively at 29.01%.

Table 4: **Specific causes of febrile seizures.**

Causes of Febrile seizures among paediatric patients		
	Frequency	Percent
Malaria	20	15.27
Pneumonia	20	15.27
Gastroenteritis	18	13.74
Pharyngotonsillitis	16	12.21
Acute tonsillitis	14	10.69
Acute pharyngitis	8	6.11
No Identifiable cause	8	6.11
Gastroenteritis & Malaria	6	4.58
Urinary tract infection	5	3.82
AOM	3	2.29
AOM/A. Tonsillitis	2	1.53
Meningitis	2	1.53
Post Vaccination	2	1.53
Malaria & Pneumonia	2	1.53
AOM/A. Pharyngitis	1	0.76
Mastoid Abscess	1	0.76
Neck Abscess	1	0.76
Post auricular abscess	1	0.76
Retroviral disease	1	0.76

4.3.3 Acute Otorhinolaryngological infections causing febrile seizures.

The top three otorhinolaryngological causes of febrile seizures were Pharyngotonsillitis, Acute tonsillitis and acute pharyngitis. These three accounted for 80.85% of otorhinolaryngological causes of febrile seizures. Some had more than one condition and this included, AOM & tonsillitis, AOM and Pharyngitis.

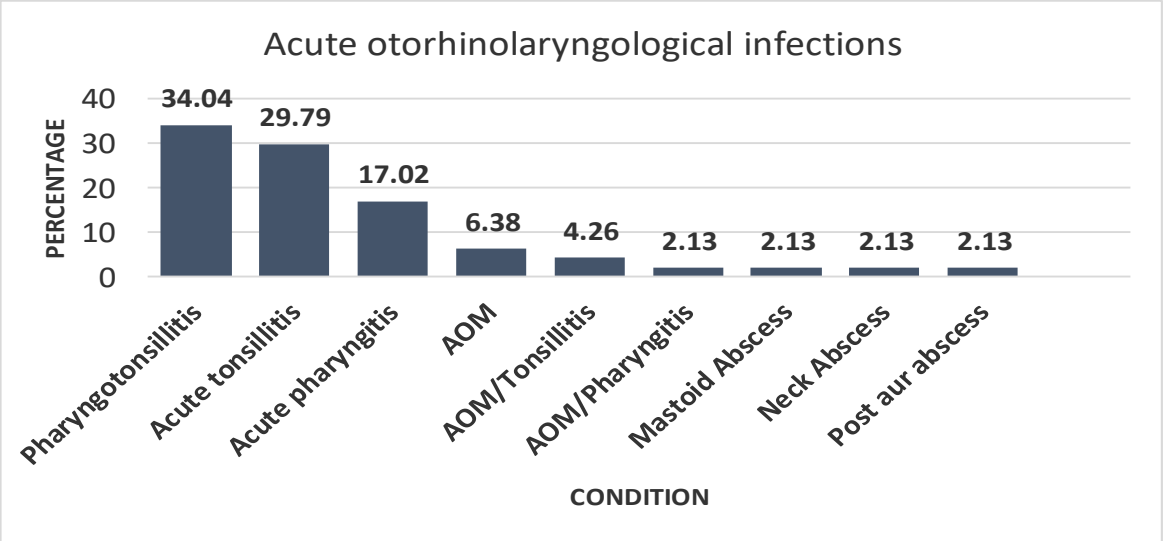

Figure 4: Acute Otorhinolaryngological infections causing febrile seizures

4.4. Types of febrile seizures.

4.4.1. Types of seizures seen among all paediatric patients.

More paediatric patients presented with simple febrile seizure (85.7%), compared to those who presented with complex febrile seizures at 14.3%. For most of the paediatric patients, this was the first episode which accounted for 79.4% and 52.9% of simple and complex febrile seizures respectively.

Table 1: **Types of seizures seen among all paediatric patients.**

Types of seizure seen in all paediatric patients				
	First episode	No of paediatric patients	Total paediatric patients	Percent
Simple	Yes	81(79.4%)	102	**85.7**
	No	21(20.6%)		
Complex	Yes	9(52.9%)	17	**14.3**
	No	8(47.1)		
Total		119	119	**100.0**

4.4.2 Types of seizures seen among paediatric patients with acute otorhinolaryngological infections.

Simple febrile seizures accounted for most of the convulsions among paediatric patients with acute otorhinolaryngological infections at 95.74%, compared to 4.26% in paediatric patients who had complex seizures. For paediatric patients with complex febrile seizures, both had experienced a previous episode of febrile seizure. For paediatric patients with simple febrile seizures, the seizure was the first episode as depicted in table 2 below.

