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Pattern of allergic rhinitis among children in Ekiti, Nigeria

Waheed Atilade Adegbiji[a], Gabriel Toye Olajide[b,*], Anthony Oyebanji Olajuyin[a], Shuaib Kayode Aremu[b], Akanbi Ganiyu Olusola[c]

[a] ENT Department, Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria
[b] ENT Department, Federal Teaching Hospital, Ido-Ekiti/Afe Babalola University Ado-Ekiti (ABUAD), Ekiti State, Nigeria
[c] Radiology Department, Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria

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ABSTRACT

Background: Allergic rhinitis is a chronic and recurrent nasal condition. It is often neglected in children with late presentation. This study aimed at determining the prevalence, sociodemographic features, comorbid illnesses, complications and quality of life in children with allergic rhinitis in the study institution.

Materials and methods: This is a prospective hospital based study of children with allergic rhinitis in Ekiti state university teaching hospital, Ado Ekiti. The study was carried out in ENT department over a period of two years (between June 2015 to May 2017). Informed consent was obtained from the parents/guardian/patients and consented patients were enrolled into the study. Data were obtained by pretested interviewers assisted questionnaire. Details of their history, physical examination and investigations were carried out and findings were documented. All data obtained were descriptively analysed using SPSS version 18.0 and presented in simple tables and charts. Ethical clearance was sought for and obtained from the ethical committee of the hospital.

Results: A total of 4341 patients were seen out of which 265 were children with allergic rhinitis. Prevalence of allergic rhinitis in children in this study was 6.1%. There were 63.0% males with male to female ratio of 2:1. Allergic rhinitis was peaked at preschool age group (1–5 years) accounted for 47.9%.

A total of 42.3% participants were living in urban setting while 57.7% were from rural setting. Majorities (40.4%) of the patients were in nursery and parent's major occupation was mainly farming in 27.2%.

There was positive family history of allergy in 54.7% patients. Perennial allergic rhinitis were noted in 63.8% patients while seasonal allergic rhinitis were noted in 36.2% patients. Major form of allergens was inhalant 81.8% and the least form of allergen was ingestant 5.7%.

The commonest identified trigger factors among the study population were as follows: dust, cold weather and smoke which were accounted for 59.6%, 37.4% and 18.9% of the study patients respectively. Other noted triggering factors were soap and perfume which accounted for 4.2% and 1.1% respectively.

Major associated comorbid illnesses among the patients were tonsils hypertrophy, adenoid hypertrophy and inferior turbinate hypertrophy which accounted for 55.5%, 46.4% and 40.4% respectively. Clinical presentations of allergic rhinitis in this study were mainly 75.8% nasal blockage, 65.3% runny nose and 8.5% recurrent sneezing.

Commonest complications of allergic rhinitis were 35.1% pharyngitis, 32.1% otitis media and 28.3% headache.

Treatment of allergic rhinitis leads to improvement on the clinical features in 90.1% patients. No significant improvement in clinical features were noticed in 9.8% patients. None of the studied patients reported worse clinical condition after treatment of allergic rhinitis. No mortality was recorded from allergic rhinitis in this study.

Conclusion: Allergic rhinitis affect all paediatric age group and there were delayed presentation in the participants. There were associated comorbid illnesses, complications and affectation of quality of life at presentation in majority of the patients.

* Corresponding author.
E-mail addresses: awagbiji@yahoo.com (W.A. Adegbiji), toyeolajide@yahoo.co.uk (G.T. Olajide), oyebanjiolajuyin@yahoo.com (A.O. Olajuyin), Shuaib.aremu@gmail.com (S.K. Aremu), solz50@hotmail.com (A.G. Olusola).

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1. Introduction

Allergic rhinitis happens when aeroallergens trigger the release of histamine in the nose and it results from nasal congestion, rhinorrhea, sneezing and itching. Symptoms in the eyes, ears and throat are frequently associated [1–5].

Majority of the available data in the literature has focused on adults with allergic rhinitis and very little data is available about prevalence, burden, quality of life, complications, effects and comorbidities in children especially in developing countries [6]. In an American survey, 61% of children were diagnosed with allergic rhinitis by 6 years of age, and most of these children were diagnosed by pediatricians [7–11]. Allergic rhinitis was previously classified as seasonal and/or perennial. New Allergic Rhinitis and Its Impact on Asthma (ARIA) classification system was designed to better classify the disorder and include the categories of intermittent and persistent allergic rhinitis [12–16]. In allergic rhinitis the allergens include house dust mites, grass pollen, tree pollen, cockroaches, rodents, weed pollens, cat, dog, and molds [17–21].Nonallergic triggers such as weather, fumes, odours, and exercise were commonly reported [15,16]. Allergic rhinitis may be due to local IgE production in the nose if no allergen was identified [22–24]. The role of histamine in allergic diseases is well defined [25–27]. Histamine mediates its effects via an established set of histamine receptors. In the nose this results in sneezing, itching and rhinorrhea. Risk factors for pediatric allergic rhinitis include genetic predisposition, prenatal as well as early-life environmental exposures (infections, indoor and outdoor air pollution, tobacco smoke, and diet) at a critical time when the immune system is still undergoing development, atopy, high socioeconomic status, and positive family history [28,29].

Complications of allergic rhinitis include the following: acute or chronic sinusitis, otitis media, sleep disturbance or apnea, dental problems (overbite). Morbidity/mortality from allergic rhinitis is not a life-threatening unless it is accompanied by comorbid illnesses such as severe asthma or anaphylaxis, eczema, and food allergies.

There is increase in prevalence rate of allergic rhinitis in recent time. Despite this increment there is still paucity of literature on allergic rhinitis in the developing countries. This study aimed at determining prevalence, sociodemographic features, comorbid illnesses, complications and quality of life of patients with allergic rhinitis in the study institution.

2. Materials and methods

This is a prospective hospital based study of the patients with clinical diagnosis of allergic rhinitis in children seen, reviewed and managed in the Ear, Nose and Throat department of the Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria. This included all children aged 18 years and below at the time of this work. This tertiary health institution is the only state ownedhealth facility serving over two millions populations in the state and 4 neighboring states of Ondo, Osun, Kogi and Kwara. The study was carried out over a period of two years (from June 2015 to May 2017). All consecutive patients who presented to the department were enrolled into the study. Informed consent was obtained from patients/guardian/parents before patients were enrolled into the study. Interviewer assisted questionnaire (pretested) were given to consented patients/parents/guardians to obtain detailed data on sociodemographic features of patients. Their detailed otorhinolaryngological history including their past medical, surgical and social history was also taken. Also history of allergens exposure and drugs usage were taken.

All the patients that were recruited into this study had detailed ENT examination done using endoscopes. Detailed nose, ear, throat, head and neck examination were done and documented. Detailed rhinological examination includes anterior rhinoscopy, nasal cavity and posterior rhinoscopy with nasoendoscopy. Oropharyngeal examination performed and findings were documented. General physical and systemic examination was performed.

Limitations of this study include the absence of allergy testing and failure of estimating the measure of quality of life based on a standardized and validated (generic or disease-related) questionnaires.

Mucopurulent sino nasal discharge (specimen) was aseptically taken examined and sent for microscopy, culture, and sensitivity in case of any super imposed bacterial infection. Further investigations such as x ray, computerized tomographic (CT) scan of the paranasal sinuses were requested based on clinical findings.

All the patients were educated based on the findings on the line of management of allergic rhinitis. Treatment modalities were avoidance of allergens, antibiotic therapy (such as amoxicillin/clavulanic acid to treat superimposed infection), antihistamines, topical corticosteroids, systemic steroids and surgery (adenoidectomy with or without tonsillectomy) depending on clinical findings. Participants were followed up in the ear, nose and throat clinic for possible outcome and complications.

All data obtained were documented, collated and analysed. The data analysis was done by using SPSS version 18. The analyzed data were presented in simple descriptive tables and charts.

Ethical clearance was sought for and obtained from the ethical committee of the hospital.

3. Results

A total of 4341 patients were seen in the ENT department over the study period. There were 265 paediatric patients (characterised by rhinorrhoea, nasal obstruction, epiphora, and nasal and eye itching) enrolled into the study. Prevalence of allergic rhinitis in children in this study was 6.1%. Allergic rhinitis affects all the paediatric age group with a peak at preschool age group (1–5) years accounted for 47.9%. This was demonstrated in Fig. 1. There were 167 (63.0%) males 98 (37.0%) females with male to female ratio of 2:1. A total of 112 (42.3%) participants were living in urban setting while 153 (57.7%) were from rural setting. Majority (40.4%) of the patients were in nursery, 26.8% were in secondary school level while 9.4% are in post-secondary level of education. Parent's major occupation were mainly farming (27.2%), teaching (25.9%) while 10.6% are health worker. This was illustrated in Table 1.

There were positive family history of allergy in 145 (54.7%) while 120 (45.3%) did not have. From the patients history perennial allergic rhinitis were noted in 169 (63.8%) patients while seasonal allergic rhinitis were noted in 96 (36.2%) patients. Using ARIA classification as shown in Table 2, majority 145 (54.8%) of the patients were moderate-

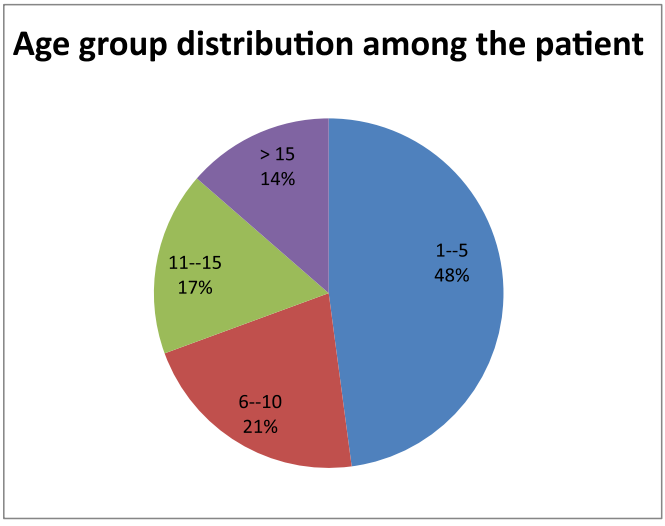


Fig. 1. Age group(years) among patients.

