# PREVALENCE OF ALLERGIC RHINITIS AMONG SECONDARY SCHOOL PUPILS IN KINONDONI DISTRICT

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**MMed (Otorhinolaryngology) Dissertation**
**Muhimbili University of Health and Allied Sciences**
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# PREVALENCE OF ALLERGIC RHINITIS AMONG SECONDARY SCHOOL PUPILS IN KINONDONI DISTRICT

**By**

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**Dissertation submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Otorhinolaryngology) of Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences**
**October 2017**

## CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: "***Prevalence of allergic rhinitis among secondary school pupils in Kinondoni district***" in (partial) fulfillment of the requirements for the degree of Master of Medicine (Otorhinolaryngology) of the Muhimbili University of Health and Allied Sciences.

……..

**Dr. Victor MASHAMBA**

(Supervisor)

Date……

## DECLARATION AND COPYRIGHT

I, Dr. Sweety Bindiya AUBROO declare that to the best of my knowledge this dissertation is my original work, and has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature…… Date……

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## DEDICATION

This dissertation is dedicated to Father Bheesum, Mother Mouneza and Sister Preety Shabana for their love, Support, Inspiration and Patience.

## ABSTRACT

**Introduction:**

An estimation of about 1.4 billion people are suffering from allergic rhinitis worldwide. Allergic rhinitis (AR) is a common debilitating disorder that can adversely affect the quality of life and the academic performance of school-age children. It is a condition that has a growing impact on every day medical practice, as its prevalence has steadily increased during the last decades.

The burden of this disease has been on the rise according to recent ongoing studies. The quality of life of people with the condition is significantly affected, but there is very limited information on its pattern and magnitude in East Africa.

**Broad Objective**:

The aim of this study was to determine the prevalence of allergic rhinitis among secondary school pupils in Kinondoni district, Dar-es-salaam.

**Methodology:**

This was a community based cross-sectional prospective study that was conducted in secondary schools in Kinondoni district, Dar-es-salaam over a period of six months between August 2016 and January 2017 using random sampling method. Data was collected using a pre-tested coded questionnaire and analyzed using SPSS statistical computer software version 21.

**Results:**

A point prevalence rate of 34.7% was reported with a female predominance with 15-16 age group predilections in this study. Sneezing (65.9%) was the commonest nasal symptom and hypertrophied inferior turbinate (61.8%) the commonest physical finding. The commonest aeroallergen was the house dust mite (77.3%) and the least was dog fur (5.9%).

**Conclusion:**

Allergic rhinitis affects a significant proportion of the adolescent population with symptoms which have a negative impact on the lifestyle of these participants. The common aeroallergens are found within our immediate surroundings e.g. house dust mite, which can be controlled if participants are educated and proper clean environmental control measures are instituted.

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## ABBREVIATIONS

| Acronym- | Definition of Abbreviations |
|---|---|
| AR - | Allergic Rhinitis |
| ARIA - | Allergic Rhinitis and its Impact on Asthma |
| ORL - | Otorhinolaryngology |
| MNH - | Muhimbili National Hospital |
| MUHAS - | Muhimbili University of Health and Allied Sciences |
| WHO - | World Health Organization |
| USA - | United States of America |
| SPSS - | Statistical Package for Social Sciences |
| MD - | Doctor of Medicine |
| MMED - | Masters of Medicine |
| SAR - | Seasonal Allergic Rhinitis |
| PAR - | Perineal Allergic Rhinitis |
| PAF - | Platelets Activating Factor |
| IgE - | Immunoglobin E |
| LTRAs - | Leucotriene Receptor Antagonists |
| IL - | Interleukin |
| ISAAC - | International Study of Asthma and Allergis in Childhood |
| HDM - | House Dust Mite |
| SPT - | Skin-Prick Testing |
| OME - | Otitis Media with Effusion |
| SD - | Standard Deviation |
| URTI - | Upper respiratory tract infections |
| SPSS - | Statistical Program Software for Social Sciences |

# 1 INTRODUCTION

## 1.1 Background

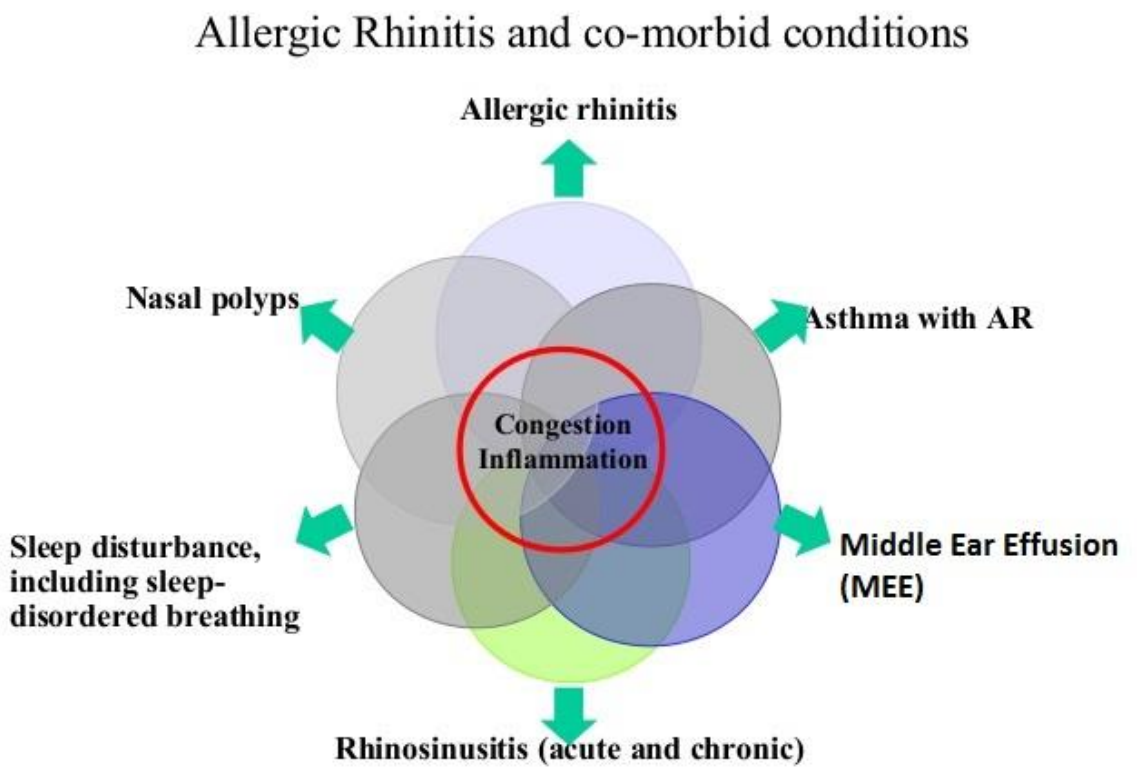
Allergic rhinitis (AR) is an atopic disease with growing impact on everyday medical practice, as its prevalence has steadily increased during the last decades (1). The WHO (World Health Organization) classifies allergic disease as the forth most important chronic disease in the world. It is associated with significant morbidity and impact the quality of life of millions of individuals. Lost productivity at work or school and total healthcare expenditure exceeds several billion dollars annually in United States.

Allergic rhinitis is frequently ignored, under diagnosed, misdiagnosed, and mistreated, which not only is detrimental to health but also has social costs (2) with an estimation of >$6 billion spent on prescription medications alone (3). The total burden of allergic rhinitis lies on impaired physical and social functioning and also in a financial burden for treatment of its co-morbid diseases (4).

AR symptoms should be a red flag for a potentially serious lifelong effect, as the younger the child, the greater the likelihood of suffering severe and persistent disease and its related co-morbidities later in life (5). The negative effect of early symptoms should not be downplayed. Allergic Rhinitis is one of the most common as well synonyms of hay fever, which commonly arise as a response to allergens such as pollen, dust, animal dander (old skin) and mold. Classic symptoms of Allergic Rhinitis manifests as nasal congestion, nasal itch, rhinorrhea (runny nose), sneezing, and itchy eyes.

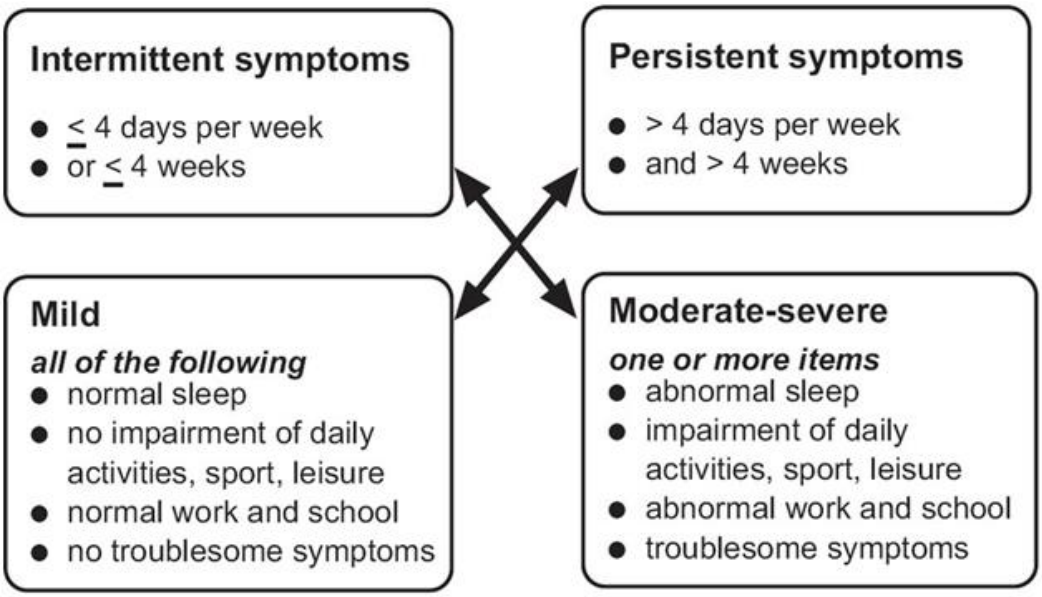
Allergic rhinitis is divided into seasonal and perennial. Seasonal rhinitis is a disease particularly of teenagers and young adults and appears to be less common in primary and preschool age children. In seasonal rhinitis, with relevant grass pollen sensitization, the link between allergen exposure and rhinitis is clear cut. However, in other situations such as perennial rhinitis and house dust mite allergen sensitization, the link between symptoms and allergen exposure is less certain (6).