Table 2: **Types of seizures seen among paediatric patients with acute otorhinolaryngological infections.**

Type of seizure in paediatric patients with acute otorhinolaryngological infections.				
	First episode	No of paediatric patients	Total paediatric patients	Percent
Complex	Yes	0	2	**4.26**
	No	2		

Simple	Yes	45	45	**95.74**
	No	0		
Total		47	47	**100**

4.5 Correlation of type of seizure among paediatric patients with acute otorhinolaryngological infections:

Simple febrile seizures were the most common. These accounted for 95.74% of the paediatric patients who presented with febrile seizures. Only two paediatric patients who had acute tonsillitis and post auricular abscess had complex seizures. Paediatric patients with acute otorhinolaryngological infections are more likely to have simple seizures compared to complex febrile seizures ($P<0.05$)

Table 5: **Correlation of type of seizures with the acute otorhinolaryngological infection.**

CORRELATION OF TYPE OF SEIZURE WITH ACUTE OTORHINOLARYNGOLOGICAL INFECTIONS		
	TYPE OF SEIZURE	
Condition	Complex	Simple
Acute tonsillitis	1(7.14%)	13(92.86%)
Post auricular abscess	1(100%)	0(0%)
Acute pharyngitis	0(0%)	8(100%)
Pharyngotonsillitis	0(0%)	16(100%)
Acute otitis media	0(0%)	3(100%)
AOM/A. Pharyngitis	0(0%)	1(100%)
AOM/A. Tonsillitis	0(0%)	2(100%)
Mastoid abscess	0(0%)	1(100%)
Neck Abscess	0(0%)	1(100%)
Total	2(4.26%)	45(95.74%)
Pearson Correlation		P = 0.009

5.0. DISCUSSION:

Febrile seizures are seizures that occur when a patient has fever (temperature > 38°C). These commonly affect children aged between 6-60 months of age, with peak incidence at 2 years without a central nervous system cause (1,2). The seizures are classified into complex and simple febrile seizures. A Simple seizure occurs once a day, is generalized and lasts less than 15 minutes. Complex seizures are focal, last for at least 15 minutes and occur more than once in 24 hours. This study was carried out in a tertiary referral hospital, with the aim of describing acute otorhinolaryngological infections in paediatric patients presenting with febrile seizures.

In this study there was male preponderance, with males accounting for the 58% of the paediatric patients, while females accounted for 42%. Worldwide studies have shown a male preponderance in paediatric patients who suffer from febrile seizures (1). Storz et al study found males to be more than females at 52% which is similar to our study findings (6).

The paediatric patients age range was 6 to 60 months in this study, but those of younger age, were more affected by febrile seizures than those older than 36 months.

Paediatric patients with age range of 25 – 36 months accounted for the majority of participants at 45.4%. Those less than 36 months accounted for more than 64% of the paediatric patients. Febrile seizures were more common in children younger than 36 months with a peak of 12 – 18 months. This is likely due to the susceptibility of the developing brain to the effect of fever and other pyrogenic inflammatory markers that act as neurotransmitters like interleukin (IL)-1β (6,40). In a similar study by Komi et al, children less than 3 years of age were the most commonly affected and constituted 65.9% of all paediatric patients (41). Storz et al also found the peak of presentation of febrile seizures to be 2.2 years, those less than 3 years accounting for two thirds of the cases (6). These two

studies show similar findings to our studies in terms of peak age and majority of affected paediatric patients.