Table 1
Sociodemographic features of the patients.

Sociodemographic features	Number	Percentage (%)
Sex		
Male	167	63.0
Female	98	37.0
Residential		
Urban	112	42.3
Rural	153	57.7
Education level		
Nursery	107	40.4
Primary	62	23.4
Secondary	71	26.8
Post secondary	25	9.4
Parental occupation		
Business	55	20.8
Teaching	69	25.9
Industrial worker	41	15.5
Farming	72	27.2
Health worker	28	10.6

Table 2
Features of Allergy among the patients.

Features of Allergy	Number	Percentage (%)
Family history of Allergy		
Present	145	54.7
Absent	120	45.3
Type of Allergy		
Perennial	169	63.8
Seasonal	96	36.2
ARIA Classification		
Mild-Intermittent	26	9.8
Moderate-Severe intermittent	51	19.2
Mild-Persistent	43	16.2
Moderate-Severe Persistent	145	54.8
Form of Allergy		
Inhalant	217	81.8
Ingestantt	15	5.7
Contactant	33	12.5
Trigger factor		
Dust	158	59.6
Cold weather	99	37.4
Smoke	50	18.9
Perfume	11	4.2
Vehicle exhaust	24	9.1
Soap	3	1.1

severe persistent allergic rhinitis and 51 (19.2%) had moderate-severe intermittent allergic rhinitis. Major form of allergens was 217 (81.8%) inhalant and the least form of allergen was 15 (5.7%) ingestant. In this study, self-reported allergy were based on the trigger factors. The commonest identified trigger factors among the study population were as follows: dust, cold weather and smoke which were accounted for 158 (59.6%), 99 (37.4%) and 50 (18.9%) of the study patients respectively. The less common trigger factors were soap and perfume which accounted for 11(4.2%) and 3 (1.1%). This was showed in Table 2.

Major associated comorbid illnesses among patients with allergic rhinitis in this study were tonsillar hypertrophy, adenoid hypertrophy and inferior turbinate hypertrophy which accounted for 147 (55.5%), 123 (46.4%) and 107 (40.4%) respectively. Minor associated comorbid illnesses in this study were sinusitis, allergic dermatitis and ear discharge which accounted for 14 (5.3%), 14 (5.3%) and 22 (8.3%) respectively. This was showed in Table 3.

Clinical presentation of allergic rhinitis in this study were mainly nasal blockage in 201 (75.8%) of our patients, runny nose in 173 (65.3%) and 155 (58.5%) had recurrent sneezing. Permanent nasal obstruction were noticed in 172 (64.9%) while recurrent nasal obstruction were noticed in 29 (10.9%). Trigger factors for sneezing were identified in 146 (55.1%) patients. Less common presentation of

Table 3
Comorbid illnesses among the patients.

Comorbid illnesses	Number	Percentage (%)
Asthma	63	23.8
Allergic conjunctivitis	84	31.7
Allergic dermatitis	14	5.3
Recurrent tonsillitis	147	55.5
Adenoid hypertrophy	123	46.4
Inferior turbinate hype	107	40.4
Nasal polyps	25	9.4
Ear discharge	22	8.3
Sinusitis	14	5.3

Table 4
Symptoms of allergy among the patients.

*Symptoms	Number	Percentage (%)
Blocked nose	201	75.8
Runny nose	173	65.3
Recurrent sneezing	155	58.5
Nasal itching	141	53.2
Itchy throat	103	38.9
Itchy ear	93	35.1
Watery eyes	88	33.2
Itchy nose	87	32.8
Eye itching	86	32.5

*NB.
*Some patients has more than one symptoms.

allergic rhinitis in this study were 86 (32.5%) itchy eye and 87 (32.8%) itchy nose. This was illustrated in Table 4.

Clinical findings in this study were mainly oedematous nasal mucosa, enlarged turbinate and reduced nasal patency and they accounted for 193 (72.8%), 178 (67.2%) and 140 (52.8%) respectively.

Common complications which were associated with allergic rhinitis includes pharyngitis in 93 (35.1%), otitis media in 85 (32.1%) while 75 (28.3%) has headache. Fig. 2.

Microscopic, culture and sensitivity were requested for patients with mucopurulent discharge. There was no growth in 9 (3.4%) of the nasal specimen taken. There were growths of streptococcus in 64 (24.2%), *Staphylococcus aureus* in 49 (18.5%) and Hemophilus influenzae in 31 (11.7%) of the patients.

Treatment approach was by combination of allergens avoidance, medical treatment and surgery was reserved for patients with adenoid

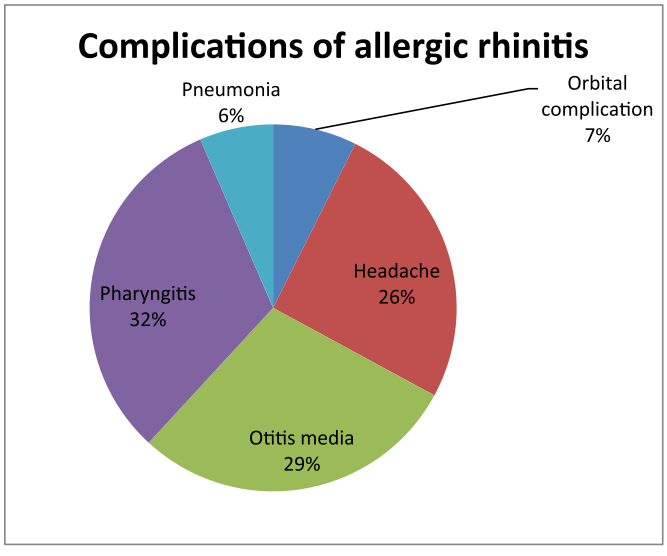


Fig. 2. Complications of allergic rhinitis.

and/or tonsils hypertrophy. Treatment of allergic rhinitis and comorbid illnesses leads to improvement and recovery on the clinical features (not cure) in 239 (90.2%) patients. There was no significant improvement in clinical features in 26 (9.8%) of our patients. None of the studied patients reported worse clinical condition after treatment of allergic rhinitis and comorbid illnesses. No mortality was recorded from allergic rhinitis, comorbid illnesses, complications or treatment intervention in this study.

4. Discussion

Allergic rhinitis in children is still a global healthy problem with little or no recognition. In most cases children allergic rhinitis is commonly under-diagnosed because the symptoms are frequently attributed to a viral or recurrent flu. As a result of this most parents do not seek medical intervention. Some parents use available medication or local herbs without doctors prescription and such symptoms treatment are suboptimal [30].

Prevalence of allergic rhinitis in children in this study was 6.1% this is lower than prevalence rate in other previous studies [7–9]. This low prevalence of allergic rhinitis in children may be due to underestimate as majority of patients with this condition are treated by their family physician or paediatrician at peripheral hospitals. Majority of the patients in this study were with severe symptoms, complicated cases or associated co-morbidities were referred to otorhinolaryngologist, head and neck surgeon. A true prevalence of allergic rhinitis among paediatric in this region requires comprehensive community-based study. The study population were mainly civil servant from low industrial state in a developing part of the world compared to study in developed part of the world with higher prevalence of allergic rhinitis. There is higher prevalence in some developing region such in African countries includes 29.6% in Nigeria and 30% in Cape Town in South Africa [31,32]. Factors responsible for high prevalence of allergic rhinitis in children includes climatic factors, dietary changes, environmental factors and industrial pollution were very low in the study population.

In this study, male gender preponderance was observed which is in agreement with other study [33]. This however differs from other studies with female preponderance [34]. There are some studies with equal sex preponderance [35]. This gender proportions is found to be inconsistent in different study. Gender parity findings may likely be by chance.

Majority of the paediatric patients in this study were preschool children this is comparable with other previous studies [36,37]. This may be due to increased number of associated comorbid illnesses such as adenoid with tonsillar hypertrophy of allergic rhinitis at this age group which prompted parent to attend specialist medical services in this study. Allergic rhinitis is also associated with severe and troublesome symptoms which are exacerbated by acute viral infections forcing parents or guardian to seek specialist medical cares. Common chronic symptoms of allergic rhinitis are commonly ignored in older aged patients in this study except when complicated.

In this study environmental factors that were responsible for increase risk of allergic rhinitis in children were dusts, fumes exhausts from vehicle, environmental tobacco smoke exposure and moulds and perfume and this is similar to findings in other studies [38–40]. Many patients in this study had family history of allergy. Similar findings were discovered in previous study [41].

Inflammation of the nasal mucosal lining and contiguous structure from allergens results in sneezing, rhinorrhoea, nasal congestion, with itching of the nose, ear, palate, throat and eyes [42]. Nasal obstruction usually worsen with comorbid inferior turbinate hypertrophy, nasal polyps and adenoid hypertrophy among our patients. Blocked nose showed significant association with adenoid hypertrophy in children in this study. Rhinorrhea is the resultant effects of nasal mucosal goblet cell stimulation by the allergens. In our study, high percentage of patients had runny nose (rhinorrhoea), nasal blockage, bout of sneezing and these findings are similar to other studies on allergic rhinitis [43]. Consequently qualities of life are grossly affected in some of our patients. Qualities of life that are often affected include impaired social life (especially in the older ones), sleep disruption, daytime sleepiness, absenteeism and irritability [43]. Nasal obstruction and nasal congestion were responsible for the sleep disturbances [43]. Nasal blockage and rhinorrhoea when severe may cause interference with daily activities and embarrassment to allergic rhinitis patients [44].

In this study population, allergic rhinitis in children has significant comorbid illnesses such as asthma, sinusitis, otitis media, adenoid hypertrophy and allergic conjunctivitis in different percentages. Many other studies reported different percentage of associated comorbid illnesses [30].