Allergic Rhinitis (AR) has major co-morbidities in patients includes asthma, nasal polyps (NP), adenoid hypertrophy, tonsillitis, hypertrophied turbinate, conjunctivitis, rhinosinusitis (RS), otitis media with effusion (OME) and sleep apnea (7–9). Patients suffer from insomnia snoring, and obstructive sleep apnea syndrome, which result in daytime somnolence, fatigue, irritability, depression, reduced productivity and memory and learning deficit. There is a strong correlation between severity of rhinitis symptoms, particularly nasal obstruction, and sleep impairment. Treatment of AR results in better sleep, reduced daytime somnolence, and improved quality of life (10).



### 1.1.1 ARIA Classification of Allergic Rhinitis

The latest classification of allergic rhinitis divides this disease into two groups: intermittent and persistent: (adopted from ARIA 2008 guideline)




### 1.1.2 Predisposing factors

Hereditary: If both parents have allergic tendency there is a high incidence of allergy in their offsprings (11).

Hormonal: Since it begin in puberty and increases during pregnancy, a hormonal basis is possible (12).

Climate: Change in humidity and atmospheric pollution (13).

Emotional: Psychological factors may affect the nose.

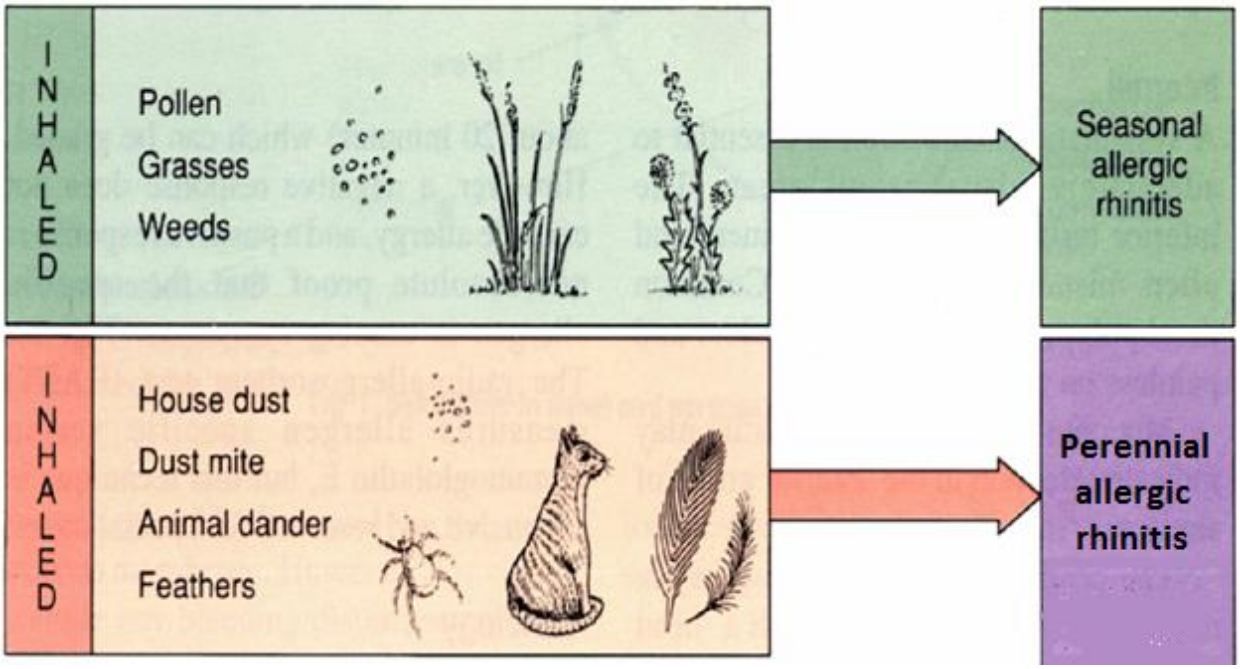
### 1.1.3 Aetiology

Hay fever is the type of Allergic rhinitis triggered by the pollens of specific seasonal plants and it is most prevalent during haying season (haying - the season for cutting, drying and storing grass as fodder).

However, it is possible to suffer from hay fever throughout the year especially in tropical African countries there is no specific seasonality.

Predominant causes of hay fever are the tiny, hardly visible pollens of wind-pollinated plants and this varies from region to region and among individuals.

The common allergens are pollens, Fungi, Animal dander and anthropods.



### 1.1.4 Pollen

Plants usually produce a huge amount of pollens daily. Those with bright flowers are of less concern to this part because their pollen are transferred mainly by insects so they are less responsible to hays.

Common plants allergens to human includes the following; Oleaceae, Plantanaceae, Salicaceae and Ulmaceae.

**Fungi (Moulds)**

Based on in vitro assays and skin tests, approximately 20-30% of atopic individuals are sensitized to one or more fungal allergens.

The 10 most common allergenic fungi are:- Alternaria, Bipolaris (Helminthosporium), Cladosporium, Aspergillus, Penicillium,Epicoccum, Fusarium, Stemphylium, Botrytis and Curvularia.

**Animal Dander**

The mammalian hair, feathers, furs and other secretions are important sources of allergens.

Common Allergenic Animals (Mammals and Birds) includes:- Passeriformes, Galliformes, Rodentia, Marsupialia, Insectivora, Perissodactyla and Artiodacyla.

**Ingestants**

These are protein sources which when eaten can trigger an episode of allergic reactions, these include: e.g. milk and eggs.

In general those are plants, fungi and animals which when happen to be inhaled or eaten they can trigger an episode of hay fever (14).

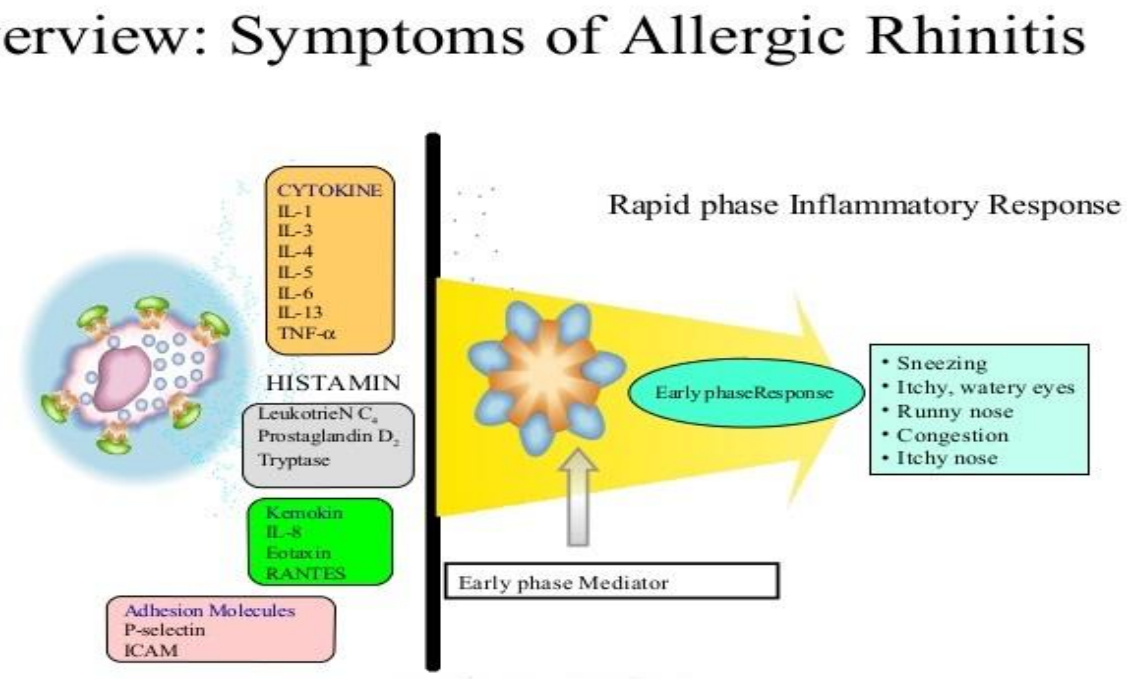
### 1.1.5 Clinical presentation

The following exposure to antigen, patients usually experience itching within seconds, which is soon followed by sneezing.

Rhinorrhea ensues, and within about 15 minutes, nasal congestion peaks.
In addition to nasal symptoms, patients often complain about ocular itching, tearing, pharyngeal itching, throat clearing, cough, and ear popping.

Other commonly reported symptoms include postnasal drip, increased lacrimation, dry cough, red eyes, headaches (pressure) over the paranasal sinus areas, and loss of smell or taste.

Other Signs and symptoms of allergic rhinitis include the following; itching: ears and palate, postnasal drip, anosmia, headache, earache, tearing, red eyes, eye swelling, fatigue, drowsiness and malaise. These symptoms are nonspecific and have significant clinical overlap with other disorders.




**Other Specific symptoms and signs of allergy rhinitis:-**

- Allergic salute
- Nasal crease
- Allergic shiners (infra orbital skin darkness)
- Denne's lines
- Mouth breathing
- Pale boggy inferior turbinate
- Allergic conjunctivitis, asthma
- Asthma

### 1.1.6 Physical examination

Nasal manifestations of allergic rhinitis can include the following:

Nasal crease: A horizontal crease across the lower half of the bridge of the nose; caused by repeated upward rubbing of the tip of nose by the palm of hand.

Swelling of the nasal mucosa or hypertrophic turbinate.

Pale, thin, watery nasal secretions

Manifestations of allergic rhinitis offending ears, eyes, and oropharynx include the following:

**Ears**: Retraction and abnormal flexibility of the tympanic membrane

**Eyes**: Injection and swelling of the palpebral conjunctivae, with excess tear production; Dennie-Morgan lines (prominent creases below the inferior eyelid); and dark circles around the eyes (“allergic shiners”) which are related to vasodilatation or nasal congestion

**Oropharynx**: "Cobblestoning," that is, streaks of lymphoid tissue on the posterior pharynx; tonsilar hypertrophy; and malocclusion (overbite) and a high-arched palate (15).

### 1.1.7 Diagnosis

The diagnosis of allergic rhinitis is made through revelation of clinical symptoms and signs during history taking and physical examination. Diagnosis rests on a detailed history, nasal and chest examination and tests for specific IgE (16).

AR is defined as the presence of signs and symptoms of clinical rhinitis, including watery anterior rhinorrhea, nasal obstruction or congestion, nasal pruritus, and sneezing, especially paroxysmal (according to standard questionnaire) (17). Post-nasal drip, pallor and swelling of the nasal and turbinate mucosa not due to a recent common cold could improve clinical diagnosis. Patients with two or more of the mentioned suggestive symptoms for more than 1 hour on most days were clinically diagnosed as having AR (17).