The causes of acute febrile seizures are multifactorial. In our study we found that non otorhinolaryngological infections accounted for 53.8% of paediatric patients with febrile seizures, while acute otorhinolaryngological infections accounted for 30.3% of paediatric patients. The commonest non otorhinolaryngological causes were Malaria and pneumonia which accounted 15.27% each, followed by gastroenteritis at 13.74 %. A metanalysis done by Vesani et al found upper respiratory tract infections as the commonest cause at 42.3% followed by gastroenteritis accounting for 21.5% (1). The metanalysis involved studies done in Europe in which malaria is not endemic. This could explain the difference in our findings of malaria being one of the commonest causes. Among otorhinolaryngological causes, pharyngotonsillitis was the commonest cause and accounted for 12.2% of the cases. In the Vesani et al study, they classified conditions as upper respiratory tract infection and not the specific otorhinolaryngological infections. Upper respiratory tract infection accounted for the majority of causes of febrile seizures at 42.3% (1). It is of importance to note that Pharyngotonsillitis, acute tonsillitis, acute pharyngitis, which are also classified under upper respiratory tract infections accounted for the majority of paediatric patients cumulatively at 29.01% in our study.

A study done in Tanzania by Storz et al, found upper respiratory tract infections, malaria and gastroenteritis to be the top three causes of febrile seizures at 36%, 34 and 19% respectively (6). This corresponds to our study that found upper respiratory tract infections (Pharyngotonsillitis, acute tonsillitis, acute pharyngitis) to account for 29.01% and malaria accounting for 15.27% to be among the commonest cause of febrile seizures.

Pharyngotonsillitis was the commonest acute otorhinolaryngological infection that caused febrile seizures accounting for 34.04% of paediatric patients. This was followed by acute

tonsillitis and pharyngitis at 29.79% and 17.02% respectively. We found no study analyzing acute otorhinolaryngological infection causes of febrile seizures independently from other causes. Though, through extrapolation from Storz et al study in Tanzania, otorhinolaryngological causes were the commonest causes of febrile seizures accounting for 36.4% (6). Other acute otorhinolaryngological infections that caused febrile seizures included acute tonsillitis, acute pharyngitis, acute otitis media and Abscesses: mastoid and neck abscess.

More paediatric patients presented with simple febrile seizure at 85.7% compared to those who presented with complex febrile seizures at 14.4 %. Vesani et al in a metanalysis found the prevalence of simple febrile seizures to be more at 69.3% as compared to complex seizures at 28.3% (1). A similar study by Alexander et al found that, simple febrile seizures accounted for 80% of convulsions compared to complex febrile seizures at 20% (42). Our study which found a prevalence of simple febrile seizures to be more at 85.7%, than complex febrile seizure at 14.3% corresponds with the two studies" finding above.

Simple febrile seizure was commoner in paediatric patients with acute otorhinolaryngological infection than complex, at 95.74% and 4.26% respectively. A patient with acute otorhinolaryngological infection was more likely to get simple febrile seizure than complex febrile seizure with $P < 0.05$. In a study done in Nigeria by Adama et al, simple febrile seizures accounted for majority of paediatric patients at 82.4% (42). This is similar to our study where majority of paediatric patients had simple febrile seizures. Our percentage is higher because in the analysis, Adama et al, included non-otorhinolaryngological causes of febrile seizures which do cause seizures via direct brain involvement while we have looked at the acute otorhinolaryngological causes. (40)

6.0 CONCLUSIONS

Acute otorhinolaryngological infections were the 2nd commonest cause of febrile seizures in this study. The prevalence of acute otorhinolaryngological infection among paediatric patients presenting with febrile seizures was 30.3%. Among acute otorhinolaryngological infections, pharyngotonsillitis was the commonest cause of febrile seizures followed by acute tonsillitis. Abscesses including, post auricular and neck abscess were the least common cause of febrile seizures.

Simple febrile seizures were more common than complex seizures and accounted for 95.74% of the paediatric patients with acute ORL infections versus 4.26% for complex seizures. Paediatric patients with acute otorhinolaryngological infections were 22 times more likely to have simple febrile seizure than complex febrile seizure.

7.0 RECOMMENDATIONS

Our findings show that acute otorhinolaryngological infections are the 2nd commonest cause of acute febrile seizures. Most of these conditions are diagnosed via clinical examination which is faster than other conditions that need laboratory work to confirm. We advise pediatricians and emergency medicine doctors to consider making otorhinolaryngological examination routine to assist in early identification of the cause of febrile seizures before ordering for further laboratory investigations. Those found with otorhinolaryngological infections, especially if recurrent they should be referred to the ENT specialist for review and treatment.

For children with febrile seizures clinicians should be looking for otorhinolaryngological infections like pharyngotonsillitis, tonsillitis, pharyngitis and acute otitis media as some of the common causes.