In the management of the patients with allergic rhinitis in children in this study multidisciplinary approach was used. This is because of the associated comorbid illnesses and complication with allergic rhinitis in the studied children. The health team included general practitioner, paediatricians, allergists and otorhinolaryngologists, head and neck surgeon [30]. The treatment of approach were allergen avoidance, medical intervention and surgical treatment of comorbid illnesses and complications. Allergens control requires aggressive environmental control which is effective [45]. Medical treatment includes intranasal steroid, antihistamines and antibiotics to treat superimposed infection and depending on the presenting clinical features. Surgical therapy was reserved for adequate treatment of comorbid illnesses, complications and refractory to medical treatment [46,47]. Surgical treatments are for patients with adenoid hypertrophy, tonsillar hypertrophy and turbinate hypertrophy. Other form treatments such as Immunotherapy, desensitization are not used in this study due to available facilities in the study [48]. Montelukast a leukotriene receptor antagonist used for the maintenance treatment of allergy and asthma is not available in our center.

There was no associated mortality to allergic rhinitis in children in our study. Common cause of death due to comorbid illnesses, surgical complications were recorded in other study [49].

Findings in this study was due to some potential limiting factors which includes to performed allergy testing, hospital based study and measurement of quality of life without the use of standardized and validated (generic or disease-related) questionnaires. Despite these limitations this study provide hospital information which can serve as bases for community based study and may help health care workers to develop guideline in management of allergic rhinitis in children.

5. Conclusion

Allergic rhinitis is very common and affect all paediatric age group usually neglected and delayed presentation in the participants. Prevalence of allergic rhinitis was low in this study compare to previous study. There were associated comorbid illnesses, complications and affectation of quality of life before presentation to the otorhinolaryngologist in majority of the patients. Early referral is highly recommended to the specialist to avoid on toward effect.

Conflicts of interest

None.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.ijporl.2018.01.014.

References

[1] K.S. Glenis, Allergic rhinitis in children, Paediatr. Child Health 18 (7) (2008) 323–328.

[2] T. Sanford, Allergic rhinitis in children, Missouri Medicine 105 (3) (2008) 230–234.
[3] J.S. Kim, H.S. Kang, H.J. Jang, J.H. Kim, D.H. Lim, B.K. Son, Clinical features of allergic rhinitis in Korean children, Allergy Asthma Respir Dis 3 (2015) 116–123.
[4] Allergic rhinitis in children with attention-deficit/hyperactivity disorder, B. Ashley, S. Bernard, K. Shannon, G. Denise, O. Mark, B. Harvey, S. Arlene, Ann Allergy Asthma Immunol 92 (2004) 663–667.
[5] W.E. Berger, Overview of allergic rhinitis, Ann. Allergy Asthma Immunol. 90 (Suppl 3) (2003) 7–12.
[6] M. Erkkola, M. Kaila, B.I. Nwaru, C. Kronberg-Kippilä, S. Ahonen, J. Nevalainen, et al., Maternal vitamin D intake during pregnancy is inversely associated with asthma and allergic rhinitis in 5-year-old children, Clin. Exp. Allergy 39 (6) (2009) 875–882.
[7] E.O. Meltzer, M.S. Blaiss, J. Derebery, T.A. Mahr, B.R. Gordo, K.K. Sheth, et al., Burden of allergic rhinitis: results from the Pediatric Allergies in America survey, J. Allergy Clin. Immunol. 124 (2009) s43–70.
[8] N. Ait-Khaled, H.R. Anderson, M.I. Asher, et al., Worldwide time trends for symptoms of rhinitis and conjunctivitis: phase III of the International Study of Asthma and Allergies in Childhood, Pediatr. Allergy Immunol. 19 (2007) 110–124.
[9] S. Hamouda, C. Karila, T. Connault, P. Scheinmann, J. de Blic, Allergic rhinitis in children with asthma: a questionnaire-based study, Clin. Exp. Allergy 38 (2008) 761–766.
[10] G. Scadding, Optimal management of nasal congestion caused by allergic rhinitis in children: safety and efficacy of medical treatments, Paediatr. Drugs 10 (2008) 151–162.
[11] H. Yuksel, A. Sogut, H. Yilmaz, O. Yilmaz, G. Dinc, Sleep actigraphy evidence of improved sleep after treatment of allergic rhinitis, Ann. Allergy Asthma Immunol. 103 (2009) 290–294.
[12] J. Bousquet, N. Khaltaev, A.A. Cruz, J. Denburg, W.J. Fokkens, A. Togias, Allergic rhinitis and its Impact on asthma (ARIA) 2008 update (in collaboration with the world health Organization, GA2LEN and AllerGen), Allergy 63 (Suppl 86) (2008) 8–160.
[13] LBCl Klimek, R. Mösges, U. Munzel, D. Price, J.C. Virchow, U. Wahn, J. Bousquet, Effectiveness of MP29-02 for the treatment of allergic rhinitis in real-life: results from a noninterventional study, Allergy Asthma Proc. 36 (8) (2015) 40–47.
[14] J. Bousquet, J. Reid, C. Van Weel, C. Baena Cagnani, G.W. Canonica, P. Demoly, et al., Asthma management pocket reference 2008, Allergy (2008) 63 implementation. Allergy.
[15] J. Bousquet, H.J. Schunemann, J. Fonseca, B. Samolinski, C. Bachert, G.W. Canonica, et al., MACVIA-ARIA Sentinel NetworK for allergic rhinitis (MASK-rhinitis): the new generation guideline implementation, Allergy 70 (11) (2015) 1372–1392.
[16] J. Marek, A. Loana, B. Sergio, B.A. Wesley, C. FLinda, D. Pascal, et al., International consensus on allergy immunotherapy, J. Allergy Clin. Immunol. 136 (3) (2015) 556–568.
[17] J. Corren, F.M. Baroody, R. Pawankar, Allergic and nonallergic rhinitis, in: N.F. Adkinson, Jr.B.S. Bochner, A.W. Burks, et al. (Eds.), Middleton's Allergy: Principles and Practice, eighth ed., Elsevier Saunders, Philadelphia, PA, 2014chap 42.
[18] M.D. Seidman, R.K. Gurgel, S.Y. Lin, et al., Guideline Otolaryngology Development Group, AAO-HNSF. Clinical practice guideline: allergic rhinitis, Otolaryngol. Head Neck Surg. 152 (1) (2015) S1–S43.
[19] G.K. Scadding, S.R. Durham, R. Mirakian, et al., BSACI guidelines for the management of allergic and non-allergic rhinitis, Clin. Exp. Allergy 38 (2008) 19–42.
[20] J. Bousquet, P. Van Cauwenhage, N. KhaltaevARIA Workshop Group, Allergic Rhinitis and its Impact on Asthma (ARIA) J Allergy Clin Immunol 108 (suppl 5) (2001) S147–S333.
[21] G.J. Burbach, L.M. Heinzerling, G. Edenharter, C. Bachert, C. Bindsley-Jensen, S. Bonini, et al., GA(2)LEN skin test study II: clinical relevance of inhalant allergen sensitizations in Europe, Allergy 64 (2009) 1507–1515.
[22] N. Fuiano, S. Fusilli, C. Incorvaia, A role for measurement of nasal IgE antibodies in diagnosis of Alternaria-induced rhinitis in children, Allergol Immunopathol (Madr) 40 (2012) 71–74.
[23] P.A. Eggleston, Methods and effectiveness of indoor environmental control, Ann. Allergy Asthma Immunol. 87 (2001) 44–47.
[24] R.J. Boyle, C. Pedroletti, M. Wickman, L. Bjermer, E. Valovirta, R. Dahl, et al., Nocturnal temperature controlled laminar airflow for treating atopic asthma: a randomised controlled trial, Thorax 67 (2012) 215–221.
[25] C. Bachert, The role of histamine in allergic disease: re-appraisal of its inflammatory potential, Allergy 57 (2002) 287–296.
[26] H. Li, Q. Sha, K. Zuo, H. Jiang, L. Cheng, J. Shi, G. Xu, Nasal saline irrigation facilitates control of allergic rhinitis by topical steroid in children, J Otorhinolaryngol Relat Spec 71 (2009) 50–55.
[27] G.K. Scadding, S.R. Durham, R. Mirakian, N.S. Jones, S.C. Leech, S. Farooque, et al., BSACI guidelines for the management of allergic and non-allergic rhinitis, Clin. Exp. Allergy 38 (2008) 19–42.
[28] L. Cazzoletti, M. Ferrari, M. Olivieri, G. Verlato, A. Leonardo, R. Bono, et al., The gender, age and risk factor distribution differs in self-reported allergic and non-allergic rhinitis: a cross-sectional population-based study, Allergy Asthma Clin. Immunol. 11 (2015) 36.
[29] M.S. Jaakkola, R. Quansah, T.T. Hugg, S.A.M. Heikkinen, J.J.K. Jaakkola, Association of indoor dampness and molds with rhinitis risk: a systematic review and meta-analysis, J. Allergy Clin. Immunol. 132 (2013) 1099–1110.
[30] A. Hardjojo, L.P. Shek, H.P. Van Bever, B.W. Lee, Rhinitis in children less than 6 years of age: current knowledge and challenges, Asia Pac Allergy 1 (3) (2011) 115–122.
[31] M.J. Mercer, G.P. Van der Linde, G. Joubert, Rhinitis (allergic and nonallergic) in an atopic pediatric referral population in the grasslands of inland South Africa, Ann. Allergy Asthma Immunol. 89 (5) (2002) 503–512.
[32] S. Masuda, T. Fujisawa, H. Katsumata, J. Atsuta, K. Iguchi, High prevalence and young onset of allergic rhinitis in children with bronchial asthma, Pediatr. Allergy Immunol. 19 (6) (2008) 517–522.
[33] S. Alsowaidi, A. Abdulle, R. Bernsen, T. Zuberbier, Allergic rhinitis and asthma: a large cross-sectional study in the United Arab Emirates, Int. Arch. Allergy Immunol. 153 (3) (2011) 274–279.
[34] W.G. Borges, D.A. Burns, M.L. Felizola, B.A. Oliveira, C.S. Hamu, V.C. Freitas, Prevalence of allergic rhinitis among adolescents from Distrito Federal, Brazil: comparison between ISAAC phases I and III, J Pediatr (Rio J) 82 (2) (2006) 137–143.
[35] C. Gathiru, I. Macharia, The prevalence of allergic rhinitis in college students at Kenya Medical Training College-Nairobi,Kenya, World Allergy Organ. J. (2007) S84–S85.
[36] O.O. Desalu, A.K. Salami, K.R. Iseh, P.O. Oluboyo, Prevalence of self reported allergic rhinitis and its relationship with asthma among adult Nigerians, J Investig. Allergol. Clin. Immunol. 19 (6) (2009) 474–480.
[37] H. Yuksel, G. Dinc, A. Sakar, O. Yilmaz, A. Yorgancioglu, P. Celik, C. Ozcan, Prevalence and comorbidity of allergic eczema, rhinitis, and asthma in a city in western Turkey, J Investig. Allergol. Clin. Immunol. 18 (1) (2008) 31–35.
[38] C. Rondon, J. Fernandez, G. Canto, M. Blanca, Local allergic rhinitis: concept, clinical manifestations, and diagnostic approach, J Investig. Allergol. Clin. Immunol. 20 (5) (2010) 364–371.
[39] I. Nurliza, G. Norzi, A. Azlina, I. Hashimah, M.H. Sabzah, Daycare tonsillectomy: a safe outpatient procedure. Hospital Sultanah Bahiyah, Alor Setar Malaysia experience, Med. J. Malaysia 66 (5) (2011) 474–547.
[40] L.P. Zhu, F. Wang, X.Q. Sun, R.X. Chen, M.P. Lu, M. Yin, L. Cheng, Comparison of risk factors between patients with non-allergic rhinitis and allergic rhinitis, Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 45 (12) (2011) 993–998.
[41] M. Herr, B. Clarisse, L. Nikasinovic, C. Foucault, A.M. Le Marec, J.P. Giordanella, J. Just, I. Momas, Does allergic rhinitis exist in infancy? Findings from the PARIS birth cohort, Allergy 66 (2) (2011) 214–221.
[42] E.W. Gelfand, Pediatric allergic rhinitis: factors affecting treatment choice, Ear Nose Throat J. 84 (3) (2005) 163–168.
[43] I.C. Camelo-Nunes, D. Sole, Allergic rhinitis: indicators of quality of life, J. Bras. Pneumol. 36 (1) (2011) 124–133.
[44] B. Engel-Yeger, A. Engel, A. Kessel, Differences in leisure activities between children with allergic rhinitis and healthy peers, Int. J. Pediatr. Otorhinolaryngol. 74 (12) (2011) 1415–1418.
[45] W.E. Berger, Overview of allergic rhinitis, Ann. Allergy Asthma Immunol. 90 (6) (2003) 7–12.
[46] M. Michael, G.C. Carr, S. Dhave, Predictive factors of prolonged hospital Stay in tonsillectomy patients, Otolaryngol. Head Neck Surg. 145 (2) (2011) 243–246.
[47] A.N. Stevenson, M.D. Shuler, C.M. Myer, P.S. Singer, Complications and legal outcomes of tonsillectomy malpractice claims, Laryngoscope 122 (1) (2012) 71–74.
[48] P.J. Turner, A.S. Kemp, Allergic rhinitis in children, J. Paediatr. Child Health 48 (4) (2010) 302–310.
[49] J.P. Windfuhr, G. Schloendorff, A.M. Sesterhenn, A. Prescher, B.A. Kremer, Devastating outcome after adenoidectomy and tonsillectomy: ideas for improved prevention and management, Otolaryngol. Head Neck Surg. 140 (2) (2009) 191–196.