Clinical rhinitis was then confirmed by a positive skin-prick test (SPT)

A positive SPT result could confirm the robust clinical diagnosis of AR, and negative results were considered as non-AR (18). Skin prick test is the most sensitive test for allergies.

**A laboratory test which may be used in substantiation of the diagnosis of allergic rhinitis includes the following:**

Allergy skin tests (immediate hypersensitivity testing): An in vivo method of determining immediate (IgE-mediated) hypersensitivity to specific allergens is considered a primary method for identifying specific allergic triggers of rhinitis (15).

Radioallergosorbent test (RAST): Indirectly measures the quantity of immunoglobulin E (IgE) serving as an antibody to a particular antigen.

Investigations which may help to confirm the diagnosis includes allergic skin test and IgE levels in the blood as well as test for nasal infiltration.

Total serum IgE levels are helpful in the in vitro diagnosis of allergic rhinitis. High total IgE level suggests that in vitro testing would confirm specific sensitizations in patients with allergic rhinitis but this result can be more helpful when combined with other factors (19).

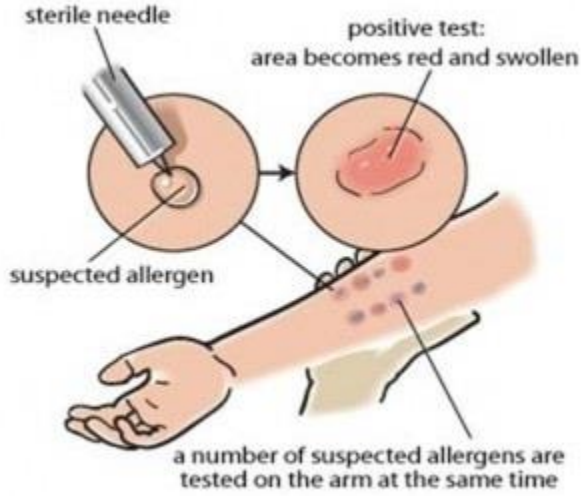
Total blood Eosinophils count: This is neither sensitive nor specific for the diagnosis, but, as with total serum IgE, eosinophil counts greater than 80cells/ml in an individual with clinical signs and symptoms of rhinitis are likely to correlate with an atopic etiology (20).

**SPT and Interpretation:**

**Skin prick testing (SPT)** - the primary mode of skin testing for immediate IgE-mediated allergy. It is widely practiced, carries very low (but not negligible) risk of serious side effects to patients and provides high quality information when performed optimally and interpreted correctly (21).

Patient needs to be in a comfortable position, with the forearms or back at a convenient height to do the test, an enquiry should be made about medications that the patient is taking. Patients must avoid antihistamines and other interfering drugs as well as skin moisturizers prior to the procedure. The area to be tested should be exposed with no risk of clothing brushing across the test area and wiping the test solutions. Results from the skin prick test can be interpreted within 15-20 minutes (21).

**Medications that can interfere with skin prick testing such as** antihistamines; corticosteroid should be stopped 5 to 7 days prior to scheduled skin testing.







Positive test: Skin is red 


### 1.1.8 Complications

Allergic rhinitis leads to significant short term and long term complications. Uncontrolled symptoms of allergic rhinitis lead to sleep loss, learning impairment, reduced cognitive function and decrease quality of life (22).

Allergic rhinitis also results in bad breath, a husky voice and sore throats, it worsens snoring and the tendency to sleep apnea in adults, it causes abnormal development of the mouth and teeth from chronic mouth breathing. The result is often in a high arched palate, crowded teeth and high

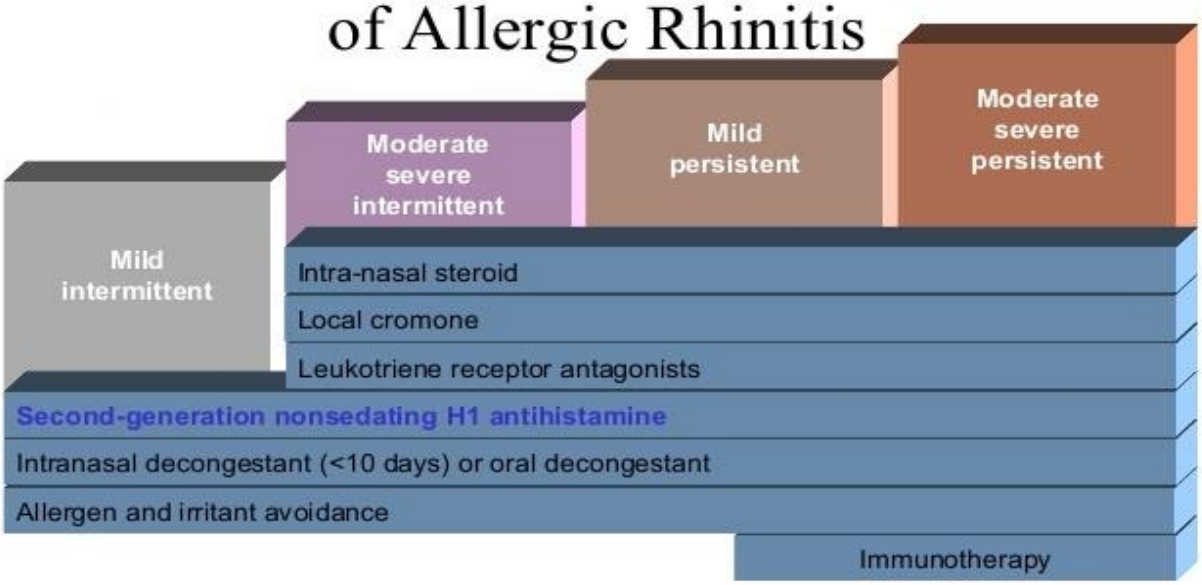
dental costs, and results in eye infections because people rub itchy eyes. Some will even become allergic to eye drops of the preservative in the bottle (23,24).
If these allergic rhinitis is unsuccessfully treated, chronic state of inflammation, obstruction, and infection develops can cause mucosal damage and, ultimately, chronic disease such as sinusitis and otitis media with effusion (22).

The long term complication which has been associated with this condition includes sinusitis, otitis media, nasal polyposis, turbinate hypetrophy, respiratory infections and orthodontic malocclusions (25).

### 1.1.9 Allergic rhinitis therapy

Management includes irritant and allergen avoidance and pharmacotherapy. Mild intermittent symptoms can be managed by non-sedating antihistamines and more troublesome symptoms by topical nasal corticosteroids. Immunotherapy is currently reserved for severe disease, although it can also reduce the progression to asthma. Surgery is rarely necessary (16).

# ARIA Guidelines: Recommendations for Management of Allergic Rhinitis




ARIA = Allergic Rhinitis and its Impact on Asthma.
Bousquet et al. *J Allergy Clin Immunol.* 2001;108 (5 suppl):S147.

## 1.2 Literature review

The global burden of allergic rhinitis has been on the rise especially in developed and industrialized countries but there is little information on these trends in Tanzania and East Africa as whole more precisely among the adolescents.

An estimation about 1.4 billion people are suffering from allergic rhinitis worldwide.

**Prevalence of Allergic Rhinitis**

In the global synthesis of international studies of asthma and allergies in children reveals that the global average prevalence of AR in children aged 6-7 years was 8.5 % and13-14 years was 14.6% (26,27)

The prevalence of allergic rhinitis differs among age groups. During childhood allergic rhinitis is found to be more numerous in boys but in adulthood is more frequent in women (28,29)

Allergic rhinitis is one of the most common chronic diseases in childhood. Allergic disorders are encountered with a variable prevalence in different parts of the world. The prevalence of AR has increased in recent decades (30,31). About 20-40 million people in the USA alone are estimated to be affected (32) . This condition has significantly influence the quality of life in people suffering from it due to its clinical manifestations and co morbidities (7–9).

Allergic rhinitis is very common in children and adolescent however there is significant number of adults who are also suffering from this condition. Asthma and allergic rhinitis are common health problems that cause major illness and disability worldwide. The prevalence of allergic rhinitis is estimated to range from 10% to 20% in the USA and Europe (33).

Allergic rhinitis has been noted to have a high prevalence in the Western European countries such as Belgium, France, Germany, Italy, Spain, and the UK (34).

In Münster, Germany, two cross-sectional surveys 5-years apart (1994/1995, 1999/2000) was conducted to assess time trends in symptoms of allergic rhinitis among 6-7 and 13-14 year olds. Study stated to have an increase in the prevalence of allergic symptoms, which occurred more in girls than in boys in both age groups (35).

Another study done in Poland prevalence of AR was noted to be 23.6% in children aged 6-7 years, 24.6% in 13-14 years old and adults with this disease were 21% (36).

In a follow up study to find out the trends of AR in Africa a high prevalence of AR was noted in Cape Town, Reunion Island, Brazzaville, Urban Ivory Coast, Conakry, Casablanca, Wilays of Algiers, Sousse and Eldoret (37).

A cross-sectional Study in Lebanon in 2009 with 3,115 students (13-14 yr) selected from 13 schools in 5 Lebanese provinces to determine prevalence and characteristics of allergic rhinitis among Lebanese school children where by prevalence of allergic rhinitis was 45.2% (38).

In Africa a study which was done in South Africa for adolescents, from 1995 to 2002 has shown that there was increase prevalence of symptoms of Allergic rhinitis in a 12 month period from 30.4% in 1995 to 38.5% in 2002. This study was comparing the cross-sectional data from two international studies of Asthma and allergies (39).

In a follow-up study done in Kenya, there was a rise in prevalence of Allergic rhinitis in school children aged 13-14 yrs from 14.9% in 1995 to 38.6% in 2001 (41)**.**

Females seem to have higher prevalence of the disease, this finding has been seen in several studies done in various countries (42–45).

**Symptoms of Allergic Rhinitis**

A cross-sectional surveys conducted in 1994 and 2002 respectively in 8 areas in northern and central Italy, to evaluate prevalence changes for asthma, allergic rhinitis among 13- to 14-year-old adolescents revealed symptoms of allergic rhinitis in adolescents has a prevalence that changed 4.1% to 6.3%, it had a rapid change but with uncertain causes (46).

A cross-sectional Study in Lebanon in 2009 with 3,115 students (13-14 yr) selected from 13 schools in 5 Lebanese provinces to determine prevalence and characteristics of allergic rhinitis

among Lebanese school children where by prevalence of symptoms of allergic rhinitis 45.2% (38).

