

SEASONAL ALLERGIC RHINITIS TRIGGERED BY POLLEN IN THE NORTHERN CAPE

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ABSTRACT

The diagnosis and management of allergic rhinitis triggered by tree, grass and weed pollen remains complex and costly. Patient and practitioner education is central to starting to reduce the burden of this condition. Giving attention to diagnosing the coexisting types of rhinitis is imperative if patient treatment failure is to be prevented. Seasonal rhinitis is often difficult to distinguish from other forms of rhinitis and the clinical picture on presentation may be confusing. A thorough clinical history together with skin-prick and molecular-based testing are good first steps in the diagnosis of seasonal rhinitis. Patient self-treatment may further confuse the signs and symptoms. Improved patient education is suggested in order to promote an understanding of seasonal allergic rhinitis and its management.

Keywords: seasonal allergic rhinitis, pollen, diagnosis, management

INTRODUCTION

Pollen is the male gametophyte produced by the anthers of plant flowers. It contains numerous proteins, carbohydrates and fats necessary for plant survival, which they do by fertilising their own species in order to produce seeds. Pollen grains are magnificent fingerprints that are characteristic to each species: proteins that are necessary for a plant species to recognise a susceptible stamen for fertilisation. In atopic patients these proteins have the ability to induce the IgE immune response in exposed mucosal surfaces – the list of identified proteins responsible for this allergic response is growing daily. But little is known about the exact role of lipids, carbohydrates and proteins, the main constituents of plant cells – in inducing the immune response through the dendritic cells and further research into this role is therefore still required.¹

SEASONAL ALLERGIC RHINITIS

Respiratory allergies, including allergic rhinitis (AR), affect 10–40% of the world's population. The highest incidence occurs in children.² A growing body of evidence suggests that global warming and pollution are playing a contributing role in the increase of respiratory allergies worldwide. With myriad medications available on the market, and with specific guidelines for how and when to use them, why is it that we are still struggling to manage this condition effectively? Multiple studies have shown that only 45% of patients with AR seek medical advice from their general practitioner and only 18–48% of these patients are controlled by pharmacotherapy.³ The economic burden of this disease (especially the unseen costs of absenteeism) is considerable and comparable to that of other chronic diseases. Most medical aids, however, exclude the management of allergy as a chronic disease, making it very difficult to manage these patients long-term.

COST ANALYSIS OF ALLERGIC RHINITIS

The cost of AR management in South Africa is largely unknown. The costs of a disease can be described according to both direct costs (medication, doctor visits, etc) and indirect costs (absenteeism and presenteeism – being at work but with decreased efficiency). Studies from First World countries have raised a red flag for healthcare costs in general. The TOTALL study from Sweden documented the total cost of AR was estimated at €1.3 billion annually (70% due to indirect costs).⁴ This is equivalent to €961.1 per individual per year with a population of only 9.5 million.

Similarly, a recent review has shown that in the European Union, total costs was estimated between €55 and €151 billion per annum, equivalent to €2,405 per untreated patient a year.⁵ During 2011 the costs covered by Discovery Health for allergy testing in South Africa was approximately R10 million, of which 66% was spent on specific IgE testing in the paediatric population alone.⁶

AR is not seen as a chronic disease due to its low morbidity and mortality but from these studies it appears to carry a major financial burden on society. Many factors influence the effective management of AR that can influence financial burden. AR symptoms are often trivialised by patients and doctors alike.¹¹ Patients tend to self-medicate rather than visit a GP or specialist. This can complicate the clinical presentation and the management costs. Many South African languages do not have a direct equivalent word to describe 'allergy' and is often synonymous with sinusitis. Access to medical care in many provinces like the Northern Cape is limited. Often great distances of travel are necessary to visit these facilities. There

are often limited doctors and nursing staff available to attend to these patients. Patient financial limitations often make it difficult to procure the medications necessary to treat and even to attend the healthcare facility. It might be one of the reasons that promote self-medication. Patient education and healthcare staff education with regard to AR and management in these difficult conditions might improve the financial burden on society. Information on allergy and immunology is expanding exponentially. In order to educate our patients appropriately, we need to stay educated ourselves.

POLLEN ALLERGENS

The specific pollens responsible for AR in each region in South Africa are still largely unknown. For years, aerobiologists have been charting pollen in Cape Town and, occasionally, in Gauteng; however, a nationwide study commenced recently which included other major cities in South Africa. If certain trends in different biomes are identified, healthcare providers might improve the diagnosis and management of AR and asthma triggered by pollen.⁷ More than 150 pollen allergens are officially acknowledged by the International Union of Immunological Societies' (IUIS) allergen nomenclature sub-committee. These pollen allergens originate from grasses, trees and weeds (www.allergen.org/index.php).⁸ The pollination periods for exotic trees are usually well defined and pollen charts could help with managing these intermittent episodes of AR. In South Africa, the clinically most relevant source of pollen allergens is found within the Poaceae family, which includes Chloridoideae (eg Bermuda grass), Panicoideae (eg Kikuyu grass) and Pooideae (eg rye grass).⁹ Cross-reactivity occurs between these species and our endemic grasses.

