Original Article

# Prevalence of Allergic Rhinitis and Associated Complications among Patients Receiving Otorhinolaryngology Services at Muhimbili National Hospital

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## ABSTRACT

***Background:*** The prevalence and burden of Allergic rhinitis have been rising worldwide in recent years, but little is known about its pattern and magnitude especially Tanzania. The overall prevalence was 10.3% with no sex or racial predilection.

Adenoid hypertrophy, tonsillitis, hypertrophy of inferior turbinate, nasal polyps, otitis media, middle ear effusion and sinusitis were the most common complications affecting more than 90% of cases and were the major reason for attending hospital services.

The aim of this study was to reveal the baseline information concerning the pattern of AR and its magnitude at MNH which is the largest hospital in Tanzania.

***Materials and method:*** A cross-sectional, hospital based study was done, a total of 1984 patients received ORL services at Muhimbili national hospital during study period were interviewed all patients with a clinical diagnosis of allergic rhinitis were captured; Data was collected using a pre-tested coded questionnaire and analyzed using SPSS statistical computer software version 21.

***Results:*** The overall prevalence of allergic rhinitis in our study was found to be 10.3%, commonly affecting children and adolescent. With equal male to female ratio and the mean age of patients was 22.1 years (SD=1.6). About 80% of patients were coming from Dar es Salaam.

***Conclusion:*** Allergic rhinitis is prevalently common in our setting most victims seek medical services due to complications of which combination of surgical and medical treatment was needed. High index of suspicion in diagnosing allergic rhinitis and early treatment is the key to success.

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## BACKGROUND

Allergic rhinitis (AR) is a disease of the nasal mucosa characterized by a complex IgE mediated inflammatory response to a repeated exposure to an extrinsic protein that causes hypersensitivity (1).

Allergic rhinitis is the most common of all atopic diseases, it is an important public health problem and

**Key Words**: *Allergic rhinitis, otolaryngology.*

its prevalence is increasing worldwide (1, 2, 3, 21).

Allergic Rhinitis exists as a co morbid condition with common illnesses such as rhino sinusitis, asthma and otitis media with effusion, contributing to the severity of these illnesses and significantly affecting the patient quality of life. (4).

Allergic rhinitis contributes significantly to the pathogenesis of other upper and lower respiratory illnesses (22, 24, 25, 26).

Although it is a benign chronic disease of the upper airway, it affects the quality-of-life and studies demonstrate that allergic rhinitis causes significant impairment of function, exceeding that of heart disease and asthma (1, 2)

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 (36).

The long term complication which has been associated with this condition includes sinusitis, otitis media, nasal polyposis, turbinate hypertrophy, respiratory infections and orthodontic malocclusions (37).

## METHODS

### Study design and participants

This was a hospital based descriptive cross-sectional study carried out between September and November 2014 and included all the patients with Otorhinolaryngology problem attending Muhimbili National Hospital.

### Study population

The study included all the patients with Otorhinolaryngology problem attending MNH during the period when the study will be conducted.

### Sampling method

Convenience sampling technique was used in which selection based on most available sample. Patient who met the inclusion criteria were chosen provided they were available during data collection and they were added up till the desired sample size was achieved.

### Inclusion and exclusion criteria

All patients with the diagnosis of allergic rhinitis who attended at the otorhinolaryngology department and consented for study.

The patient was considered to have AR if she/he fell on ARIA (allergic rhinitis and its Impact on Asthma) criteria whereby the patient must have had watery runny nose with one or more of the following symptoms Frequent sneezing, Nasal congestion, Nasal itching and Red itchy eyes.

Those with nasal congestion alone were also recruited and underwent further diagnosis assessment as ARIA suggest that AR patient could only present with nasal congestion alone. Patients with the disease symptoms but did not consent for the study were excluded.

### Sample Size Calculation

Sample size was calculated using the sample size formula developed by the Creative Research system and the sample size was 193 patients.

### Data collection methods

For all patients who gave informed consent, were interviewed using a structured questionnaire/clinical examination form.

The interview was conducted by either principal investigator or trained research assistants.