RESPONSE TO REVIEWER'S COMMENT on Manuscript No: IJPORL-D-17-00879

1. First paragraph of introduction was re –written into another sentence
2. Two out of three of the America survey that was cited had been deleted
3. Irrelevant Part of paragraph four was removed
4. Pathophysiology aspect was removed
5. Second page, second paragraph – the causes of complications were removed
6. Impact of allergic rhinitis was modified
7. ENT Examination carried out in detail
8. Specimen collected for m/c/s to R/O super imposed bacterial infection
9. Antibiotics used was Amoxicillin /clavulanic acid combination
10. Surgery done were mainly Adenoidectomy with or without tonsillectomy
11. Diagnosis is mainly clinical features with endoscopic finding in older children who are cooperative
12. 90 % success but "not cure"
13. Montelukast is not available in our centre but explaination was given in the text
14. Differential diagnosis - done with the aid of clinical features, clinical examination, endoscopy and radiological investigations
15. Sentence on complications was modified and orbital complication expunged
16. The quality of life that wer not relevant to children were expunged
17. Surgery – mainly adenoidectomy with or without tonsillectomy
18. Irrelevant references were deleted or expunged
19. Nasal polyps as a complication was skipped
20. Figure to was expunged
21. References that were not relevant were removed.

TITLE PAGE

Pattern Of Allergic Rhinitis Among Children In Ekiti, Nigeria.

Abstract

Background: Allergic rhinitis is a chronic and recurrent nasal condition. It is often neglected in children with late presentation. This study aimed at determining the prevalence, sociodemographic features, comorbid illnesses, complications and quality of life in children with allergic rhinitis in the study institution.

Materials and Methods: This is a prospective hospital based study of children with allergic rhinitis in Ekiti state university teaching hospital, Ado Ekiti. The study was carried out in ENT department over a period of two years (between June 2015 to May 2017). Informed consent was obtained from the parents/guardian/patients and consented patients were enrolled into the study. Data were obtained by pretested interviewers assisted questionnaire. Details of their history, physical examination and investigations were carried out and findings were documented. All data obtained were descriptively analysed using SPSS version 18.0 and presented in simple tables and charts. Ethical clearance was sought for and obtained from the ethical committee of the hospital.

Results: A total of 4,341 patients were seen out of which 265 were children with allergic rhinitis. Prevalence of allergic rhinitis in children in this study was 6.1%. There were 63.0% males with male to female ratio of 2:1. Allergic rhinitis was peaked at preschool age group (1-5 years) accounting for 47.9%.

A total of 42.3% participants were living in urban setting while 57.7% were from rural setting. Majority 40.4% of the patients were in nursery, 26.8% were in secondary school level while 9.4% are in post-secondary level of education. Parent's major occupation were mainly farming 27.2%, teaching 25.9% while 10.6% were health worker.

There was positive family history of allergy in 54.7% patients. Perennial allergic rhinitis were noted in 63.8% patients while seasonal allergic rhinitis were noted in 36.2% patients. Using ARIA classification majority of the patients were 54.8% moderate-severe persistent allergic rhinitis and 19.2% moderate-severe intermittent allergic rhinitis. Minority 9.8% of the patients were mild intermittent allergic rhinitis. Major form of allergens was inhalant 81.8% and the least form of allergen was ingestant 5.7%.

The commonest identified trigger factors among the study population were as follows: dust, cold weather and smoke which were accounted for 59.6%, 37.4% and 18.9% of the study

patients respectively. The less common trigger factors were soap and perfume which accounted for 4.2% and 1.1% respectively.

Major associated comorbid illnesses among the patients were tonsils hypertrophy, adenoid hypertrophy and inferior turbinate hypertrophy which accounted for 55.5%, 46.4% and 40.4% respectively. Minor associated comorbid illnesses in this study were sinusitis, allergic dermatitis and ear discharge which accounted for 5.3%, 5.3% and 8.3% respectively.

Clinical presentation of allergic rhinitis in this study were mainly 75.8% nasal blockage, 65.3% runny nose and 8.5% recurrent sneezing. Permanent nasal obstruction were noticed in 64.9% while recurrent nasal obstruction were noticed in 10.9%. Catarrh was reported to be mucopurulent in 47.9% and clear mucous in 17.4%. Trigger factors for sneezing were identified in 55.1%. Less common presentation of allergic rhinitis in this study were 32.5% itchy eye and 32.8% itchy nose.

Clinical findings in this study were mainly oedematous nasal mucosa, enlarged turbinate and reduced nasal patency and were 72.8%, 67.2% and 52.8% respectively. Bluish oedematous nasal mucosa in 69.4% but reddish in 3.4%. Total nasal obstruction in 32.8% and partial patency in 34.3%. Less common findings were septal ulceration and post nasal discharge which accounted for 11.3% and 23.0% respectively. Post nasal discharge were mucopurulent in 21.1% while mucoid in 1.8%.

Commonest complications of allergic rhinitis were 35.1% pharyngitis, 32.1% otitis media and 28.3% headache. Less common compilcations of allergic rhinitis was 6.8% orbital complication.

Microscopic, culture and sensitivity revealed no growth in 3.4% of the nasal mucous swab taken. There were growths of streptococcus sp 24.2%, Staphylococcus aureus 18.5% and Hemophilus influenzae 11.7% of the sample.

Treatment of allergic rhinitis leads to improvement on the clinical features in 90.1% patients. No significant improvement in clinical features were noticed in 9.8% patients. None of the studied patients reported worse clinical condition after treatment of allergic rhinitis. No mortality was recorded from allergic rhinitis in this study.

Conclusion: Allergic rhinitis affect all paediatric age group and there were delayed presentation in the participants. There were associated comorbid illnesses, complications and affectation of quality of life at presentation in majority of the patients.

Keywords: Paediatric, Allergic rhinitis, Allergens, ARIA classification, Comorbid illnesses, complication.

Introduction

Allergic rhinitis happens when aeroallergens trigger the release of histamine in the nose it results from nasal co,gestion, rhinorjhea, sneezing and itching. Symptoms in the eyes, ears and throat are frequently associated [1-5]. Allergic rhinitis in children is a reaction that happens in the nose, ear, throat and eyes when allergens in the air trigger the release of histamine in the body [1-4]. It is a chronic inflammatory disease of the upper airways, and it present as nasal congestion, rhinorrhea, sneezing, and itching. Presentation may include eyes, ears, and throat [5,6].

Majority of the available data in the literature has focused on adults with allergic rhinitis and very little data is available about prevalence, burden, quality of life, complications, effects and comorbidities in children especially in developing countries [6].