Sensitisation to Bermuda grass pollen is very common in South Africa. 'Sensitisation' refers to a positive allergy test but does not necessarily mean that these patients develop clinical symptoms (pollenosis). When they do present with symptoms, it is referred to as AR.

ALLERGIC RHINITIS

AR is a well-known condition that presents regularly to the general practitioner and the paediatrician but also to the otorhinolaryngologist as part of a complex rhinitis. Each biome in South Africa is characterised by different aeroallergens and climatic conditions that affect the management of this condition. Some provinces with similar biomes can be expected to experience similar clinical presentations. Ongoing studies are therefore necessary to identify specific aeroallergens in each province and the specific factors in each that prevent optimal control of seasonal AR triggered by pollen.

In arid areas such as the Northern Cape province it is often very difficult to distinguish AR from other types of rhinitis on a clinical basis alone: the harsh climate necessitates the frequent use of fans and air conditioners. Moreover, many areas in South Africa are faced with a long pollinating season of grass species. Exposure to these factors often forms the basis of a complex inflammatory reaction in the nose.

Other factors, such as a deviated nasal septum and turbinate hyperplasia, often contribute to a more complex presentation.

These patients drift around from one practitioner to the next, often using 30 or more over-the-counter prescribed products, homeopathic products and multiple courses of antibiotics to treat sinusitis. They marginally improve through parts of the year but gradually sink into the abyss of negativity towards clinicians and their apparently useless medication and costs that spiral out of control. A systematic and careful history and examination followed by skin-prick tests (SPTs) and molecular-based testing is often the only way to slowly reach the individual factors involved.

Seasonal AR due to pollen inhalation is a Th2 IgE inflammatory response in the nose caused by exposure to pollen mainly from trees, grasses and weeds. A major Group 1 allergen in these grasses is responsible for their allergenicity. The number of IgE epitopes and their spatial clustering determines their allergenic activity.¹

FACTORS THAT INFLUENCE THE ALLERGENICITY OF POLLEN¹⁰

The factors that influence the allergenicity of pollen include these:

1. The amount of pollen produced.
2. The aerodynamic character of the pollen – wind-pollinating species are usually associated with greater allergenic potential.
3. The size and weight of the pollen and whether it is broken up by environmental factors – diesel particles and pollution might increase allergenicity. Normal aerodynamic pollen ranges between 15 µm and 40 µm. The size of these pollen grains is too large to produce primary lung symptoms and mainly leads to AR and conjunctivitis symptoms and signs. Smaller particles of between 2 µm and 10 µm and even smaller particles of less than 1 µm (associated with pollution and urbanisation) are more associated with asthma symptoms.¹¹ The airway is unitary and the inflammatory cascade effects can be seen through the whole system and cannot be explained by the particle size alone.
4. Allergenic IgE-binding epitopes and spatial clustering.
5. Genetic factors in the individual.
6. The strength and penetrability of the mucosal barriers.
7. Environmental factors.¹⁰
 - a. Pollen production is related to the length of the growing season and a body of evidence is identifying that the growing season is starting earlier and ending later as a result of climate change.
 - b. Progressive wind speeds and erratic weather conditions lead to intense pollen dispersal into the atmosphere and this is synonymous with an increase in hay-fever symptoms. For instance, studies have identified ragweed pollen in parts of the world where these weeds have not previously been identified in nature.
 - c. Although rainfall is usually associated with decreased pollen levels in the atmosphere, thunderstorms can cause a sudden dispersal of pollen particles such as starch granules and fractured pollen particles as a result of osmotic shock and wet conditions. It has also been noted that species associated previously with dispersion by insects are

becoming prone to wind dispersal as a result of climate change.

d. Some plant species are more allergenic than others.

According to the Aria classification system, AR can be classified into intermittent or persistent symptoms, which can be mild, moderate or severe. 'Persistent symptoms' refers to symptoms that persist for more than four days a week for longer than four weeks.¹¹

DIAGNOSIS

Diagnosis is often easy and can be made on a history alone. AR, however, often occurs in conjunction with other pathologies such as deviated nasal septums, chronic sinusitis and other underlying chronic forms of rhinitis. Patient self-medication further complicates the clinical presentation. It is therefore imperative to take a proper history and perform a thorough clinical examination of the head and neck, skin, eyes, ears, oral cavity, pharynx/larynx and chest. This complex presentation often necessitates further special examinations to confirm clinical suspicion.¹²

History-taking should be directed at the type of symptoms, the duration and timing of symptoms, the frequency, and environmental exposures at home, school or work. The current and past medication profile is important too.²

SYMPTOMS

Symptoms of AR usually commence during childhood and include clear rhinorrhoea (anterior or posterior), congestion of the nose, pruritus of the nose and sneezing. It is often accompanied by ophthalmological symptoms such as tearing, itchy and scratchy eyes suggestive of allergic conjunctivitis. The parents might also complain about the child's snoring, a decreased sense of smell, open-mouth breathing (Figure 1), poor eating behaviour, frequent sore throat, sleep disorders and behavioural issues.