TIMELINES

Table 6: Study timelines

	January - July 2020	August- Sept 2020	July- Aug 2021	Aug –Nov 2021	Dec 2021- Jan 2022	Feb2022
Proposal Development						
Proposal presentation						
Ethical Approval						
Data Collection						
Data Processing and Analysis						
Results presentation						

BUDGET

Table 3: Study budget

Particular	Amount (Ksh)
Stationery	20,000
Statistician	35,000
Dissemination fee	25,000
Miscellaneous fee	20,000
Total	**100,000.00**

Budget was funded by the principal researcher.

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APPENDICES

Appendix I: Consent Form

STUDY TITLE: ACUTE OTORHINOLARYNGOLOGICAL INFECTIONS ASSOCIATED WITH FEBRILE SEIZURES AMONG PAEDIATRIC PAEDIATRIC PATIENTS PRESENTING AT THE KENYATTA NATIONAL HOSPITAL

PRINCIPAL INVESTIGATOR: Dr. Gerald Psinen Rotich (Postgraduate student in Ear Nose and Throat Surgery, University of Nairobi**)**

SUPERVISORS:

Professor Isaac Macharia

Dr. Elaine Yuko

Introduction

Febrile means having fever or hotness of body. Seizures are jerky movements of the body due to excessive excitement of the brain function. Therefore, Febrile seizures jerky movement of the body in children with high fever.

Some of the causes of this fever, are from the infection of the ear nose and throat. We are trying to identify children with febrile seizures who have these ear, nose and throat infections. By identifying this, it will assist paediatricians and ENT specialists manage this patient promptly and comprehensively.

In this form, we provide of information needed about the research. We request you to go through it and ask any questions that you may have before agreeing to participate

in this study. The information we obtain from this study will help us in the future to improve the care we give to paediatric patients by identifying paediatric patients at risk early enough and also by showing the role of the otorhinolaryngologist in prevention of febrile seizures.

Purpose of the study:

The study aims to identify children with febrile seizures who have ear, nose and throat infections. By identifying this, it will assist paediatricians and ENT specialists manage this patient promptly and comprehensively.

Description of the study.

Before taking part in this study, you will be allowed to ask questions about this study. All your concerns will be addressed and once satisfied you will be given a consent form that you will sign to accept your child to participate in this study. The principal researcher will take your details which include demographic data, your medical history and examination of the ear, nose and throat exam. The principal investigator will record his findings in a document.

Risks involved.

This study will be done in the most medically accepted way. No risks involved, no additional charges will be incurred and no treatment shall be withdrawn if your child does not participate in this study or if you drop your child out of the study.

Benefits:

The information provided will assist in comprehensive management of paediatric patients with febrile seizures and acute ear and nose infections. In case there is any ear, nose and throat disease identified during the study in your child, you will be offered consultation by an ENT specialist for free.

Confidentiality:

We will use a code to identify your child as the study participant. You child's name or a number that can lead to breach of confidentiality will not be used.

Payments

You will not incur any extra costs above your child's normal treatment nor receive any monetary benefits.

Use of data collected

The information obtained from the study will only be shared only after it has been authorized by KNH – UON Ethics committee. The information will be shared in scientific forums like journals, conferences and specialities meeting that involve management of paediatric patients with febrile seizures and acute otorhinolaryngological infections.

Rights as a participant

You can voluntarily withdraw your child from the study at any time without any penalty.

Investigator's declaration

I as the principal investigator declare that I have not received any financial payments, nor the supervisors have received any financial payment from any pharmaceutical company or any other institution to finance this study that may compromise the study.

In case you have any questions please feel free to seek information through the contacts given below;

The Chairperson

The Kenyatta National Hospital /University of Nairobi – Ethics and Research Committee **(KNH/UON - ERC**)

Telephone no. 027263009 Ext. 44355

Supervisors

Prof. Isaac M. Macharia

Professor and Consultant Otorhinolaryngologist,

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Dr. Elaine Yuko

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P O Box 29838-00202, Nairobi

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P O Box 2134-00100 Nairobi

University of Nairobi

Barua pepe: gpsinen@gmail.com

Nambari ya simu: 0726706927

Part II: Consent/ Assent Statement

I ……... give consent for my child …….. to take part in this study, the nature of which has been explained to me by Dr. Psinen Rotich. I have been informed and have understood that my child's participation is entirely voluntary and I understand that I am free to withdraw my consent at any time if I so wish and that my withdrawal will not compromise the care given to my child.