In a study that was done among South African adolescents Cape Town assessed time trends in the symptoms allergic rhinitis resulted as a 12-month prevalence of symptoms of allergic rhinitis in 1995 vs. 2002 to be 30.4% vs. 38.5%), rhinoconjunctivitis (17.6% vs. 24.3%) both increased significantly. Limitation of daily activity from nasal symptoms (22.3% vs. 37.8%) and with an increase in the prevalence of allergic symptoms occurred in girls and boys (39).

The prevalence and severity of allergic rhinitis symptoms in 4947 pupils aged 13-14 years attending 30 schools in socioeconomically diverse areas of Cape Town 33.2% in 2004. Girls had a significantly higher prevalence of all symptoms than boys (47).

A cross-sectional health survey, in the municipality of Copenhagen was conducted in 2012 to determine the prevalence of hay fever among children in different age groups and examine the associations with parental socioeconomic position. prevalence of allergic rhinitis increased with increasing age from 3.1% among children aged 3 years to 21.3% among children aged 15 years (48).

In 2012 a study conducted in Tanzania, showed a prevalence of 14.7%, of which 92.6% manifested with co-morbidities that included adenoid hypertrophy, hypertrophy of inferior turbinate, nasal polyps, otitis media and sinusitis. Sleep disturbance was noted to be common in children with adenoids hypertrophy (49).

**Common allergens causing allergic rhinitis**

**Indoor Allergens**

**Animal dander**: Hypersensitivity in proximity to animals has also been known for a long time. A variety of animals can lead to sensitization. The major cat allergen, Fel d I, is found in the saliva and pelts of cats, and because of its particle size as small as 2 μm in diameter, may remain airborne for prolonged periods in residential air (50–52)

A study conducted in Riyadh, Saudi Arabia with 139 subjects, skin prick test (SPT) shows the percentages of the allergen that the sample were allergic to. Results were as followed 77.8% positive to HDM, 33.6% to cat, 19.2% to Cockroach, Prosopis juliflora positive in 72.1%, Bermuda grass in 53.8%, Chenopodium album in 47.1%, Rye grass in 36.5% and Salsola kali in 36.5% finally Moulds (18.2%) and Aspergillus fumigatus (18.2%) extracts (53).

In Qatar, 2002, a study conducted with 1106 allergic patients, SPT & total IgE , 44.9% had positive skin prick tests, 30.7% of patients had at least one animal at home. Cats (26.7%), goats (15%) and birds (14.7%) were the most common present within the house. Prevalence of allergic rhinitis was significantly more common in families with animals (54). A similar study in Kuwait was carried with 160 children (aged 9-16 years) were assessed by questionnaires, determination of sensitization status (skin tests and IgE) which demonstrated home allergen levels and frequency of pet ownership were very low (cat, 4.1%; dog, 1.5%) (55).

**Outdoor Allergens (such as tree, grass, weed pollens and mold spores)**

A study conducted in Qatar in 2002 included a population of 1106 that was diagnosed with allergic rhinitis. Skin prick test (SPT) results were as follow pollen 41.6% – grass and tress 36.9% – Cockroach allergen 32.2% with conclusion of females are more exposed to pollen, grasses and tress, but males are mostly exposed to mites and insects (56).

## 1.3 Problem statement

Allergic rhinitis is among the common ENT conditions affecting males and females of all age groups, and all races, also presently the most common chronic disorder in the pediatric population peaking in the teenage years worldwide. It is frequently ignored, under diagnosed, misdiagnosed, and mistreated with a significant health, social and large economic burden in our setting.

Although allergic rhinitis is not a serious illness, it has considerable amount of co-morbidities, underlying complications and affects quality of life and productivity at work or school.

Symptoms during the day can hamper concentration and lead to learning problems. Nocturnal symptoms can cause sleep loss and secondary daytime fatigue, further undermining a child's ability to function well during the day. It is a condition that has a growing impact on everyday medical practice, as its prevalence has steadily increased during the last decades.

There is no study done in Tanzania to determine the magnitude and pattern Allergic rhinitis among adolescents. Allergic rhinitis is common in this group of adolescents and increasingly impairs their quality of life, can impair sleep and reduce school performance and attendance.

## 1.4 Rationale of the study

The study was intended to evaluate the magnitude of allergic rhinitis, presenting symptoms and commonest allergens among secondary school students in Dar-es-salaam. Early identification of allergic rhinitis and proper treatment can reduce development co-morbidities as well improve the quality of life and school performance.

The information obtained will create awareness to the clinicians for early diagnosis and proper management of patients with allergic rhinitis so as to prevent complications. It will help the Ministry of health, in planning for improvement of treatment facilities and educating the society about risk factors and and its complications, early seeking of treatment so as to reduce the complications and morbidities to the society. Information which was obtained from this study will form a baseline data for further studies on AR in Tanzania. The study has identified improtant areas in Allergic Rhinitis for the need of future researches. This study was also done as the requirement for the fullfillment of my MMed degree in ORL at MUHAS.

## 1.5 Objectives

### 1.5.1 Broad objective

To determine the prevalence of Allergic Rhinitis among secondary school pupils in Kinondoni district from August 2016 to January 2017.

### 1.5.2 Specific Objectives

1. To determine the prevalence of Allergic Rhinitis by age and sex.

2. To determine the common clinical features of Allergic Rhinitis.

3. To determine the common inhalant allergens by SPT.

# 2 METHODOLOGY

## 2.1 Study design

This study was a community based cross-sectional study.

## 2.2 Study Area/ Location

Kinondoni District in Dar-es-salaam city in Tanzania**.**

## 2.3 Study Population

The study population included all secondary day school pupils in the selected schools during the period of study.

## 2.4 Sampling Population and Sampling Technique

Kinondoni district consist of 146 secondary schools. There are 58 government and 88 non government secondary schools. From which there are 21 Boarding Schools in Kinondoni, 11 from community government schools and 10 are non government secondary schools.

The study population included secondary day school pupils aged between 13 to 19 years of age in randomly selected schools. A list of all private and government owed secondary day schools was obtained from the Kinondoni education offices in Dar-es-salaam and was divided into two groups, government or private. Using simple random sampling 7 secondary schools were selected from each group for the first stage. Then 2 classes were selected from each shcool from the frist stage using simple random technique and consent and assent forms were given to selected classes pupils.

## 2.5 Sample Size (estimation)

Sample size was calculated using sample size formula developed by Creative Research system;

$$N = \frac{Z^2 P (1- P)}{E^2}$$

Whereby:

N= an estimated sample size

Z= Standard normal deviation (1.96) which correspond to 95% confidence interval

P= % (P is the prevalence of Allergic Rhinitis among secondary schools pupils)

P= previous Prevalence, and I used the

Prevalence found in Kenya which was 38.6%

E= Margin Error (4 %)

$$N = \frac{1.96^2 x 0.386(1-0.386)}{0.04^2}$$

**N = 569**

Therefore, from above formula the required minimum sample size was 569.

Adjusting for non-response rate which was 10%, the required sample size was **626**.

## 2.6 Study duration

This study was conducted for a duration of 6 months, from August 2016 to January 2017

## 2.7 Inclusion criteria

- All pupils aged between 13-19 years old (adolescents group)

## 2.8 Exclusion criteria

- Pupils that were not present in school on the day of screening.

- Refusal to participate in SPT

- Nasal infection

- Skin diseases e.g. eczema

## 2.9 Data collection procedures

An introduction letter by the education officer at the Kinondoni District education office was obtained after receiving relevant research clearance. The introduction letter was given to principals/ head teachers in those secondary day schools that was selected. At selected secondary day schools, the primary researcher and research assistants introduced themselves and explain clearly the aim and purpose of the study that was conducted.

Consent and assent forms were distributed to 2 randomly selected classes and were collected by respective teachers. Both filled asesent and consent forms were collected in a time space of one week by the respective teachers.

For all pupils whose parents/guardian/caretaker gave the informed consent together with agreed assent form, were interviewed using the structured questionnaire/clinical examination form. The interview was conducted only by the primary researcher and two trained assistants. A study number was assigned to each student whose parent/guardian/caretaker had consented and data was recorded according to the structured questionnaire.

During screening of students, they were grouped into small groups until they were all screened in an available quite classroom where privacy of each pupil was maintained.

Data was administered in questionnaire inclusive of student's age, sex, nasal symptoms, eye symptoms, age of onset of symptoms, triggering factors, presence or absence of family history of allergic rhinitis, results of skin prick allergy test(if conducted). Rhinoscopy findings were recorded in structured questionnaire. During rhinoscopy, aseptic techniques were applied for each pupil.

Using a questionnaire 626 pupils were interviewed by primary investigator and two trained assistants, pupils were divided into two groups; the symptomatic and asymptomatic.

Pupils with watery runny nose with one or more of the other symptoms or with nasal congestion alone was also recruited as ARIA suggest that AR patient could only present with nasal congestion alone were considered to have symptoms of AR.

Pupils who were symptomatic for allergic rhinitis were proceeded for Confirmation of AR which were physical examination and SPT. The important physical findings included; a pale edematous nasal mucosa, hypertrophy of inferior turbinates, watery / mucoid rhinorrhoea, transverse nasal crease, allergic shiners and/or conjunctiva injection.

Skin allergy test was done by primary researcher and two trained assistants to all pupils who showed allergic signs and symptoms for the aim of determining the commonest allergen causing allergic rhinitis and this was done before the students start antihistamines or steroids. Those who were constantly on steroids and antihistamines were included in the study and if had already started but use of antihistamines or steroids intermediately were recruited in the study.

Skin prick testing is a minimally invasive procedure which carries relatively low risk of infection but since the test is percutaneous, infection control measures are essential. Pupils and parents/caretakers were fully and appropriately informed about the test. Disposable prickers were used during the test to avoid cross-contamination.

**Procedure (SPT)**

I) **Techniques of SPT**

• Anterior aspect of forearm was cleaned with spirit swab and dots approximately 2 cm apart corresponding to number of allergens to be tested were marked off using a marking pen.

• A drop of allergen was pulled on dot and a prick to skin made using a sterile lancet/needles. A sterile needle per allergen was used.

• A positive (histamine lmg/ml) and negative (saline) control was included in the testing.

• Excess allergen was removed by putting a tissue (blotting paper) on the drop.

**II) Interpretation of Results**

• Tests were read after 15-20minutes.