Paediatric Allergies in America survey found 13% of children had diagnosis of allergic rhinitis and were symptomatic within the past year. In an American survey, 61% of children were diagnosed with allergic rhinitis by 6 years of age, and most of these children were diagnosed by pediatricians [7-11]. In the Pediatric Allergies in America survey, it was reported that allergic rhinitis was 62% seasonal and also reported that it was 37% perennial [14,15]. Allergic rhinitis was previously classified as seasonal and/or perennial. New Allergic Rhinitis and Its Impact on Asthma (ARIA) classification system was designed to better classify the disorder and include the categories of intermittent and persistent allergic rhinitis [16-21]. Patients that experience symptoms fewer than 4 days per week or for fewer than 4 weeks at a time are classified as having intermittent allergic rhinitis while patients that experience symptoms more than 4 days per week or more than 4 weeks at a time are classified as having persistent allergic rhinitis. Based on the severity **of** allergic rhinitis is classified as mild or moderate to severe. This classification is based on whether the allergic rhinitis symptoms result in any impairment of daily activities, sleep disturbances, and the degree of troublesome of symptoms.

In allergic rhinitis the allergens include house dust mites, grass pollen, tree pollen, cockroaches, rodents, weed pollens, cat, dog, and molds [17-21]. Nonallergic triggers such as weather, fumes, odours, and exercise were commonly reported [15,16]. Allergic rhinitis may be due to local IgE production in the nose if no allergen was identified [22-24]. IgE antibodies are preformed from previous exposure to allergen and it sit on the surface of mast cells. They are allergen specific. On re-exposure to allergen, IgE is cross-linked, and this signal leads to mast cell degranulation. This results in the release of a variety of inflammatory mediators, including histamine. The role of histamine in allergic diseases is well defined [25-27]. Histamine mediates its effects via an established set of histamine receptors. The biological effects of histamine in the allergic reaction are related to activity of H1 receptors, including smooth muscle contraction,

bronchospasm, increased endothelial permeability, and stimulation of sensory nerves and cough receptors [33-35]. In the nose this results in sneezing, itching and rhinorrhea. Similar allergic reaction occur in the ear, throat, eyes, lower respiratory tract and skin.

Symptoms of allergic rhinitis are triggered by exposure to allergens includes the following: sneezing, itching: Nose, eyes, ears, palate, rhinorrhea, postnasal drip, congestion, anosmia, headache, earache, tearing, red eyes, eye swelling, fatigue, drowsiness and malaise [36-38]. Usual clinical findings were oedematous mucosa, bluish mucosa, enlarged turbinate, rhinorrhea, septal deviation, bulbous septum, nasal patency and post nasal discharge [37-39]. There may be retraction and abnormal flexibility of the tympanic membrane, injection and swelling of the palpebral conjunctivae, with excess tear production, dark circles around the eyes, cobble stoning (streaks of lymphoid tissue on the posterior pharynx), tonsillar hypertrophy, and malocclusion (overbite) and high-arched palate [37-40].

Risk factors for pediatric allergic rhinitis include genetic predisposition, prenatal as well as early-life environmental exposures (infections, indoor and outdoor air pollution, tobacco smoke, and diet)at a critical time when the immune system is still undergoing development, atopy, high socioeconomic status, and positive family history [28,29].

Complications of allergic rhinitis include the following: acute or chronic sinusitis, otitis media, sleep disturbance or apnea, dental problems (overbite). Caused by excessive breathing through the mouth, palatal abnormalities and eustachian tube dysfunction [43].

On the mortality/morbidity and allergic rhinitis, it is not a life-threatening unless it is accompanied by comorbid illnesses such as severe asthma or anaphylaxis, eczema, and food allergies. and so on.

Allergic rhinitis is associated with significant morbidity and also affects patients' quality of life, emotional well-being, productivity, and cognitive functioning [44-45]. Many of these issues are related to poor sleep quality and sleep disturbances caused by allergic rhinitis. It has been reported that physical, mental, emotional, and social problems were more frequently affected in children with allergic rhinitis [45].

There is increase in prevalence rate of allergic rhinitis in recent time. This rate of increase is comparable with that observed in adults over the same time period. Despite this increment there are still paucity of literature on allergic rhinitis in the developing countries. This study aimed at determining prevalence, sociodemographic features, comorbid illnesses, complications and quality of life of patients with allergic rhinitis in the study institution.

Materials and Methods

This is a prospective hospital based study of the patients with clinical diagnosis of allergic rhinitis in children seen, reviewed and managed in the Ear, Nose and Throat department of the Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria. This included all children aged 18 years and below at the time of this work. This tertiary health institution is the only state owned health facility serving over two millions populations in the state and 4 neighbouring states of Ondo, Osun, Kogi and Kwara. The study was carried out over a period of two years (from June 2015 to May 2017). All consecutive patients who presented to the department were enrolled into the study. Informed consent was obtained from patients/guardian/parents before patients were enrolled into the study. Interviewer assisted questionnaire (pretested) were given to consented patients/parents/guardians to obtain detailed data on sociodemographic features of patients. Their detailed otorhinolaryngological history including their past medical, surgical and social history was also taken. Also history of allergens exposure and drugs usage was taken.

All the patients that were recruited into this study had detailed thorough ENT examination done using endoscopes. Detailed Thorough nose, ear, throat, head and neck examination were done and documented. Detailed Thorough rhinological examination includes anterior rhinoscopy, nasal cavity and posterior rhinoscopy with nasoendoscopy. Oropharyngeal examination performed and findings were documented. General physical and systemic examination was performed.

Limitations of this study include the absence of allergy testing and failure of estimating the measure of quality of life based on a standardized and validated (generic or disease-related) questionnaires.

Mucopurulent Sinonasal discharge (specimen) was aseptically taken examined and sent for microscopy, culture, and sensitivity. Further investigations such as x ray, computerised tomographic scan of the paranasal sinuses were requested based on clinical findings.

All the patients were educated based on the findings on the line of management of allergic rhinitis. Treatment modalities were avoidance of allergens, antibiotic therapy (such as amoxicillin/clavulanic acid to treat superimposed infection), antihistamines, topical corticosteroids, systemic steroids and surgery (such as adenoid, tonsils and turbinate) depending on clinical findings. Participants were followed up in the ear, nose and throat clinic for possible outcome and complications.

All data obtained were documented, collated and analysed. The data analysis was done by using SPSS version 18. The analyzed data were presented in simple descriptive tables and charts.

Ethical clearance was sought for and obtained from the ethical committee of the hospital.

Results

A total of 4,341 patients were seen in the ENT department over the study period. There were 265 paediatric patients (characterised by rhinorrhoea, nasal obstruction, epiphora, and nasal itching) enrolled into the study. Prevalence of allergic rhinitis in children in this study was 6.1%. Allergic rhinitis affects all the paediatric age group with a peak at preschool age group (1-5) years accounting for 47.9%. This was demonstrated in figure 1.

There were 167 (63.0%) males 98 (37.0%) females with male to female ratio of 2:1. A total of 112 (42.3%) participants were living in urban setting while 153 (57.7%) were from rural setting. Majority (40.4%) of the patients were in nursery, 26.8% were in secondary school level while 9.4% are in post-secondary level of education. Parent's major occupation were mainly farming (27.2%), teaching (25.9%) while 10.6% are health worker. This was illustrated in table 1.

There were positive family history of allergy in 145 (54.7%) while 120 (45.3%) did not have. From the patients history perennial allergic rhinitis were noted in 169 (63.8%) patients while seasonal allergic rhinitis were noted in 96 (36.2%) patients. Using ARIA classification as shown in table 2, majority 145 (54.8%) of the patients were moderate-severe persistent allergic rhinitis and 51 (19.2%) had moderate-severe intermittent allergic rhinitis. Major form of allergens was 217 (81.8%) inhalant and the least form of allergen was 15 (5.7%) ingestant. In this study, self-reported allergies were based on the trigger factors. The commonest identified trigger factors among the study population were as follows: dust, cold weather and smoke which were accounted for 158 (59.6%), 99 (37.4%) and 50 (18.9%) of the study patients respectively. The less common trigger factors were soap and perfume which accounted for 11(4.2%) and 3 (1.1%). This was showed in table 2.

Major associated comorbid illnesses among patients with allergic rhinitis in this study were tonsils hypertrophy, adenoid hypertrophy and inferior turbinate hypertrophy which accounted for 147 (55.5%), 123 (46.4%) and 107 (40.4%) respectively. Minor associated comorbid illnesses in this study were sinusitis, allergic dermatitis and ear discharge which accounted for 14 (5.3%), 14 (5.3%) and 22 (8.3%) respectively. This was showed in table 3.

Clinical presentation of allergic rhinitis in this study were mainly nasal blockage in 201 (75.8%) of our patients, runny nose in 173 (65.3%) and 155 (58.5%) had recurrent sneezing. Permanent nasal obstructions were noticed in 172 (64.9%) while recurrent nasal obstructions were noticed in 29 (10.9%). Trigger factors for sneezing were identified in 146 (55.1%) patients. Less common presentation of allergic rhinitis in this study was 86 (32.5%) itchy eye and 87 (32.8%) itchy nose. This was illustrated in table 4.

Clinical findings in this study were mainly oedematous nasal mucosa, enlarged turbinate and reduced nasal patency and they accounted for 193 (72.8%), 178 (67.2%) and 140 (52.8%) respectively. Other clinical findings are detailed or shown in figure 2.

Common complications which were associated with allergic rhinitis includes pharyngitis in 93 (35.1%), otitis media in 85 (32.1%) while 75 (28.3%) has headache. This is shown in figure 3.

Microscopic, culture and sensitivity were requested for patients with mucopurulent discharge. based on patients condition. There was no growth in 9 (3.4%) of the nasal mucous taken. There were growths of streptococcus so 64 (24.2%), Staphylococcus aureus 49 (18.5%) and Hemophilus influenzae 31 (11.7%) were recorded.

Treatment approach was by combination of allergens avoidance, medical treatment and surgery was reserved for patients with adenoid and/or tonsils hypertrophy, inferior turbinate hypertrophy. and so on comorbid illnesses and complications. Treatment of allergic rhinitis and comorbid illnesses leads to improvement and recovery on the clinical features (not cure) in 239 (90.2%) patients. No significant improvements in clinical features were noticed in 26 (9.8%) patients. None of the studied patients reported worse clinical condition after treatment of allergic rhinitis and comorbid illnesses. No mortality was recorded from allergic rhinitis, comorbid illnesses, complications or treatment intervention in this study.