Signature/ left thumb print(self)……

Date……

Study Number…….

Part III: Researcher's Statement

I, the undersigned, have fully explained the relevant details of this research study to the participant. The participant has understood what the research study entails and has willingly given consent.

Name ……...

Signature ……Date……

Day/Month/Year

APPENDIX II: IDHINI

FOMU YA IDHINI

Utangulizi

Febrile seizures ni aina ya kifafa, ambacho kinatokana na kuwa na joto kwa mwili. Dalili za ugonjwa huu ni kuwa na joto mwilini na kifafa wakati mtoto ako na joto. Kuwa na ugonjwa katika masikio, mapua ama masikio kunaweza kusababisha hii.

Katika utafiti huu tunataka kuangalia vile ugonjwa wa febrile seizures unasababishwa na shida za mapua, masikio na koo.

Ndio sababu tunakusihi kama ni sawa na wewe uweze kukubali tuweze kufanya huu utafiti kwa mtoto wako.

Katika fomu hii tunakupatia maelezo juu ya huu utafiti. Tunakuomba uangalie haya maelezo na uulize maswali nayo kabla kukubali kuwa mmoja wa wale watafanyiwa huu utafiti.

Sababu za utafiti

Kusudi la utafiti huu ni kutambua shida kwa mapua, masikio na koo, kwa watoto wenye febrile seizures. Majibu kutoka utafiti huu yatasaidia kuwatibu wagonjwa walio na febrile seizures na shida za mapua, koo na masikiol.

Maelezo ya Utafiti

Kabla ya kukubali kushiriki katika utafiti huu, utapewa nafasi ya kuuliza maswali juu ya huu utafiti. Maswali yako yote yatajibiwa na kama utaridhika, basi utapewa fomu ya idhini ambayo utatia sahihi ya kukubali mtoto wako afanyiwe huu utafiti. Mtafiti mkuu atajukua historia ya kidemografia na juu ya ugonjwa wa mtoto wako. Mtafiti pia atapima mtoto kwa mapua, masikio and koo.

Hatari zinazohusika

Utafiti huu utafanya kwa njia ya kimatabu inayokubalika. Utafiti hautaathiri mtoto wako vibaya kwa namna yoyote na hakuna madhara yaliyofichika katika ushiriki katika utafiti huu. Hautatumia pesa zozote katika utafiti huu, ila tu hile ya matibabu yako ya kawaida. Kama utakataa kushiriki Matibabu hayaondolewa.

Faida
Taarifa tunayopata kutoka utafiti huu itatusaidia kutibu wagonjwa wa febrile seizures vizuri. Kama mtoto wako atakuwa na shida yoyote ya mapua, masikio ama koo, ataweza kupata kuonekana na daktari mtaalamu wa mapua, masikio na koo bila kulipa ada ya kuona mtaalamu huyo.

Siri
Tutatumia nambari ya siri katika utafiti huu. Jina la mtoto wako halitatumika ama nambari yenye itaweza kuvunja siri ya maelezo utakayotupatia ama majibu ya utafiti.

Mali
Hutapata gharama yoyote zaidi ya ile ya matibabu ya mtoto wako wala kupokea faida yoyote ya kifedha.

Matumizi ya Data
Matokeo ya huu utafiti yataweza kutolewa kwa mikutano ya kisayansi baada kukubaliwa kufanya hivo na shirika kuu la maadili ya kisayansi la hospitali kuu ya Kenyatta na chuo kikuu cha Nairobi (KNH – UON ethics committee).

Uhuru wa mshikiri.
Unaweza kuondo mtoto wako kwa hiari wakati wowote bila adhabu yoyote katika utafiti huu.

Tamko la Mtaalam
Mimi kama mchunguzi mkuu natangaza kuwa hakuna malipo ya kifedha niliopokea wala wasimamizi au hospitali ya Taifa ya Kenyatta kutoka kwa kampuni yoyote ya dawa au kampuni nyingine yoyote ili kufanya utafiti huu.