A thorough history taking, physical examination and allergic test were done to make sure the patient has allergic rhinitis.

All patients who were confirmed to have the disease, complications were ruled out using paranasal sinus x-ray waters view, nasal pharyngeal x-ray lateral view +/- nasal endoscopy and CT scan of paranasal sinuses for those ones who could afford.

For patients with suspected adenoids hypertrophy a lateral view pharyngeal x-ray was done to confirm, all those with features suggestive of sinusitis (purulent nasal discharge, headache on stooping, facial pain and pressure and facial tenderness underwent paranasal sinus x ray waters view for children and CT scan for adults. For all patients with signs of middle ear effusion on examination, tympanometry was done after their ear canals have been cleaned (wax removed).

All the patients with suspected nasal polyps did CT scan of the paranasal sinuses according to MNH protocol. Skin allergy test was done to all patients with 3years and above, before starting antihistamines or steroids and if they had already started they were told to wean off the steroids and antihistamines for at least a week then the test was performed.

The skin prick test was used as the allergy test method to all patients. Children below the age of twelve years were pricked on the upper back while adults were pricked on the forearms. Histamine and saline were used as a control to avoid false positive and false negative and a wheal of above 9mm was considered positive (means allergic to that particular allergen).

The allergens used/tested included: house dust mites (Dermatophagoides Pteronyssinu and Dermatophagoides Farinae), Pollens: Grasses-Grasses mix, secale cereal, mixes grain pollen (Wheat, Rye, Oat and Barley. Trees: Betura vettucose, spring trees. Weeds: Mix weeds and Plantago lanceolata. Moulds and Fungi: aspergillus fumigates Pen, Notatum, Candida albicans, Moulds mix, Cladosporidium, Alternalia Alternalia Alternata. Animal dender from: Dog, Cat, Cow, Goat and Chicken.

**Data analysis**

Data was collected and entered in my personal computer on the same day of collection.

Data quality check for inconsistence was done on daily basis to ensure that incomplete and missing data was identified and corrected immediately.

The information collected is confidential stored in locked filing cabinets and computer data is stored and secured by password-protected computers.

SPSS vision 13.0 was used to analyzed the Data collected with a consultation from biostatistician for its analysis and interpretation. A p-value of less than 0.05 considered as statistically significant.

**Ethical considerations**

Patients were provided with an informed consent and then asked to provide written consent to participate in the study. For patients younger than 18 years, informed consent was obtained from their parents or guardians. This study was approved by the Research and Publication Committee of the Muhimbili University of Health and Allied Sciences (MUHAS).

## RESULTS

**Demographic characteristics of the study population**

Between September and November 2014 a total of 1984 patients received ORL services at Muhimbili national hospital. Of those, 193 patients had a clinical diagnosis of Allergic rhinitis. This makes a prevalence of 10.3% of cases.The mean age of attended patients was 22.1 years ± (SD=1.6), with 95%CI for the mean being 19.5 to 24.6 years. Male to female ratio is 1:1. About 97.4% (n=188) of attended patients were outpatients and about 50% of patients were children and adolescents.

**Table 1: Distribution of patients according to Age and Sex**

| | Sex | | | | Total | |
|---|---|---|---|---|---|---|
| | Male | | Female | | | |
| Age (years) | N | % | N | % | n | % |
| < 5 | 32 | 66.7 | 16 | 33.3 | 48 | 24.9 |
| 6 to 15 | 21 | 52.5 | 19 | 47.5 | 40 | 20.7 |
| 16 to 25 | 13 | 41.9 | 18 | 58.1 | 31 | 16.1 |
| 26 to 35 | 15 | 51.7 | 14 | 48.3 | 29 | 15 |
| >36 | 17 | 37.8 | 28 | 62.2 | 45 | 23.3 |
| Total | 98 | 50.8 | 95 | 49.2 | 193 | 100 |

**Patients' distribution according to residence**

Most of patients were coming from Dar es Salaam (80%), and among those Kinondoni district led followed by Ilala, Temeke district was the last. 18% of patients came from the mainland and the rest came from Zanzibar.