Figure 1 Age group distribution among the patients

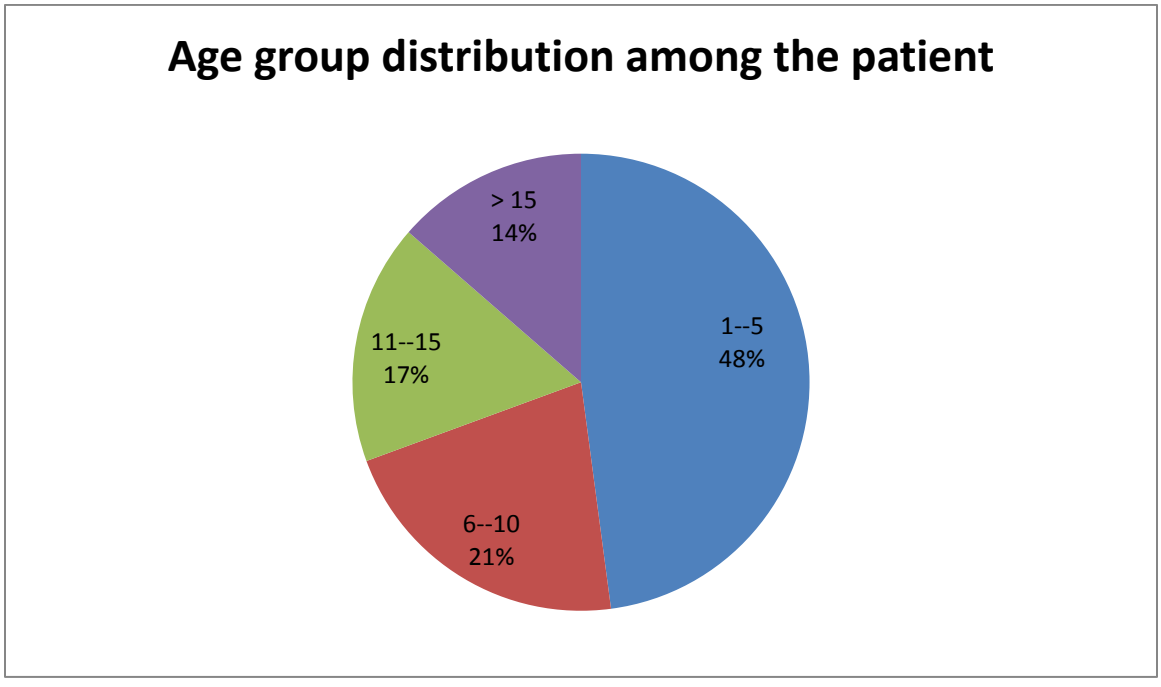


Table 1 Sociodemographic features of the patients

Sociodemographic features	Number	Percentage (%)
Sex		
Male	167	63.0
Female	98	37.0
Residential		
Urban	112	42.3
Rural	153	57.7
Education level		
Nursery	107	40.4
Primary	62	23.4
Secondary	71	26.8
Post secondary	25	9.4
Parental occupation		
Business	55	20.8
Teaching	69	25.9
Industrial worker	41	15.5
Farming	72	27.2
Health worker	28	10.6

Table 2 Features of Allergy among the patients

Features of Allergy	Number	Percentage (%)
Family history of Allergy		

Present	145	54.7
Absent	120	45.3
Type of Allergy		
Perennial	169	63.8
Seasonal	96	36.2
ARIA Classification		
Mild-Intermittent	26	9.8
Moderate-Severe intermittent	51	19.2
Mild-Persistent	43	16.2
Moderate-Severe Persistent	145	54.8
Form of Allergy insert		
Inhalant	217	81.8
Ingestantt	15	5.7
Contactant	33	12.5
Trigger factor		
Dust	158	59.6
Cold weather	99	37.4
Smoke	50	18.9
Perfume	11	4.2
Vehicle exhaust	24	9.1
Soap	3	1.1

Table 3 Comorbid illnesses among the patients

Comorbid illnesses	Number	Percentage (%)
Asthma	63	23.8
Allergic conjunctivitis	84;	31.7,
Allergic dermatitis	14	5.3
Tonsils hypertrophy	147	55.5
Adenoid hypertrophy	123	46.4
Inferior turbinate hype	107	40.4
Nasal polyps	25	9.4
Ear discharge	22	8.3
Sinusitis	14	5.3

Table 4 Symptoms of allergy among the patients

Symptoms	Number	Percentage (%)
Blocked nose	201	75.8
Runny nose	173	65.3
Recurrent sneezing	155	58.5
Nasal itching	141	53.2
Itchy throat	103	38.9
Itchy ear	93	35.1
Watery eyes	88	33.2
Itchy nose	87	32.8
Eye itching	86	32.5

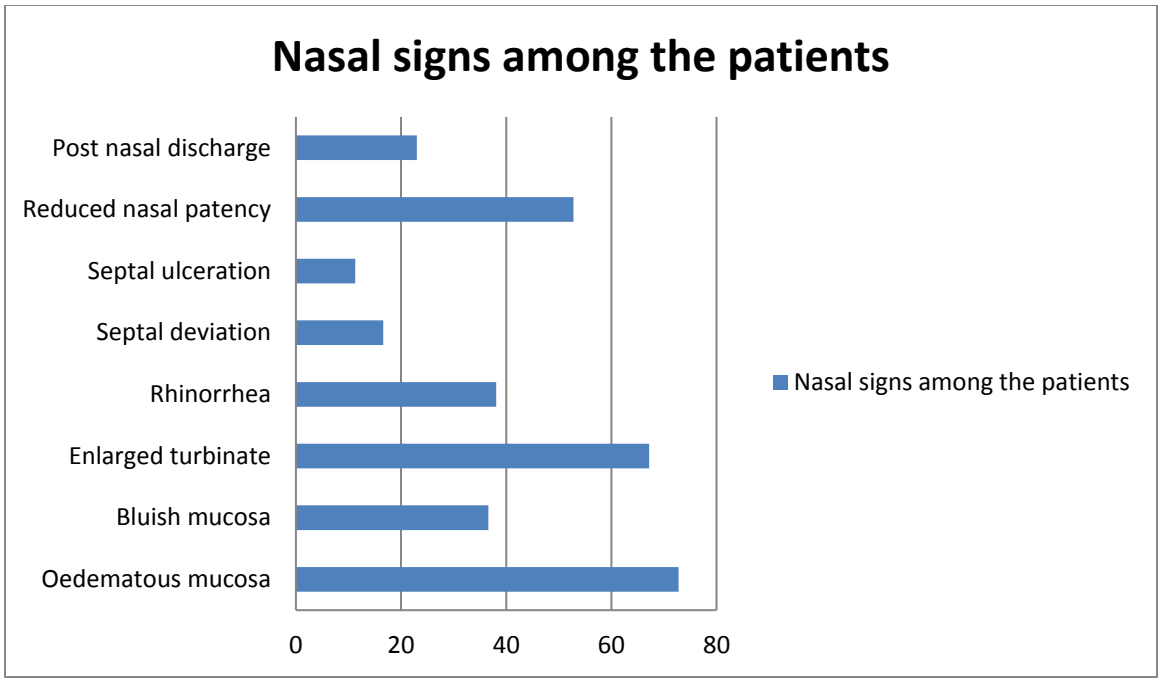
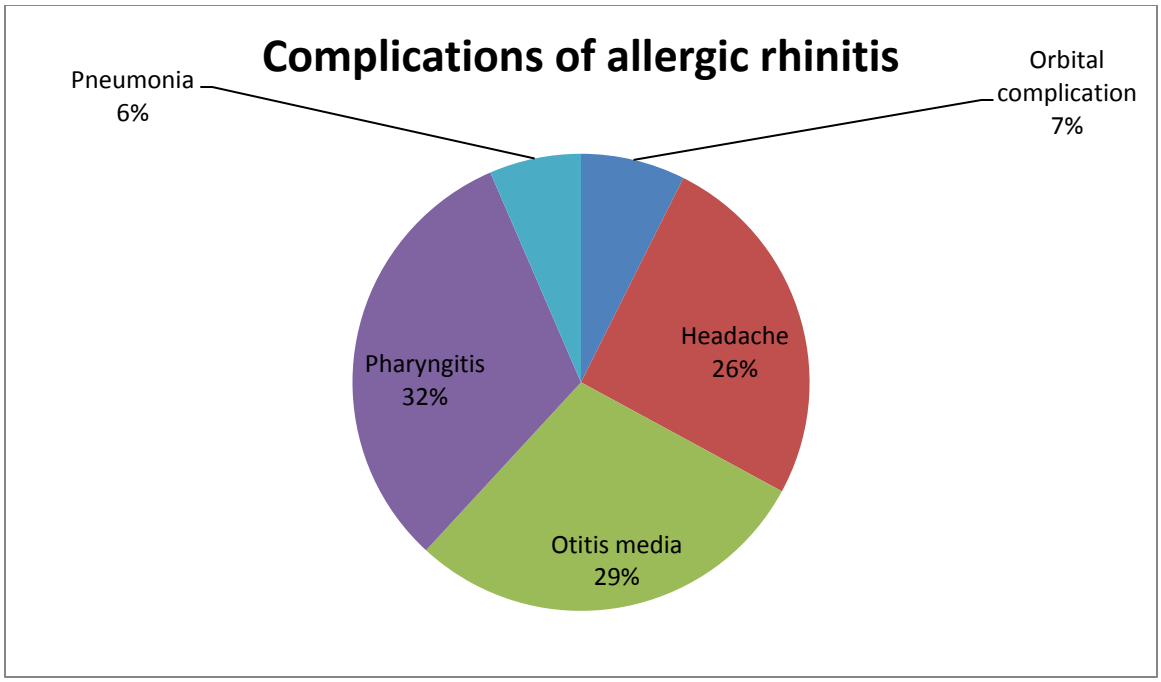


Figure 3 Complications of allergic rhinitis nb orbital complications.



Discussion

Allergic rhinitis in children is still a global healthy problem with little or no recognition. In most cases children allergic rhinitis is commonly under-diagnosed because the symptoms are frequently attributed to a viral or recurrent flu. As a result of this most parents do not seek medical intervention. Some parents use available medication or local herbs without doctor's prescription and such symptoms treatment are suboptimal [30].