• Positive reaction was reported when average diameter = major diameter + perpendicular diameter 2 =3mm > negative control

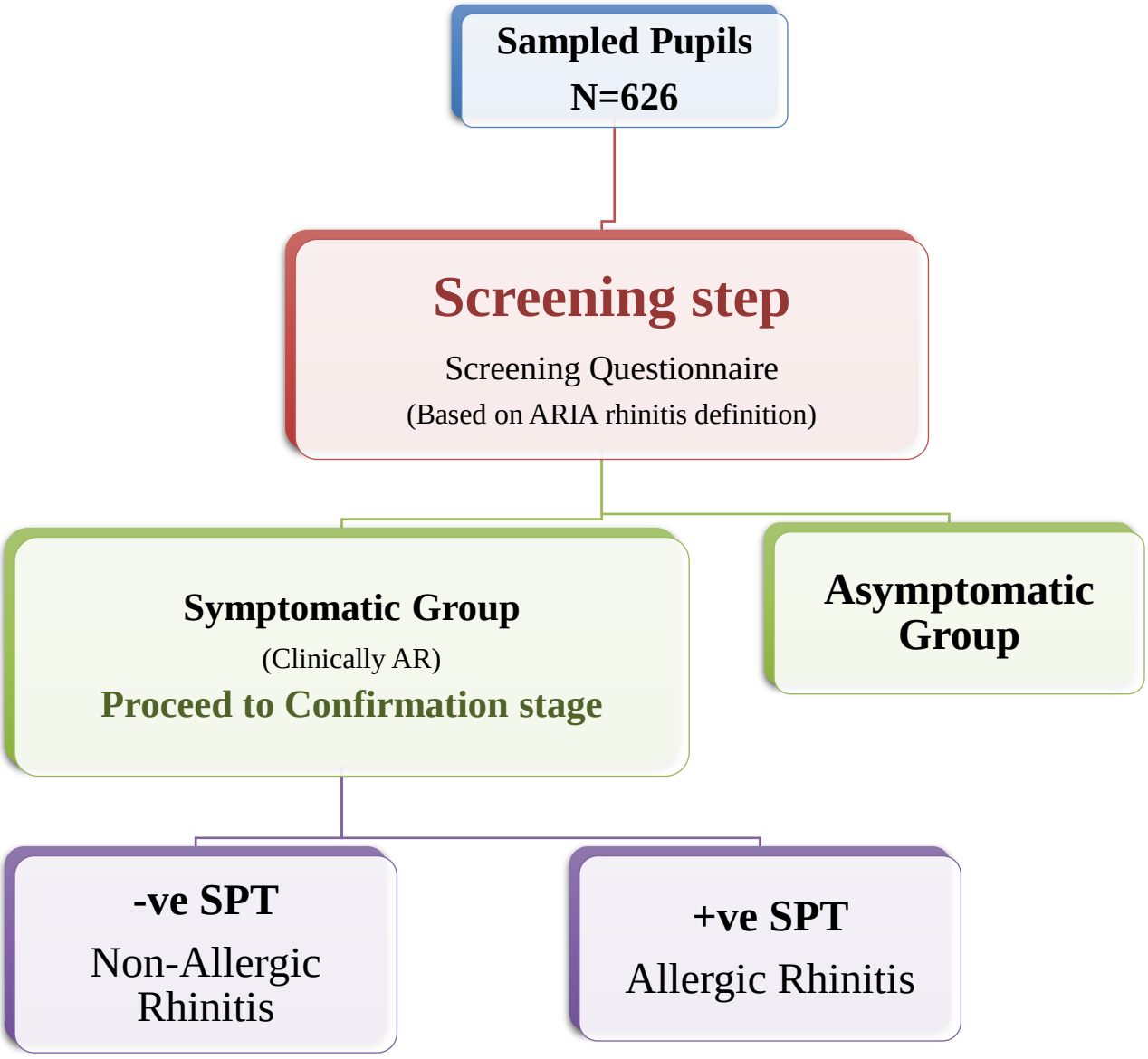
• NB: Subject should not react to negative control

• Atopy was defined as a positive SPT.

The wheal normally heals within 1 - 2 hrs.

**CASE DEFINITION:** Students with watery runny nose with one or more of the other symptoms or with nasal congestion alone was also recruited as ARIA suggest that AR patient could only present with nasal congestion alone according to ARIA (allergic rhinitis and its Impact on Asthma) criteria; nasal obstruction, sneezing, nasal pruritis, watery rhinorhoea with or without conjunctivitis on most days and a positive SPT were considered to have AR.

## 2.10 Flow chart data collection procedure



## 2.11 Data collection tool

- English version of structured questionnaire with a swahili version,
- Clinical examination forms,
- Allergic skin prick kit(Standardized commercial glycerinated extract purchased from a single vendor)
- **Eight allergens were tested including;**
    I. Dermatophagoides Pteronyssinus (HDM).
    II. Grass Mix Pollen (Velvet grass, Cocksfoot, Rye grass, Timothy (Phleum pratense), Meadow grass, Tall fescue).
    III. Weed mix (Mugwort, Nettle, Pellitory, Dandelion, and English plantain).
    IV. Tree mix (Alder, Hazel, Poplar, Elm, and Willow).
    V. Aspergillus fumigates.
    VI. Cat fur.
    VII. Dog hair.
    VIII. Chicken feathers.
- Sterile lancet/needle,
- Spirit, cotton wools, tissue paper,
- Marker pen,
- Positive control (0.1% histamine) , Negative control ,
- Torch/ head light, Killian nasal speculum, otoscope, stethoscope,
- Adrenaline injection needles/syringes,
- Disposable Examination Gloves,
- Coolant to maintain Allergens temperature at 2° - 8° c.
- Digital Venier calliber

## 2.12 Quality control

The pupil's history, physical examination and SPT were conducted by the primary researcher and two trained assistants that entered the findings in the questionnaire.

## 2.13 Data processing and Analysis

Data quality were cross checked on a daily bases for inconsistency to ensure that incomplete and missing data was identified and corrected immediately. The quantitative data collected were coded, processed and cleaned to prevent inconsistencies and outliers.

As soon as the data was collected and entered in the principal investigator personal computer on the same day of collection. All information which was collected was confidentially stored in locked filing cabinets and computer data was stored and secured by password-protected computers.

The quantitative data was analyzed through selection of concepts, categories and themes. It involved reading through the data and developing codes that drew similar connections between categories and themes.

Data was analyzed by the use of SPSS (Statistical Package for the Social Sciences) version 20 as per specific research questions using frequencies and percentages. Chi-square test and descriptive statistic such as proportions for categorical variables and means for continuous variable were estimated. Final results were presented in the form of frequency tables, charts and figures.

A variable with P-value of equal or less than 0.05 was considered to be statistically significant.

## 2.14 Reproducibility

For the purpose of avoiding variations, clinical assessments and diagnosis of pupils was made only by the primary researcher and two trained research assistants.

Primary researcher and 2 research assistants received a training of 1 month on how to correctly perform SPT to minimize false positive. Also precautions were taken on storing and carrying allergen reagents at optimum temperature which is appropriate for the reagents.

Also a list of allergens used during this study was included in the data collection tool.

## 2.15 Pupils Interviews

The interview to these pupils was conducted using ARIA criteria structured questionnaire.

## 2.16 Ethical clearance

Ethical clearence was obtained from the Research and Publication committee of MUHAS and MNH.

## 2.17 Ethical considerations

The principal investigator went to Kinondoni District education office to obtain an introduction letter from the education officer; hence permission to go to the secondary day school was given. The main aim of this study was explained to the head teachers and requested them to facilitate the whole process of the project. The principal investigator gave full information about what the research entailed to the principal/ head teachers of the selected secondary school.

A written consent and assent forms were distributed to the teachers and request them to give to the pupils to deliver to their parents of all children involved in the study. Respondents gave consent on behalf of their children as all are 18 years of age; to participate for study. Full consent and explanation is in **Appendix I**. The structured questionnaires were administered after duly obtain consent of the participant's parent/guardian. Participants' privacy was highly maintained and ensured that they were not to be exposed to public when filling questionnaires. The researcher ensured the anonymity of respondents by concealing their identity and keep research data confidential for research purposes only. Any concerns arose were noted and resolved immediately.

All pupils who had watery runny nose with one or more of the other symptoms listed in the questionnaire were considered to have AR if she/he fallen on ARIA (allergic rhinitis and its Impact on Asthma) during the screening process was advised and managed accordingly after notifying the parents or caretakers by school teachers.

The report is submitted to Muhimbili University of Health and Allied Health Sciences (MUHAS) Directorate of Research and Publications for ethical review and clearance.

## 2.18 Study limitations and mitigation

**Limitations:**

- SPT is not representative to our local allergens as it is prepared abroad. Allergens used for the allergic test were developed from abroad which doesn't match exactly with allergens which are found in our country.

**Mitigation**

- Increase tolerance of the allergen by using immunotherapy
- Decrease the level of allergen exposure by identification of allergen by SPT and proper educations of the latter in the environment and precautions to avoid allergens.

# 3 RESULTS

A total of 626 pupils from 12 secondary schools in Kinondoni district, Dar-es salaam were involved in this study. Tables, charts and graphs below summarize the results.