**Table 2: Distribution of patients according to area of residence**

| Characters | PATIENT'S RESIDENCE | | | | | Total |
|---|---|---|---|---|---|---|
| | Kinondnoni (n, %) | Temeke (n, %) | Ilala (n, %) | Other mainland (n, %) | Zanzibar (n, %) | |
| **Age groups (years)** | | | | | | |
| Less than 5 | 15 (27.3) | 17 (37.8) | 11 (21.2) | 5 (13.2) | 0 (0) | 48 (24.9) |
| 6 to 15 | 14 (25.5) | 10 (22.2) | 12 (23.1) | 2 (5.3) | 2 (66.7) | 40 (20.7) |
| 16 to 25 | 9 (16.4) | 6 (13.3) | 12(23.1) | 3 (7.9) | 1 (33.3) | 31 (16.1) |
| 26 to 35 | 9 (16.4) | 4 (8.9) | 12 (23.1) | 4 (10.5) | 0 (0) | 29 (15) |
| 36 and above | 8 (14.5) | 8 (17.8) | 5 (9.6) | 24 (63.2) | 0 (0) | 45 (23.3) |
| **Sex** | | | | | | |
| Male | 27 (49.1) | 20 (44.4) | 32 (61.5) | 17 (44.7) | 2 (66.7) | 98 (50.8) |
| Female | 28 (50.9) | 25 (55.6) | 20 (38.5) | 21 (55.3) | 1 (33.3) | 95 (49.2) |
| **Total (N)** | **55** | **45** | **52** | **38** | **3** | **193** |

**Etiological inhalant allergens for Allergic rhinitis among patients tested.**

Various environmental inhalants allergens were found to be the source of allergic rhinitis, among those, Dust mites was the commonest allergens (72.2%) 95% C.I (71-83.4), followed by molds (51.3%) 95% C.I(44.6-58.5) then pollens (40.9%) 95% C.I (34.2-48.2) and animal dander being the last (11.4%) 95% C.I (6.7-16.1).

**Table 3: Frequency distribution table showing etiological inhalant allergens for Allergic rhinitis among patients tested.**

| Item | Frequency (n) | Percent (%) |
|---|---|---|
| **Skin allergic test results** | | |
| Positive | 155 | 80.3 |
| Not tested | 38 | 19.7 |
| **Allergen showing positive results** | | |
| Pollens | 79 | 40.9 |
| Dust mites | 149 | 77.2 |
| Moulds | 99 | 51.3 |
| Animal dander | 22 | 11.4 |

### Complications of Allergic rhinitis

Middle year effusion was common in children under five years of age (P-<0.001), Turbinate hypertrophy and sinusitis was common in above 35 years (P-0.575, 0.135), Adenoid hypertrophy was common in under five (P-<0.001) and sinonasal polyp was common in age group between 16 and 25 years (P-<0.001)

**Table 4: Complications of Allergic rhinitis**

| Complication | AGE CATEGORY (Years) | | | | | Total |
|---|---|---|---|---|---|---|
| | < 5 | 6 - 15 | 16 - 25 | 26 - 35 | 36+ | |
| Middle ear effusion | 12 (25) | 0 (0) | 1 (3.2) | 1 (3.2) | 3 (6.7) | 17 (8.8) |
| Turbinate hypertrophy | 32 (66.7) | 31 (77.5) | 19 (61.3) | 19 (65.5) | 33 (73.3) | 134 (69.4) |
| Sinusitis | 1 (2.1) | 4 (10) | 5 (16.1) | 1 (3.4) | 6 (13.3) | 17 (8.8) |
| Adenoid hypertrophy | 46 (95.8) | 13 (22.5) | 0 (0) | 0 (0) | 0 (0) | 59 (30.6) |
| Sinonasal Polyp | 0 (0) | 5 (12.5) | 11 (35.5) | 2 (6.9) | 9 (20) | 27 (14) |
| | N=48 | N=40 | N=31 | N=29 | N=45 | N=193 |

### Correlation between complications of Allergic rhinitis with gender

Middle ear effusion doesn't have gender predilection (p-0.852), turbinate hypertrophy was common in females (P-0.05) and sinusitis was equal in both sexes (p-0.852). Adenoid hypertrophy was more common in males (P-0.028) and sinonasal polyp was common in females (P-0.261).