Prevalence of allergic rhinitis in children in this study was 6.1% this is lower than prevalence rate in other previous studies [7-9]. This low prevalence of allergic rhinitis in children may be due to underestimate as majority of patients with this condition are treated by their family physician or paediatrician at peripheral hospitals. Majority of the Only patients in this study were with severe symptoms, complicated cases or associated co-morbidities were referred to otorhinolaryngologist, head and neck surgeon. A true prevalence of allergic rhinitis among paediatric in this region requires comprehensive community-based study. The study populations were mainly civil servant from low industrial state in a developing part of the world compared to study in developed part of the world with higher prevalence of allergic rhinitis. There is higher prevalence in some developing region such in African countries includes 29.6% in Nigeria and 30% in Cape Town in South Africa [31,32]. Factors responsible for high prevalence of

allergic rhinitis in children include climatic factors, dietary changes; environmental factors and industrial pollution were very low in the study population.

In this study, male gender preponderance was observed which is in agreement with other study with male preponderance [33]. This is different from other studies with female preponderance [50]. There are some studies with equal sex preponderance [35]. This gender proportions is found to be inconsistent in different study. Gender parity findings may likely be by chance.

Majority of the paediatric patients in this study were preschool children this is comparable with other previous studies [36,37]. This may be due to increased number of associated comorbid illnesses such as adenoid with tonsils hypertrophy and complication of allergic rhinitis at this age group which prompted parent to attend specialist medical services in this study. In this study high proportion of early childhood adenoid and tonsils hypertrophy may be a reason for high prevalence of allergic rhinitis in preschool age group 1-5 years. Allergic rhinitis is also associated with severe and troublesome symptoms which are exacerbated by acute viral infections forcing parents or guardian to seek specialist medical cares. Common chronic symptoms of allergic rhinitis are commonly ignored in older aged patients in this study except when complicated.

In this study environmental factors that were responsible for increased risk of allergic rhinitis in children were dusts, fumes exhausts from vehicle, environmental tobacco smoke exposure and moulds and perfume and this is similar to findings in other studies [38-40]. Many patients in this study of allergic rhinitis in children had family history of allergy. Similar findings were discovered in previous study[41].

Inflammation of the nasal mucosal lining and contiguous structure from allergens results in sneezing, rhinorrhoea, nasal congestion, with itching of the nose, ear, palate, throat and eyes [42]. Nasal obstructions usually worsen with comorbid inferior turbinate hypertrophy, nasal polyps and adenoid hypertrophy among our patients. Blocked nose showed significant association with adenoid hypertrophy in children in this studied patients. Rhinorrhea is the resultant effects of nasal mucosal goblet cell stimulation by the allergens. In this study, the high percentage of patients had runny nose (rhinorrhoea), nasal blockage, bout of sneezing and so on and thi findings are similar to other studies on allergic rhinitis [43].

In this study population, allergic rhinitis in children has significant comorbid illnesses such as asthma, sinusitis, otitis media, adenoid hypertrophy and allergic conjunctivitis in different percentages. Many other studies reported different percentage of associated comorbid illnesses [30].

Consequent to symptoms of allergic rhinitis in children such as bout of sneezing, pruritus, rhinorrhoea and nasal obstruction quality of life are grossly affected in this study. Quality of life

that are often affected includes impaired social life, sleep disruption, fatigue, sexual dysfunction, daytime sleepiness, irritability, memory deficit, effect on daily activities such as playing, working and so on absteensim [43]. Nasal obstruction and nasal congestion were responsible for the sleep disturbances [43]. Nasal blockage and rhinorrhoea when severe causes interference with daily activities and embarrassment to allergic rhinitis patients [44].

Complications of allergic rhinitis occurs when the nasal mucosal lining is bridged. In this study there is associated complications with allergic rhinitis which includes pharyngitis, otitis media, headache and orbital complication. This findings is similar to the reports in previous study [43].

In the management of the patients with allergic rhinitis in children in this study multidisciplinary approach was used. This is because of the associated comorbid illnesses and complication with allergic rhinitis in the studied children. The health team included general practitioner, paediatricians, allergists and otorhinolaryngologists, head and neck surgeon [30]. The treatments of approach were allergen avoidance, medical intervention and surgical treatment of comorbid illnesses and complications. Allergens control requires aggressive environmental control which is effective [45]. Medical treatment includes intranasal steroid, and antihistamines and antibiotics to treat superimposed infection and depending on the presenting clinical features. Surgical therapy is reserved for adequate [46,47]. Surgical treatments are for patients with adenoid hypertrophy, tonsillar hypertrophy and turbinate hypertrophy.. Other form treatment such as Immunotherapy, desensitization are not used in this study due to available facilities in the study [48]. Montelukast a leukotriene receptor antagonist used for the maintenance treatment of allergy and asthma is not available in our center.

In this study there no associated mortality to allergic rhinitis in children in the findings. Common cause of death due to comorbid illnesses, surgical complications were recorded in other study [49].

Findings in this study was due to some potential limiting factors which includes to performed allergy testing, hospital based study and measurement of quality of life without the use of standardized and validated (generic or disease-related) questionnaires. Despite these limitations this study provide hospital information which can serve as bases for community based study and may help health care workers to develop guideline in management of allergic rhinitis in children.

Conclusion

Allergic rhinitis is very common and affect all paediatric age group usually neglected and delayed presentation in the participants. Prevalence of allergic rhinitis was low in this study

compare to previous study. There were associated comorbid illnesses, complications and affectation of quality of life before presentation to the otorhinolaryngologist in majority of the patients. Early referral is highly recommended to the specialist to avoid on toward effect.

References

1.Glenis KS. Allergic rhinitis in children. Paediatrics and Child Health. Volume 18, Issue 7, July 2008, 323-328

2. Sanford T. Allergic rhinitis in children. Missouri Medicine [01 May 2008, 105(3):230-234.

3. Saleh P, Bastani P, Piri R, Goldust M, Naghavi-Behzad M. Antimicrobial prophylaxis for surgical site infections in surgical wards in northwest Iran. Life Sci J 2013;10:1977-81.

4. Kim JS, Kang HS, Jang HJ, Kim JH, Lim DH, Son BK. Clinical features of allergic rhinitis in Korean children. Allergy Asthma Respir Dis 2015;3:116–123.

5. Allergic rhinitis in children with attention-deficit/hyperactivity disorder. Ashley B, Bernard S, Shannon K, Denise G, Mark O, Harvey B, Arlene S. Ann Allergy Asthma Immunol. 2004;92:663–667.

6. Berger WE. Overview of allergic rhinitis. Ann Allergy Asthma Immunol. 2003;90(Suppl 3):7–12.

7. Erkkola M, Kaila M, Nwaru BI, Kronberg-Kippilä C, Ahonen S, Nevalainen J, et al. Maternal vitamin D intake during pregnancy is inversely associated with asthma and allergic rhinitis in 5-year-old children. Clinical & Experimental Allergy. 2009;39 (6):875–882.

8. Meltzer EO, Blaiss MS, Derebery J, Mahr TA, Gordo BR, Sheth KK, et al. Burden of allergic rhinitis: results from the Pediatric Allergies in America survey. J Allergy Clin Immunol 2009;124:s43-70.

9. Ait-Khaled N, Anderson HR, Asher MI et al. Worldwide time trends for symptoms of rhinitis and conjunctivitis: phase III of the International Study of Asthma and Allergies in Childhood. Pediatr. Allergy Immunol. 2007; 19: 110–24.

[ ]10. Hamouda S, Karila C, Connault T, Scheinmann P, de Blic J. Allergic rhinitis in children with asthma: a questionnaire-based study. Clin. Exp. Allergy 2008; 38: 761–6.

[ ]11. Taramarcaz P, Gibson PG. The effectiveness of intranasal corticosteroids in combined allergic rhinitis and asthma syndrome. Clin. Exp. Allergy 2004; 34: 1883–9.

[ ]12. Scadding G. Optimal management of nasal congestion caused by allergic rhinitis in children: safety and efficacy of medical treatments. Paediatr. Drugs 2008; 10: 151–62.

[ ]13. Yuksel H, Sogut A, Yilmaz H, Yilmaz O, Dinc G. Sleep actigraphy evidence of improved sleep after treatment of allergic rhinitis. Ann. Allergy Asthma Immunol. 2009; 103: 290–4.

[ ]14. Asthma and Allergy Foundation of America. Allergy facts and figures. Available from: http://www.aafa.org. Accessed November 2012.

[ ]15. Salo PM, Calatroni A, Gergen PJ, Hoppen JA, Sever ML, Jaramillo R, et al. Allergy-related outcomes in relation to serum IgE: results from the National Health and Nutrition Examination Survey 2005-2006. J Allergy Clin Immunol 2011;127:1226-1235.e7.

[ ]16. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA2LEN and AllerGen) Allergy. 2008;63(Suppl 86):8–160.

[ ]17. Bousquet J, Schunemann HJ, Samolinksi MD, Demoly P, Baena-Cagnani CE, Bachert C, et al. Allergic Rhinitis and Its Impact on Asthma (ARAI): achievements in 10 years and future needs. J Allergy Clin Immunol 2012;130: 1049-62.

[ ]18. Klimek LBCl, Mösges R, Munzel U, Price D, Virchow JC, Wahn U, Bousquet J. Effectiveness of MP29-02 for the treatment of allergic rhinitis in real-life: Results from a noninterventional study. Allergy and Asthma Proceedings, Volume 36, Number 1, January/February 2015, pp. 40-47(8).

[ ]19. Bousquet J, Reid J, Van Weel C, Baena Cagnani C, Canonica GW, Demoly P et al. Asthma management pocket reference 2008. Allergy. 2008 63,implementation. Allergy.

[ ]20. Bousquet J, Schunemann HJ, Fonseca J, Samolinski B, Bachert C, Canonica GW et al. MACVIA-ARIA Sentinel NetworK for allergic rhinitis (MASK-rhinitis): the new generation guideline implementation. Allergy. 2015 Volume 70, Issue 11 1372–1392.

[ ]21. Marek J, Loana A, Sergio B, Wesley BA, FLinda C, Pascal D et al. International consensus on allergy immunotherapy. Journal of Allergy and Clinical Immunology. September 2015, Vol.136(3):556–568.