Tafadhali jisikie huru kutafuta maelezo ya ziada kupitia anwani zilizopewa hapa chini;

Unaweza kupata uchambuzi wa utafiti huu na maelezo zaidi kutoka kwa:

Mwenyekiti

KNH/UON Ethical and Research Committee

Hospitali Kuu ya Kenyatta,

Nambari ya simu: 2726300-9 Ext.44355

Wasimamizi wa utafiti:

Profesa Isaac Muthure Macharia

Profesa wa upasuaji wa maskio , mapua na koo

Idara ya upasuaji, kitengo cha upasuaji wa maskio, mapua na koo

Chuo kikuu cha Nairobi

Anwani: 2134-00100 Nairobi

Daktari Elaine Yuko

Daktari wa upasuaji wa maskio, mapua na koo

Idara ya upasuaji, kitengo cha upasuaji wa maskio, mapua na koo

Hospitali Kuu ya Kenyatta

Anwani: 29838-00202, Nairobi

Mtafiti mkuu

Daktari Psinen Rotich

Mwanafunzi wa upasuaji wa maskio, mapua na koo

Chuo kikuu cha Nairobi

Barua pepe: gpsinen@gmail.com

Nambari ya simu: 0726706927

(ii) Sehemu ya pili– Idhini ya mgonjwa

Mimi (Jina)…….. Mzazi wa……...kwa hiari yangu, nimekubali kushirikisha mtoto wangu katika utafiti huu ambao unafanywa na Daktari Psinen Rotich. Nimeelezwa manufaa na madhara ya utafiti huu kwa undani na nimeelewa.

Jina la Mzazi wa mgonjwa……

Sahihi……...

Tarehe (Siku/Mwezi/Mwaka) ……...

Nambari ya utafiti…….

iii) Sehemu ya tatu – Kiapo cha mtafiti

Naapa yakwamba nimeelezea mgonjwa/ mzazi wa mgonjwa manufaa na madhara yote yanayohusu kusajiliwa katika utafiti huu. Mgonjwa/ mzazi ameelewa yote yanayohitajika na yanayohusu utafiti huu na usajili wake/ wa mtoto wake. Idhini yake imepewa kwa hiari yake bila kulazimishwa au kuahidiwa pesa, zawadi au matibabu ya ziada.

Jina la mtafiti……

Sahihi……..……Tarehe……

Appendix III: Data Collection Sheet

Study number …… Age: …… (years) …. (months) Sex: Male…...Female…

Part A: History and examination

1. What is the highest recorded temperature? (degrees Celsius) ……

2. What is the type of febrile seizure does patient have?

Simple ☐ Complex ☐

3. (a) Is this the first episode of seizure the patient has had? YES NO

(b) If **NO** in 3(a) above, what is the number of previous episodes of seizures the child has had?.....