**Table 5: Correlation between complications of Allergic rhinitis with gender**

| | Sex | | Total | p-value |
|---|---|---|---|---|
| | Male (n, %) | Female (n, %) | | |
| Middle ear effusion | 9 (9.2) | 8 (8.4) | 17 (8.8) | **0.852** |
| Turbinate hypertrophy | 62 (63.3) | 72 (75.8) | 134 (69.4) | **0.059** |
| Sinusitis | 9 (9.2) | 8 (8.4) | 17 (8.8) | **0.852** |
| Adenoid hypertrophy | 37 (37.8) | 22 (23.2) | 59 (30.6) | **0.028** |
| Sinonasal Polyp | 11 (11.2) | 16 (16.8) | 27 (14) | **0.261** |
| | N= 98 | N=95 | N=193 | |

### Complications of allergic rhinitis among patients attended during the period of study

The majority of patients had inferior turbinate hypertrophy (69.4%), adenoid hypertrophy was the second most common complication (30.6%) followed by polyp (14%), middle ear effusion (8.8%) and the sinusitis (8.8%) was the least encountered complications. 95% confidence interval are shown in the brackets for each complication.

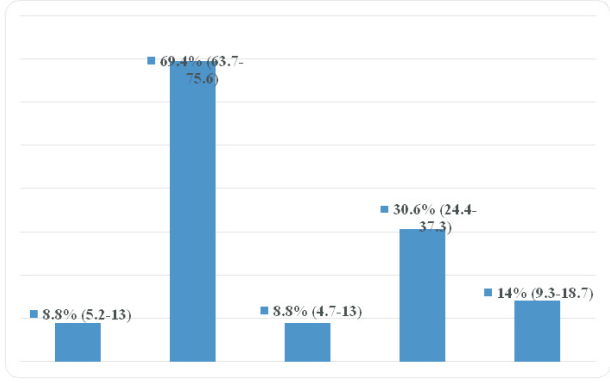


**Figure 1: Bar chart showing complications of allergic rhinitis among patients attended during the period of study**

## DISCUSSION

Worldwide the prevalence of allergic rhinitis has been increasing, and some environmental factors like pollution (38) have been associated with this. But the prevalence differs among countries or regions of the same countries, with the highest prevalence reported in the USA (22, 23) and a bit low in Africa despite few studies which have been done. In this study the prevalence at Muhimbili national hospital for the patients who are receiving ORL services was found to be 10.3%. This prevalence is analogous to 14.7% found in Bugando medical center and 13.7% in Kinshasa. In Africa the higher prevalence reported in Cape Town 30% but this was a community based study (33). The prevalence of allergic rhinitis in my study may be

not representing the actual picture of the condition in the society as majority of patients with this condition are treated in the peripheral hospitals and merely patients with severe symptoms or associated complications present to ENT surgeon. A better picture of the magnitude of Allergic rhinitis in this region requires comprehensive data collection including both hospital and communality-based study.

4.1 Socio-demographic characteristics

\The study consisted of 193 patients with allergic rhinitis and among those 88 (45.6%) were below the age of 15years which is inconsistent with other studies done elsewhere Worldwide and in Africa and (31, 32). The reason for this may be due to children being more exposed to allergens, irritants when playing around and viral upper respiratory tract infections (at school/day care centers) which exacerbate the conditions (34).

The male to female ratio was equal, which is similar with other studies which were done in East Africa (29) and Nigeria. Though some studies in Europe show female predominance (35).

4.2 Area of residence

The prevalence of allergic rhinitis differs from place to place and among regions of the same country (40). This has been associated with several theories including climatic factors, increasing in winter and rainy seasons, dietary changes, environmental factors including industrial pollution and Infections (Hygiene hypothesis). In this study about 80% of the patients were coming from Dar es Salaam, 18% from the upcountry and about 2% from Zanzibar. In Dar es Salaam most patients were coming from Kinondoni and Ilala P-value is (< 0.001). This finding is comparable with other studies finding which shows most of patients were coming from the cities which are said to be polluted than up countries with high socio economic status (1). In the study which was done in Congo 65.6% of the participants lived in urban and 34.4% lived rural areas respectively (21).