22. Corren J, Baroody FM, Pawankar R. Allergic and nonallergic rhinitis. In: Adkinson NF Jr, Bochner BS, Burks AW, et al, eds. Middleton's Allergy: Principles and Practice. 8th ed. Philadelphia, PA: Elsevier Saunders; 2014:chap 42.

[ ]23. Seidman MD, Gurgel RK, Lin SY, et al. Guideline Otolaryngology Development Group, AAO-HNSF. Clinical practice guideline: allergic rhinitis. Otolaryngol Head Neck Surg. 2015; 152(1 Suppl):S1-S43.

[ ]24. Scadding GK, Durham SR, Mirakian R et al. BSACI guidelines for the management of allergic and non-allergic rhinitis. Clin Exp Allergy 2008; 38: 19-42

[ ]25. Bousquet J, Van Cauwenhage P, Khaltaev N. ARIA Workshop Group. Allergic Rhinitis and its Impact on Asthma (ARIA) J Allergy Clin Immunol 2001;108 (suppl 5) : S147-333

[ ]26. Burbach GJ, Heinzerling LM, Edenharter G, Bachert C, Bindsley-Jensen C, Bonini S, et al. GA(2)LEN skin test study II: clinical relevance of inhalant allergen sensitizations in Europe. Allergy 2009;64:1507-15.

[ ]27. Fuiano N, Fusilli S, Incorvaia C. A role for measurement of nasal IgE antibodies in diagnosis of Alternaria-induced rhinitis in children. Allergol Immunopathol (Madr) 2012;40:71-4.

[ ]28. Eggleston PA. Methods and effectiveness of indoor environmental control. Ann Allergy Asthma Immunol 2001;87:44-7.

[ ]29. Boyle RJ, Pedroletti C, Wickman M, Bjermer L, Valovirta E, Dahl R, et al. Nocturnal temperature controlled laminar airflow for treating atopic asthma: a randomised controlled trial. Thorax 2012;67:215-21.

[ ]30. Bachert C. The role of histamine in allergic disease: re-appraisal of its inflammatory potential. Allergy 2002;57:287-96.

31. Li H, Sha Q, Zuo K, Jiang H, Cheng L, Shi J, Xu G. Nasal saline irrigation facilitates control of allergic rhinitis by topical steroid in children. J Otorhinolaryngol Relat Spec 2009;71:50-5.

[ ]32. Scadding GK, Durham SR, Mirakian R, Jones NS, Leech SC, Farooque S, et al. BSACI guidelines for the management of allergic and non-allergic rhinitis. Clin Exp Allergy 2008;38:19-42.

[ ]33. Corcostegui R, Labeaga L, Innerarity A, Berisa A, Orjales A. Preclinical pharmacology of bilastine, a new selective histaminen H1ereceptor antagonist: receptor selectivity and in vitro AH activity. Drugs R D 2005;6:371-84.

[ ]34. Broide DH. Allergic rhinitis: pathophysiology. Allergy Asthma Proc 2010;31: 370-4.

[ ]35. Osguthorpe JD. Pathophysiology of and potential new therapies for allergic rhinitis. Int Forum Allergy Rhinol. 2012 Nov 28 [Epub ahead of print].

[ ]36. Ha YK, Seung HM, Hae JJ, Dae HL, Jeong HK. Validation of "quality-of-life questionnaire in Korean children with allergic rhinitis" in middle school students. Allergy Asthma Respir Dis. 2016 Sep;4(5):369-373.

[ ]37. Hong SJ, Ahn KM, Lee SY, Kim KE. The prevalences of asthma and allergic diseases in Korean children. Korean J Pediatr 2008;51:343–350.

[ ]38. Ahn K, Kim J, Kwon HJ, Chae Y, Hahm MI, Lee KJ, et al. The prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in Korean children: nationwide cross-sectional survey using complex sampling design. J Korean Med Assoc 2011;54:769–778.

[ ]39. Weiland SK, Hüsing A, Strachan DP, Rzehak P, Pearce N. Climate and the prevalence of symptoms of asthma, allergic rhinitis, and atopic eczema in children. Occupational and Environmental Medicine 2004; 61 571-571.

[ ]40. Bauchau V, Durham SR. Prevalence and rate of diagnosis of allergic rhinitis in Europe. European Respiratory Journal 2004 24: 758-764.

[ ]41. Cazzoletti L, Ferrari M, Olivieri M, Verlato G, Leonardo A, Bono R et al. The gender, age and risk factor distribution differs in self-reported allergic and non-allergic rhinitis: a cross-sectional population-based study. Allergy, Asthma & Clinical Immunology 2015 11:36.

[ ]42. Jaakkola, M.S.; Quansah, R.; Hugg, T.T.; Heikkinen, S.A.M.; Jaakkola, J.J.K. Association of indoor dampness and molds with rhinitis risk: A systematic review and meta-analysis. J. Allergy Clin. Immunol. 2013, 132, 1099–1110.

[ ]43. Skoner DP. Complications of allergic rhinitis. Journal of Allergy and Clinical Immunology. June 2000, Vol.105(6):S605–S609.

[ ]44. Meltzer EO, Nathan R, Derebery J, Stang PE, Campbell UB, Yeh W-S, et al. Sleep, quality of life and productivity impact of nasal symptoms in the United States: findings from the Burden of Rhinitis in America survey. Allergy Asthma Proc 2009;30:244-54.

[ ]45. . Meltzer EO, Gross GN, Katial R, Storms WW. Allergic rhinitis substantially impacts patient quality of life: findings from the Nasal Allergy Survey Assessing Limitations. J Fam Pract 2012;61(2 Suppl):S5-10.

[ ]46. Hardjojo A, Shek LP, Van Bever HP, Lee BW: Rhinitis in children less than 6 years of age: current knowledge and challenges. Asia Pac Allergy. 2011, 1 (3): 115-122.

47. Mercer MJ, Van der Linde GP, Joubert G: Rhinitis (allergic and nonallergic) in an atopic pediatric referral population in the grasslands of inland South Africa. Ann Allergy Asthma Immunol. 2002, 89 (5): 503-512.

48. Masuda S, Fujisawa T, Katsumata H, Atsuta J, Iguchi K: High prevalence and young onset of allergic rhinitis in children with bronchial asthma. Pediatr Allergy Immunol. 2008, 19 (6): 517-522.

49.Alsowaidi S, Abdulle A, Bernsen R, Zuberbier T: Allergic rhinitis and asthma: a large cross-sectional study in the United Arab Emirates. Int Arch Allergy Immunol. 2011, 153 (3): 274-279.

[ ]50. Borges WG, Burns DA, Felizola ML, Oliveira BA, Hamu CS, Freitas VC: Prevalence of allergic rhinitis among adolescents from Distrito Federal, Brazil: comparison between ISAAC phases I and III. J Pediatr (Rio J). 2006, 82 (2): 137-143.

51. Gathiru C, Macharia I: The prevalence of allergic rhinitis in college students at Kenya Medical Training College-Nairobi,Kenya. World Allergy Organization Journal. 2007, S84-S85.

[ ]52. Desalu OO, Salami AK, Iseh KR, Oluboyo PO: Prevalence of self reported allergic rhinitis and its relationship with asthma among adult Nigerians. J Investig Allergol Clin Immunol. 2009, 19 (6): 474-480.

[ ]53. Yuksel H, Dinc G, Sakar A, Yilmaz O, Yorgancioglu A, Celik P, Ozcan C: Prevalence and comorbidity of allergic eczema, rhinitis, and asthma in a city in western Turkey. J Investig Allergol Clin Immunol. 2008, 18 (1): 31-35.

[ ]54. Rondon C, Fernandez J, Canto G, Blanca M: Local allergic rhinitis: concept, clinical manifestations, and diagnostic approach. J Investig Allergol Clin Immunol. 2010, 20 (5): 364-371.

[ ]55. Nurliza I, Norzi G, Azlina A, Hashimah I, Sabzah MH: Daycare tonsillectomy: a safe outpatient procedure. Hospital Sultanah Bahiyah, Alor Setar Malaysia experience. Med J Malaysia. 2011, 66 (5): 474-47

[ ]56. Zhu LP, Wang F, Sun XQ, Chen RX, Lu MP, Yin M, Cheng L: Comparison of risk factors between patients with non-allergic rhinitis and allergic rhinitis. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2011, 45 (12): 993-998.

[ ]57. Herr M, Clarisse B, Nikasinovic L, Foucault C, Le Marec AM, Giordanella JP, Just J, Momas I: Does allergic rhinitis exist in infancy? Findings from the PARIS birth cohort. Allergy. 2011, 66 (2): 214-221.

[ ]58. Gelfand EW: Pediatric allergic rhinitis: factors affecting treatment choice. Ear Nose Throat J. 2005, 84 (3): 163-168.

[ ]59. Camelo-Nunes IC, Sole D: Allergic rhinitis: indicators of quality of life. J Bras Pneumol. 2011, 36 (1): 124-133.

[ ]60. Engel-Yeger B, Engel A, Kessel A: Differences in leisure activities between children with allergic rhinitis and healthy peers. Int J Pediatr Otorhinolaryngol. 2011, 74 (12): 1415-1418.

[ ]61. Berger WE: Overview of allergic rhinitis. Ann Allergy Asthma Immunol. 2003, 90 (6): 7-12.

[ ]62. Michael M, Carr GC, Dhave S: Predictive Factors of Prolonged Hospital Stay in Tonsillectomy Patients. Otolaryngol Head Neck Surg. 2011, 145 (2): 243-246.

[ ]63. Stevenson AN, Shuler MD, Myer CM, Singer PS: Complications and legal outcomes of tonsillectomy malpractice claims. Laryngoscope. 2012, 122 (1): 71-74.

[ ]64. Turner PJ, Kemp AS: Allergic rhinitis in children. J Paediatr Child Health. 2010, 48 (4): 302-310.

[ ]65. Windfuhr JP, Schloendorff G, Sesterhenn AM, Prescher A, Kremer BA: Devastating outcome after adenoidectomy and tonsillectomy: ideas for improved prevention and management. Otolaryngol Head Neck Surg. 2009, 140 (2): 191-196.