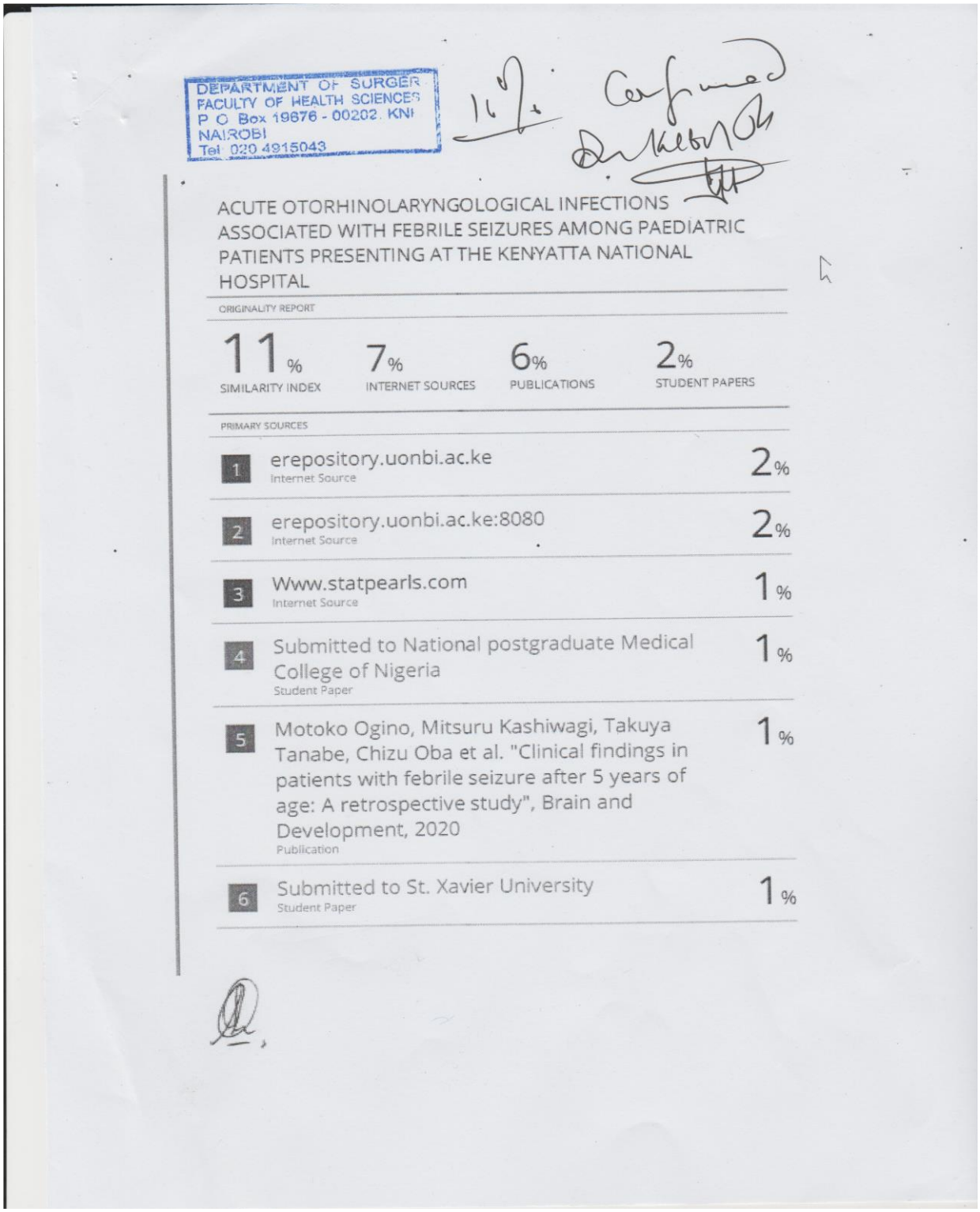
4. **What acute Otorhinolaryngological infections does the child has?**

	Yes	**No**
1. Acute otitis media		
2. Acute tonsillitis		
3. Acute pharyngitis		

5. **Is there any Other otorhinolaryngological diagnosis the child has? (Please Specify)……**

6. **Does the child have Non-ORL otorhinolaryngological diagnosis (Please Specify)…….....**

PLAGIARISM REPORT



DEPARTMENT OF SURGERY
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Confirmed

ACUTE OTORHINOLARYNGOLOGICAL INFECTIONS ASSOCIATED WITH FEBRILE SEIZURES AMONG PAEDIATRIC PATIENTS PRESENTING AT THE KENYATTA NATIONAL HOSPITAL

ORIGINALITY REPORT

11%	7%	6%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	erepository.uonbi.ac.ke Internet Source	2%
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3	Www.statpearls.com Internet Source	1%
4	Submitted to National postgraduate Medical College of Nigeria Student Paper	1%
5	Motoko Ogino, Mitsuru Kashiwagi, Takuya Tanabe, Chizu Oba et al. "Clinical findings in patients with febrile seizure after 5 years of age: A retrospective study", Brain and Development, 2020 Publication	1%
6	Submitted to St. Xavier University Student Paper	1%

ETHICAL APPROVAL

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Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
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Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/18

17th January, 2022

Dr. Gerald Psinen Rotich
Reg. No. H58/80949/2015
Dept. of Surgery
Faculty of Health Sciences
University of Nairobi

Dear Dr. Rotich,

RESEARCH PROPOSAL: ACUTE OTORHINOLARYNGOLOGICAL INFECTIONS ASSOCIATED WITH FEBRILE SEIZURES AMONG PAEDIATRIC PATIENTS PRESENTING AT THE KENYATTA NATIONAL HOSPITAL (P693/08/2021)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P693/08/2021.** The approval period is 17th January 2022 – 16th January 2023.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Dean-Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Chair, Dept. of Surgery, UoN
Supervisors: Prof. Isaac M. Macharia, Dept. of Surgery, UoN
Dr. Elaine Yuko, Consultant Otorhinolaryngologist, KNH