**Table 1: Distribution of study population according to Gender and Age**

| | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | | | |
| | Males | 243 | 38.8 |
| | Females | 383 | 61.2 |
| | **Total** | **626** | **100** |
| **Age group** | | | |
| | 13-14 years | 219 | 35.0 |
| | 15-16 years | 289 | 46.2 |
| | 17+ | 118 | 18.8 |
| | **Total** | **626** | **100** |

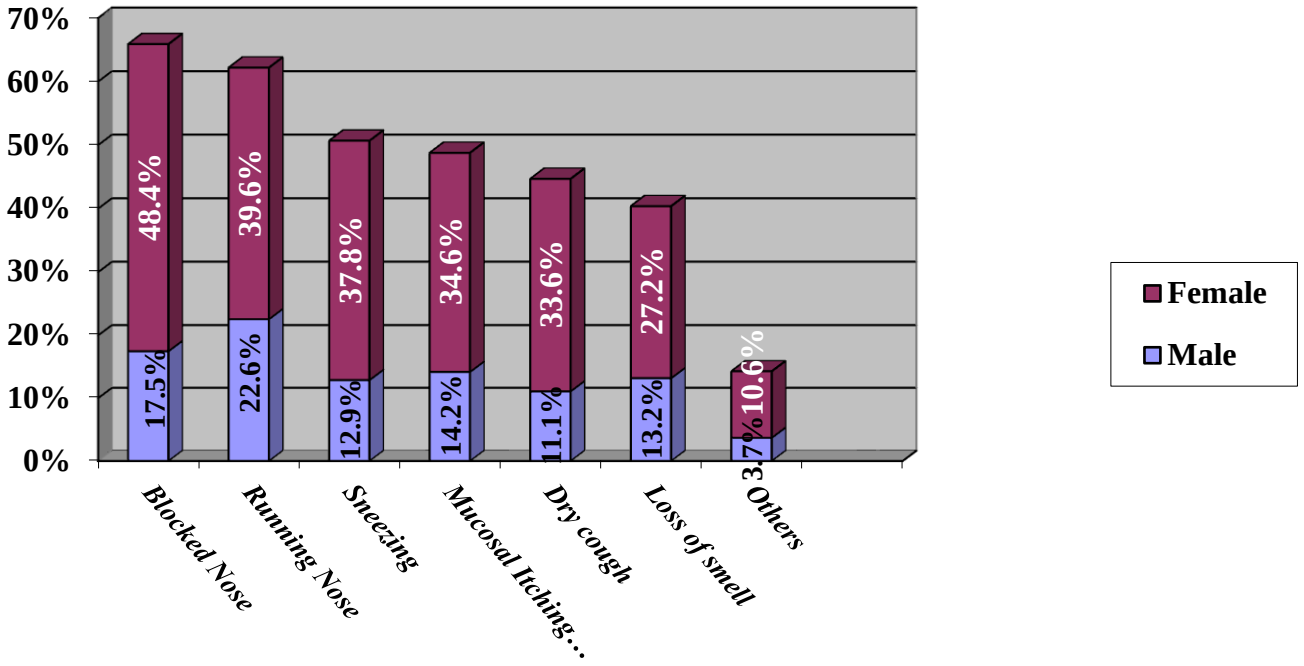
Out of 626 school children 243 (38.8%) were males and 383 (61.2%) were females, where majority 289 (46.2%) were of age group 15-16 followed by other groups as shown in table 1 above.

**Table 2: Prevalence of Allergic Rhinitis by Age and Gender**

| | Allergic rhinitis | | |
|---|---|---|---|
| | **Non allergic (n %)** | **Allergic (n %)** | **Total (N %)** |
| **Age Group** | | | |
| **13-14** | 145 (23.2) | 74 (11.8) | 219 (35.0) |
| **15-16** | 193 (30.8) | 96 (15.3) | 289 (46.2) |
| **17+** | 71 (11.3) | 47 (7.5) | 118 (18.8) |
| **Total** | **409(65.3)** | **217 (34.7)** | **626 (100)** |
| **Gender** | | | |
| **Male** | 172 (27.5) | 71 (11.3) | 243 (38.8) |
| **Female** | 237 (37.9) | 146(23.3) | 383 (61.2) |
| **Total** | **409 (65.3)** | **217 (34.7)** | **626 (100)** |

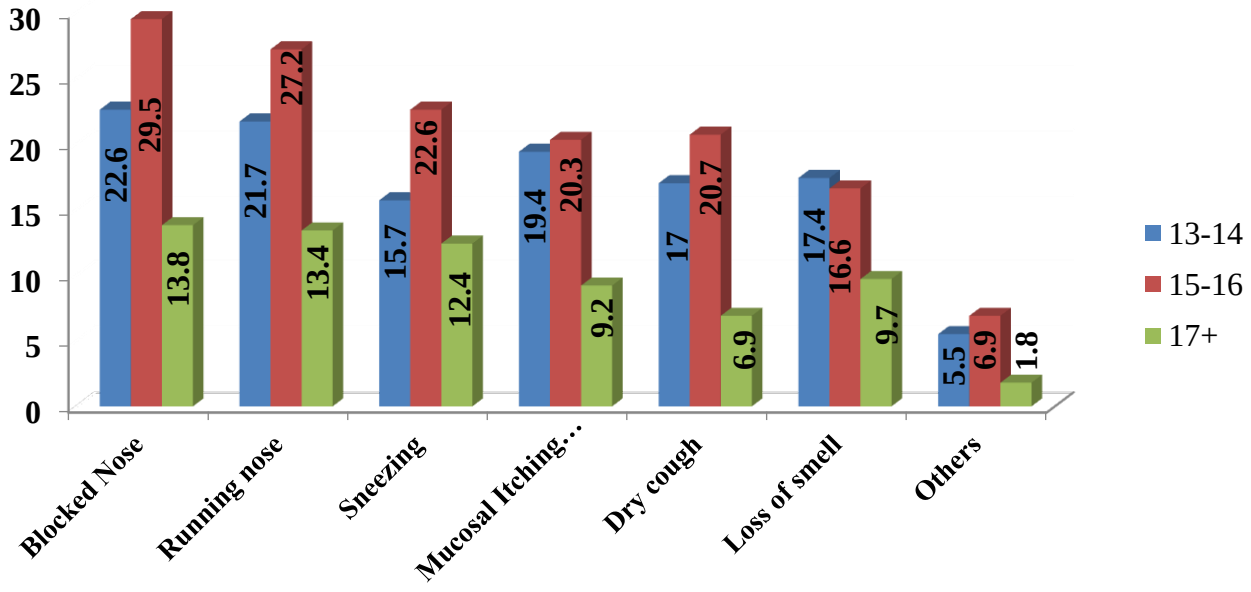
Out of 626 pupils, 217 (34.7%) had clinical features of allergic rhinitis where by majority (15.3%) were in the age group 15-16, **(P= 0.421)**. Females had higher proportion 146 (23.3%) as compared to males 71 (11.3%), **(P= 0.023)**.

**Figure 1: Distribution of clinical symptoms of AR by Gender.**




Nasal congestion was the most common symptom reported by majority of students (65.9%) and the most affected age group was 15-16 (29.5%).

**Figure 2: Distribution of clinical symptoms of AR by Age**




Majority of pupils with allergic rhinitis reported to have nasal congestion as the most common symptom 65.9% and pupils from age group 15-16 were most affected 29.5%, **(p>0.05).**

**Table 3: Distribution of physical features of AR by Gender**

| Physical features | Male (n %) | Female (n %) | Total (N %) |
|---|---|---|---|
| **Nasal Crease** | 17 (7.8) | 23 (10.6) | 40 (18.4) |
| **Allergic Shiner** | 8 (3.67) | 6 (2.8) | 14 (6.5) |
| **Hypertrophied Turbinate** | 42 (19.4) | 92 (42.4) | 134 (61.8) |
| **Nasal Mucosa Edema** | 20 (9.2) | 46 (21.2) | 66 (30.4) |
| **Others (Nasal Polyps, Denne's lines)** | 2 (0.9) | 3 (1.4) | 5 (2.3) |

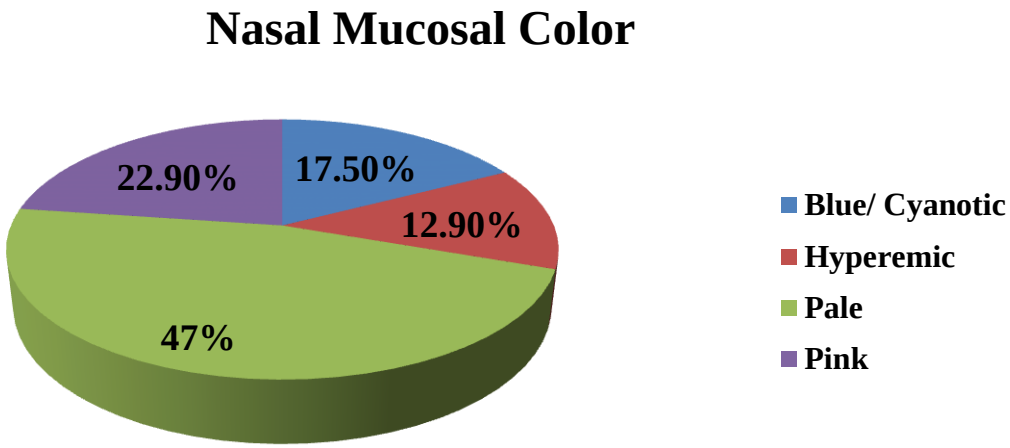
Turbinate hypertrophy was the most common physical finding by majority of students (61.8%) and females were most affected than males (42.4%), ($p>0.05$).

**Table 4: Distribution of physical features of AR by age.**

| Physical Features | 13-14 (n %) | 15-16 (n %) | 17+ (n %) | Total (N %) |
|---|---|---|---|---|
| **Nasal crease** | 13 (6.0) | 21 (9.7) | 6 (2.8) | 40 (18.5) |
| **Allergic Shiner** | 6 (2.8) | 4 (1.8) | 4 (1.8) | 14 (6.5) |
| **Hypertrophied Turbinate** | 46 (21.2) | 61 (28.1) | 27 (12.4) | 134 (61.8) |
| **Nasal Mucosa Edema** | 26 (12.0) | 28 (12.9) | 12 (5.5) | 66 (30.4) |
| **Others** (Nasal Polyps, Denne's lines) | 2 (0.9) | 3 (1.4) | 0 (0.0) | 5 (2.3) |

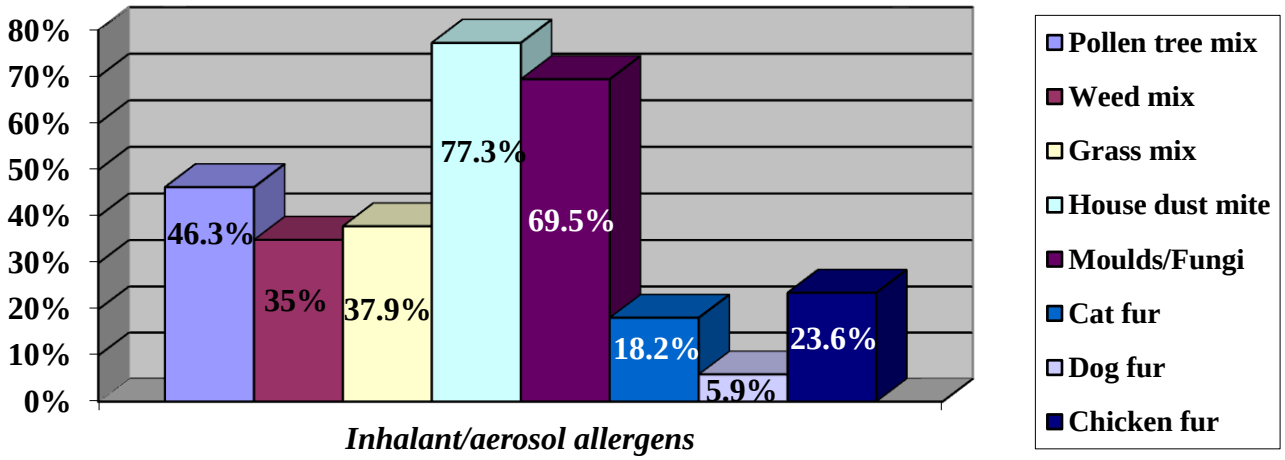
Turbinate hypertrophy was the most common physical finding by majority of students (61.8%) and the most affected age group was 15-16 (28.1 %), **($p>0.05$).**

**Figure 3: Distribution of Nasal Mucosal color among pupils with allergic rhinitis**




The most common mucosal color change was pale (47%) followed by other color changes as shown by on the pie chart above.