4.3 Common detected inhalant Allergens.

In this study allergic skin test was aimed specifically to detect the common inhalant allergens which are encountered by the allergic rhinitis patients in their environment. Exposure to dust mites, pollens, molds and animal dander were the most common reacted allergens in skin allergic test. More than 75% of the patients were allergic to dust mites and animal dander was the least found reacted positive in (11%) of the patients. This observation is in agreement with other studies reported elsewhere (39). The animal dander was the least because may be most of patients (80%) were coming from Dar es Salaam where it is difficult to keep animals but also it is not a very common habit for people in this country to keep animals as pets. But the finding is similar to the study which was done in Cameroon which assessed the risks factors in bakers (44).

Diverse environmental factors were found to enhance the risk of allergic rhinitis mainly in children. Pollution factors such as environmental tobacco smoke exposure, strong smells, road traffic pollution and house dusts seem to be important triggers of allergic rhinitis (38). Most patients were able to identify the triggers of their allergic symptoms, dust and strong smells e.g. perfumes were reported to be the most common triggering factors in 72% of patients.

4.4 Complications

In addition to its direct effect on the quality of life, allergic rhinitis has significantly caused several complications such as sinusitis, otitis media, inferior turbinate hypertrophy, adenoid hypertrophy, and middle ear effusion and sinonasal polyps (37). In the present study inferior turbinate hypertrophy was found in 69.4%, adenoid hypertrophy presented in about (30%), 14% had sinonasal polyp and sinusitis and middle ear effusion was the least complication which was found in 8.8% of the patients respectively. More than 70% of patients were found to have tonsilar hypertrophy in this study which is merely not a complication but rather a co morbid condition.

This finding reflects other studies which were done in east Africa. In Bugando turbinate hypertrophy was found in 40.5% of all patients, adenoid hypertrophy was 46%, ear discharge was 8.4%, sinusitis 5.3% and nasal polyp was 8% and about 55% of patients had tonsilar hypertrophy.

Middle ear effusion doesn't have gender predilection (p-0.852), turbinate hypertrophy was common in females (P-0.05) and sinusitis was equal in both sexes (p-0.852). Adenoid hypertrophy was more common in males (P-0.028) and sinonasal polyp was common in females (P-0.261).

Turbinate hypertrophy and sinusitis were common in patients above 35 years (P-0.575, 0.135), Middle Ear effusion was common in children under five year of age (P-<0.001), Adenoid hypertrophy was common in under five (P-<0.001) and nasal polyps was common in age group between 16 and 25 years (P-<0.001).

## CONCLUSION

1. This study has concluded that allergic rhinitis is among the most common health problems affecting Tanzanians
2. Allergic rhinitis was found to be more in younger age (<15 yrs) which is in correlation with other studies done in Africa and worldwide as whole.
3. Turbinate hypertrophy was the most common complication of Allergic rhinitis.
4. Dust mite was the most common allergen responsible for the condition.
5. Most of patients seen were from Dar es Salaam which is also similar to other studies which show urban residents suffer more from allergic rhinitis but this may be also favoured by the location of the hospital.

## LIST OF ABBREVIATIONS

MNH : MUHIMBILI NATIONAL HOSPITAL
MUHAS : MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
AR : ALERGIC RHINITIS
WHO : WORLD HEALTH ORGANIZATION

## DECLARATIONS

### Ethics approval and consent to participate

The approval to conduct the study was granted by Ethics and Research Committee for Muhimbili University of Health and Allied Sciences

### Availability of data and material

The detailed reported information can be obtained from the corresponding authors when needed and from archives of the department of otorhinolaryngology-MUHAS

### Competing interests

The authors declare that they have no competing interests

### Funding

### Authors' contributions

**WAM** participated in preparation of the manuscript. **KBM** participated in study design, data collection and analysis.

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