**Figure 4: Distribution of inhalant/aerosol allergens**




Majority of pupils were allergic to house dust mite (77.3%) followed by other allergens as shown on the histogram above.

# 4 DISCUSSION

The present study was designed to determine the prevalence and clinical presentation of allergic rhinitis among adolescents aged 13 -19 years in a community set up. Allergic rhinitis negatively affects the quality of life, sleep and impairs the process of learning (27,57–60). This study correlated prevalence of AR to age, sex, determine the presentation and pattern of symptomology and common aeroallergens involved.

The world wide prevalence of childhood allergic rhinitis varies from 8.5% - 14.6% (26,61). In developed countries prevalence of allergic rhinitis in adolescents has been noted to be higher as compared to less developed countries. There is little information regarding trends of AR in Africa, as few studies have been done. Some studies done in African countries have shown prevalence to range 13.9% to 45.2% (62,63).

**Prevalence of Allergic Rhinitis**

In this study, the prevalence of AR was 34.7% based on clinical features using a questionnaire; this was further confirmed by using SPT which gave a prevalence of 32.4%. The results of this study are analogous to the findings of follow up studies done in South Africa and Kenya which involved children aged 13-14 years (41,42). In the study done in South Africa prevalence of AR was noted to increase from 30.4% to 38.5% over a period of seven years (42). Whereas, in the Kenyan study a significantly high increment of 38.6% from 14.9% was noted in the prevalence of AR over a six year period (41).

Contrary to the findings of this study, Said et al, in a study done at Bugando, Mwanza reported a lower prevalence of AR, which was 14.7% (64), similarly Nyembue et al, in their study from DRC reported a prevalence of 13.9% (62). However the study population in these groups included participants aged from 5 to 83 years, whereas in this study the participants were aged 13-19 years. In comparison to this study, the study conducted in DRC was also community based, whereas the study done in Bugando medical centre was a hospital based study.

**Geographical Factors**

Considerable variations have been noted in prevalence of AR both between countries and centres in the same country (65). This has been postulated to be due to various factors such as climatic changes, dietary changes, and environmental factors. In this study a high prevalence of AR was

noted, which may be attributable to continuing changes in the region over the last few decades, such as stepping up industrialization, changes in lifestyle, vehicle pollution, modernization and urbanization. Adaption of the western lifestyle has vastly contributed to this increment in AR. According to the "hygiene hypothesis", the cleaner the environment the higher the prevalence of AR, therefore it is expected that the more urbanized the area the higher the prevalence of AR (58,66,67). Since this study was conducted in Dar-es-Salaam which is a highly industrialized and polluted area a high prevalence was noted. These findings are comparable to studies conducted in similar environments, high prevalence of 38.5% in south Africa and 45.2% in both Lebanese and Nigerian adolescents were noted (38,39,63). Higher prevalence have also been noted in western countries which are more industrialized and urbanized than the African countries (68,69).

**Prevalence in relation to Age Group**

Although AR may have its onset at any age, the incidence of onset is greatest in children at adolescence with a decrease in incidence seen in advancing age. A prevalence of 11.8% was seen in age group of 13-14 years, 15.3% in age group of 15-16 years and a prevalence of 7.5% in participants above 17 years of age, however this difference in occurrence of AR among age groups was not statistically significant (p=0.421). In comparison to this study, several other studies have shown a three to four fold increment in prevalence of AR in the 13-14 age group (38,42,63). A recent study done in Angola in 2017 also showed a 2 fold increase in prevalence of AR in children in this age group (70). Although AR has been reported in infants, in most cases an individual requires two or more seasons of exposure to a new antigen before exhibiting clinical manifestations of AR (71). Older children have been noted to have a higher prevalence than younger ones with a peak occurring in children aged 13-14 years. A study done in Bugando medical centre showed an overall prevalence of AR to be 14.7 % among which 68.9% of participants were aged below 20 years. Approximately 80% of individuals diagnosed with AR develop symptoms before age of 20 years (66). The reason for this increased prevalence of AR in adolescents maybe due to increased exposure to allergens, irritants when they play around and are exacerbated by viral upper respiratory tract infections.

**Prevalence in relation to Sex**

Females had a higher preponderance to AR as compared to males in this study (P=0.023). This finding was in agreement with several other studies which have shown a higher prevalence among girls than boys (42–45,72). Other studies have so no difference in prevalence of AR in either sex (64,68,73). However some studies have also shown predominance towards males (74). The sex predilection of AR still remains a controversial issue with most literature not agreeing on sex predominance. It was found in some studies that " Hormonal rhinitis" and a higher rate of cosmetic use in females may account for increased prevalence (75,76). In general, natural history of the disease shows initially higher prevalence rates among boys during childhood, shifting later to be higher among females during adolescence and adulthood.

**Presentation and Pattern of Symptomatology**

Allergic rhinitis is clinically defined as a symptomatic disorder of the nose induced after allergen exposure by an IgE-mediated inflammation (66).

Allergic rhinitis can also be defined as allergen induced inflammation of the nasal membrane and surrounding tissues that results in sneezing, rhinorrhoea, conjunctivitis, nasal congestion, and pruritis of the nose, palate, throat and ears (77).

**Symptoms of Allergic Rhinitis**

Nasal symptoms consisted of blocked nose, running nose and sneezing of which were 65.9%, 62.2%, and 50.7% respectively. Other symptoms included mucosal itch, dry cough, and loss of sense of smell. This finding is in agreement with several other studies which found nasal symptoms to be more predominant, of which blocked nose was the most common and troublesome symptom (64,78,79). Blocked nose was found to reduce sleep time, resulting in decreased day time activity, particularly sport involvement which is more popular among adolescents (80).

Other symptoms included ocular symptoms which were watering, itching and redness of eyes. Similar finding were obtained in the Bugando study where ocular symptoms were reported by few participants and considered as trivial (64). High prevalence of ocular symptoms in patients with AR has also been noted, 61.2% and 52.0% in Korea and France respectively (81,82).

Patients with moderate-severe persistent AR showed highest prevalence of ocular symptoms (81). These ocular symptoms have been thought to be due to release of histamine by allergens which initiates a naso-ocular reflex causing above mentioned symptoms (83).

**Signs of Allergic Rhinitis**

This study showed inferior turbinate hypertrophy (61.8%) to be the most common sign followed by mucosal edema (30.4%) and lastly nasal crease (18.4%). Inferior turbinate hypertrophy was found to be the most common sign in several other studies. The Bugando study also showed inferior turbinate hypertrophy to be among one of the common signs of allergic rhinitis, with 40.5% (64).

In this study 47% children with allergic rhinitis had pale mucosa, 22.9% had pink, 17.5 had cyanotic and 12.9 had hyperemic nasal mucosa. In a study done in Iran 52% of children with allergic rhinitis had pale mucosa, 36% had violaceous and 12% had normal mucosal color (84).

**Allergen sensitization by SPT**

Skin prick testing (SPT) is generally considered to be the gold standard for diagnosis of AR, it is safe and effective and used as a routine diagnostic test. It is used frequently to assess specific sensitization and to verify the diagnosis of allergic (IgE mediated) disease in symptomatic subject (30).

Allergens in our study were identified by analyzing skin prick test (SPT) of 217 participants with positive clinical symptoms out of which, 203 tested positive for the SPT and 14 participants tested negative. This negative reaction could probably be due to participants being sensitized to other allergens not included in the allergic kit for tests, or not yet identified or some non allergic forms of rhinitis among our cases.

This study reported a high sensitization to house dust mite (77.2%) followed by moulds/fungi (69.8%), then pollen tree (46.5%), grass (38.1%), weed (35.1%), and least to animal danders like chicken feather, cat fur, then dog dander in decreasing frequencies.

Dermatophagoides pteronyssinus (HDMs) was the predominant allergen in this study, and it is considered as a major source of allergens in house dust. Several studies have reported house dust mite to be the most common allergen (85–90).

Our study recorded mould/fungi (69.8%), as the second important source of allergens, which has also been observed in a studies done in Iraq and Iran (89,91).

Human skin scale is the food source of HDMs and the feces of HDM is the antigenic product (89). The growth and proliferation of HDM depends on specific environmental factor such as temperature and humidity. As for mould/fungi, most allergenic moulds grow on nonliving organic matter, while a few require a living host. Both groups need moisture, oxygen, preformed carbohydrate and occasionally additional growth factors. Many familiar moulds grow actively at 20 °C and may flourish well above or below this temperature. Although fungal components may be ingestant allergens, inhaled spores are the major source of exposure. Dar-es- salaam has a relatively high humidity ratio and temperature which is compatible with both mite and mould/fungi growth hence an increased prevalence of the two allergens was noted in our study.

Sensitization to other allergens such as grass, weed and animal dander had a relatively low prevalence in this study. Conversely in European and North American countries, sensitization to cat and dog dander have been noted to be the most common aeroallergens (92,93). This could probably be due to the increased number of cats and dogs that are present in the homes as pets in these countries in comparison to Tanzania.

**Polysensitization by SPT**

Most participants (84.1%) in this study were reactive to 2 or more allergens. Several other studies have shown similar results (94,95). This polysensitization might be the result of various factors such as interactions of genetic or environmental factors which favor growth and vegetation of specific plant species that cause allergic reactions. It could also be due to cross-reactivity among allergens belonging to close reservoirs which reflects the presence of common genetic component (95–97).

# 5 CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

- Allergic rhinitis was found to be among the most common health problem affecting studied population.
- The prevalence of AR was found to be 34.7% among adolescents in this study, and skin prick test was found to be a useful diagnostic tool.
- Blocked nose was the most common symptom and turbinate hypertrophy was found to be the most common sign of AR.
- There was no statistically significant difference in age group among adolescents with AR where as it was statistically significant by gender.
- Dust mite was the most common allergen responsible for the condition.
- Most participants were found to be sensitized to more than one allergen.

## 5.2 Recommendations

- AR is common troubling condition to young Tanzanian population and therefore, every effort should be made to avoid identified allergens and irritants by implementing community awareness.

- More community-based studies targeting different age groups are required to determine the national incidence and to identify risk factors for allergic rhinitis in the Tanzania population.

- There is a high need of developing a guideline on Allergic Rhinitis in Tanzania.

- There is a need for development of our own allergens from our environment policy maker to so as to give a real picture of responsible allergens which are responsible for allergic rhinitis.

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# 7 APPENDICES

## 7.1 Appendix I: Consent form (English version)

**ID No……**

**Title: PREVALENCE OF ALLERGIC RHINITIS AMONG SECONDARY SCHOOL PUPILS IN KINONDONI DISTRICT**

**To the /Parents/ Guardians**

**Foreword**

Greetings! I am Dr Bindiya Aubroo working on this research project with the aim of assessing the prevalence of students with allergic rhinitis in secondary day school in Kinondoni district and their health related quality of life.

**Purpose of the Study**

This study aims at determining the prevalence of allergic rhinitis among adolescents and the causative agents for related condition. We need to know this information so that we can be able to understand the magnitude of this condition in this country and educate adolescents and the society at large on how to prevent the frequency of episode of the disease and its complications as a whole. The result of this study will also help the government planning for better interventions for this condition through our recommendations so kindly be honest.

**How to participate**

The interviewer will be asking you questions while he/she will be completing a questionnaire. He/she will also perform the clinical examination in order to confirm the diagnosis and thereafter you will undergo some investigations such as anterior rhinoscopy to examine the nose and Skin prick test to finalize the diagnosis.

**Risks**

We do not expect any harm during the course of your participation. The anterior rhinoscope might make you feel uncomfortable but we will make sure is done under greater observation under aseptic techniques.

Skin prick testing is a procedure which carries relatively low risk but since the test is percutaneous (under skin), infection control measures are essential. Pupils and parents/caretakers will be fully and appropriately informed about the risks and benefits of SPT. Skin prick testing is an extremely safe procedure, with minimal discomfort. As minimal invasive technique of test-related non-allergic might include transmission of infection hence to avoid such situation disposable prickers will be used during the test.

**Benefits**

Children with allergic rhinitis will be diagnosed earlier and can be advised and treated, hence avoiding long term complications and improve the quality of life

**Confidentialiy**

We would like to assure that all the information that you will provide will remain confidential and will be used for research purpose only. No one will be allowed to see or go through your answers except the principle investigator only.

**Right to withdraw and alternatives.**

Taking part in this study is purely voluntary. You can stop participating any time even if you have already given your consent. Refusal to participate or withdrawal will neither affect the quality of your treatment nor involve a penalty.

**Consent**

I have read and understood the explanation of the study. I accept to participate in the study.

Signature of the patient/Parent/Guardian.....

Date.....

For more information or clarification you may contact one of the Doctors mentioned below,

Dr. Enica RICHARD 0715 307 717

Or in case you have any questions about your rights of participations in this study you may contact:-

Prof Said Aboud Chairperson of the Senate Research and Publications Committee

P.O Box 6500 DSM. Telephone:- +255 222 1524 89

## 7.2 Appendix I: Consent form (Swahili version)

**FOMU YA RIDHAA**

**Namba ya utambulisho……**

**Kichwa cha habari:**

**Kwa mzazi/mlezi**

**Ridhaa ya kushiriki kwenye utafiti**: KIWANGO CHA MAAMBUKIZI YA MZIO (RHINITIS) MIONGONI MWA WANAFUNZI WA SHULE ZA SECONDARI WILAYANI KINONDONI

**Utangulizi**

Habari! Jina langu ni Dr Bindiya Aubroo, nafanya kazi ya utafiti kwa lengo la kutathmini kiwango cha maambukizi ya mzio (rhinitis) miongoni mwa wanafunzi wa shule za sekondari katika Wilaya ya kinondoni.

**Madhunaumi ya utafiti**

Utafiti huu unalenga kujua ukubwa wa mzio wa pua miongoni mwa vijana na matatizo yanayohusiana. Tunahitaji kujua habari hii ili tuweze kuwa na uwezo wa kuelewa ukubwa wa hali hii katika nchi hii na kuwapa vijana na jamii kwa ujumla jinsi ya kuzuia ugonjwa huu na matatizo yake kwa ujumla. Matokeo ya utafiti huu pia itasaidia mipango ya serikali kwa ajili ya hatua zaidi ya hii kupitia mapendekezo yetu ili kuwa waaminifu.

**Jinsi ya kushiriki**

Msaili atakuuliza maswali na kujaza kwenye dodoso. Pia kufanya uchunguzi ili kuthibitisha utambuzi na baada ya hapo utapitia baadhi ya uchunguzi kama vile (rhinoscopy) kuchunguza pua.

**Madhara**

Hatutarajii madhara yoyote wakati wa ushiriki wako . Kuchunguza pua (rhinoscopy) inaweza kufanya wewe kujisikia na wasiwasi lakini tutahakikisha inafanywa chini ya uangalizi mkubwa. Kipimo cha mzio ni utaratibu ambao hubeba hatari duni hata hivyo, kudhibiti ugonjwa ni muhimu. Wanafunzi na wazazi / walezi watafahamishwa kikamilifu na ipasavyo kuhusu hatari na faida ya kipimo . Kipimo cha mzio ni utaratibu salama sana , na usumbufu mdogo.Ili kuzuia maambukizi kutoka mtu mmoja kwende kwa mwingine, tutahakikisha tuna tumia trifae kimoja kwa mgonjwa mmoja.

**Faida**

Watoto na mzio (rhinitis) watagundulika mapema watapewa ushauri na kutibiwa, hivyo kuepuka matatizo ya muda mrefu na kuboresha ubora wa maisha.

**Uhuru wa kushiriki na haki ya kujitoa**

Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa wakati wowote hata kama utakua umeshajaza fomu ya ridhaa. Kukataa au kujitoa kushiriki katika utafiti huu haita athiri ubora wa tiba utakayopewa wala adhabu yeyote.

**Kukubali**

Nimesoma na kuelewa madhumuni ya utafiti huu na nimekubali mimi na mtoto wangu kushiriki katika utafiti huu.

Sahihi ya mgonjwa/Mzazi/Mlezi.....

Kama mgojwa ni mtoto au mzee sana, uhusiano wenu.....

Tarehe.....

Kama una maswali kuhusu utafiti huu unaweza kuwasiliana na yoyote kati ya madaktari hawa.

Dr. Enica RICHARD 0715 307 717

Prof. Said Aboud Chairperson of the Senate Research and Publications Committee

P.O Box 6500 DSM. Telephone:- +255 222 1524 89

## 7.3 Appendix II: Questionnaire (English version)

The questionnaire for searching information on prevalence prevalence of allergic rhinitis among secondary school students in Kinondoni district.

QUESTIONNARE №

| Name | | | Date |
|---|---|---|---|
| Sex | Female | Male | Date of birth |

1) Did you have a complaint (in the last 12 months) of?

| | **Symptoms** | **YES** | **NO** |
|---|---|---|---|
| 1 | Stuffiness in nose (congestion/block) | | |
| 2 | Nasal itching | | |
| 3 | Sneezing (frequent) | | |
| 4 | Runny Nose | | |
| 5 | Prolonged (transparent) nasal discharge (without cold) | | |
| 6 | Red itchy eyes | | |
| 7 | Tearing (red eyes) | | |
| 8 | Loss of sense of smell | | |
| 9 | Ear popping/Palatal itching | | |
| 10 | Pharyngeal itching | | |
| 11 | Dry cough | | |

Other symptoms:-…….

3) Is there any triggering factor to these symptoms..? Yes/No

If yes explain…….

4) Does your symptoms having seasonal variations? Yes/No

5) **Physical examination (Signs)**

a) **Nose** (Rhinoscopy)

1. Watery nasal secretions
2. Nasal crease
3. Hypertrophic turbinate
4. Nasal mucosal edema
5. Color mucosa: I)Pink
   II) Pale
   III) Bluish
   IV) Hyperemic
6. Polyps
7. Others:-……

6) Skin allergic test results ……Positive/negative

7) Skin allergic test results (allergens which showed positive results)

1. Pollens
2. House dust/mites
3. Molds/Fungi
4. Animal dander:-
   I) Cat fur
   II) Dog fur
   III) Chicken features

## 7.4 Appendix II: Questionnaire (Swahili version)

Dodoso kwa ajili ya kutafuta taarifa juu ya kiwango cha maambukizi ya maambukizi ya mzio rhinitis miongoni mwa wanafunzi wa shule za sekondari katika wilaya ya Kinondoni.

QUESTIONNARE №

| Jina | | | Tarehe |
|---|---|---|---|
| Jinsia | Mme | Mke | Tarehe Ya Kuzaliwa |

1) Je, una malalamiko ( katika miezi 12 iliyopita ) ya ?

| | **DALILI** | **NDIO** | **HAPANA** |
|---|---|---|---|
| 1 | Fukuto katika pua ( msongamano / kuzuia ) | | |
| 2 | Pua kuwasha | | |
| 3 | Chafya ( mara kwa mara ) | | |
| 4 | Mafua | | |
| 5 | Kutoka kamasi mda mrefu | | |
| 6 | Macho kuwasha | | |
| 7 | Kutoa machozi | | |
| 8 | Kupoteza hisia za harufu | | |
| 9 | Uzito katika masikio | | |
| 10 | Koromeo kuwasha | | |
| 11 | Kikohozi kavu | | |

Dalili nyingine……

3) Je, kuna sababu yoyote kuchochea kwa dalili hizi? Ndio / Hapana

Kama ndiyo kueleza .....

4 ) Je, dalili zako kuwa mabadiliko ya misimu ? Ndio / Hapana

5) Uchunguzi

Wa Pua (Rhinoscopy)

1. Kutoka majimaji puani (Watery nasal secretions)
2. Nasal crease
3. Hypertrophic turbinate
4. Nasal mucosal edema
5. Color mucosa: I) Pink
   II) Pale
   III) Bluish
   IV) Hyperemic
6. Polyps
7. Others (Nyingine):-……..…

6) Matokeo ya ngozi mzio .....

7) Matoko ya ngozi mzio (ambayo yalionyesha kuathiri)

1. Pollens
2. House dust/mites (wadudu wango tokana na vumbi)
3. Molds/kuyu/ uyogo
4. Animal dander: - I) Cat fur (manyonya ya Mpaka)
   II) Dog fur (manyonya ya Mbwa)
   III) Chicken feathers