SIGNS

These patients usually present with dark discolouration peri-orbitally (allergic shiners – Figure 2), Denny Morgan lines (Figure 2), and allergic salute due to frequent nasal rubbing, allergic maneuverisms (Figure 3), sniffing and snorting.

Anterior rhinoscopy and endoscopic evaluation of the nose identify pale, white vasocongestion of the inferior turbinates and clear mucus. Other signs of atopy might be present like eczema and dermatitis (Figure 4) and 40 per cent of children with AR develop asthma.

DIFFERENTIAL DIAGNOSIS

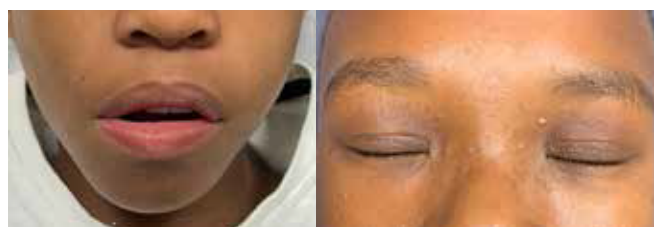


Figure 1: Open-mouth posture



Figure 2: Peri-orbital signs



Figure 3: Allergic mannerisms

Figure 4: Dermatitis

Unfortunately, different aetiologies can present with the same nasal symptoms and signs.

The differential diagnosis of AR is very wide and cannot easily be expressed concisely, especially in those patients with persistent symptoms (more than four days per week and four weeks per year). Any patient with persistent nasal symptoms who does not respond to the management of AR should be referred to an ENT surgeon to exclude other factors possibly contributing to their symptoms. The tables below elucidate these possible differential diagnoses.

In adults, however, attention should be focused on deviated nasal septums, drug-related rhinitis, vasomotor rhinitis and rhinitis medicamentosa. In children, the possibility of adenoid hyperplasia and an open mouth posture might be mistaken as a sign for AR.

Nasal decongestants are very effective in alleviating nasal obstruction, which is one of the common presenting symptoms of persistent AR caused by grass pollens. Decongestants are widely available over the counter, but they can lead to abuse. Their long-term use leads to rhinitis medicamentosa, which is often very difficult to manage without surgery.

Patients should be counselled thoroughly about the side-effects of decongestants. If dependence on these drugs is noticed, referral to an ENT surgeon is indicated for possible surgical intervention.

SPECIAL INVESTIGATIONS

Special examinations help to diagnose patients with complex rhinitis.

Validated clinical survey instruments can supply vital information in a resource-scarce environment. These surveys supply information that helps with diagnosis and disease control. The survey supplies information on symptoms (Total nasal-symptom score (TNSS)), quality of life (Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ), medication use (Daily Medication Score), disease control (Rhinitis Control Test) and an asthma-prediction test. The specific survey instrument to be used depends on the requirements of the clinician.²

SPTs (Figure 5) are a cost-effective special examination with a low risk profile that confirms sensitisation to a specific allergen. They can be used from a young age because they cause

TABLE I: CLASSIFICATION OF RHINITIS¹²

Allergic rhinitis
• Perennial allergic rhinitis
▫ Seasonal rhinitis
Non-allergic rhinitis
• Atrophic rhinitis
▫ Surgery
▫ Cocaine abuse
▫ Ageing
• Emotional rhinitis
• Gustatory rhinitis
• Hormone-related rhinitis
▫ Hypothyroidism
▫ Pregnancy
▫ Menstrual cycle
▫ Oral contraceptives
• Idiopathic (vasomotor) rhinitis
• Infectious rhinitis
▫ Acute (usually viral)
▫ Chronic (rhinosinusitis)
• Irritant- or chemical-induced rhinitis
▫ Temperature
▫ Humidity
▫ Perfumes
▫ Cleaning agents
▫ Cosmetics
▫ Air pollution
▫ Tobacco smoke
• Medication-related rhinitis
▫ Rhinitis medicamentosa
▫ Other drugs
• Non-allergic rhinitis with eosinophilia syndrome (NARES)
• Systemic diseases
▫ Auto-immune disorders
▫ Vasculitides
▫ Hormone disturbances

Source: Copied from North American Clinics

minimal discomfort. They should be used to confirm allergy, especially if a patient failed treatment of intranasal steroid and antihistamines over a period of 2–4 weeks. They also prevent unnecessary use of expensive medication over a long period, guide avoidance measures and direct guidance for referral for immunotherapy. Unfortunately, previous medication use can suppress their efficacy and some contraindications do exist. Specific allergen panels for each region are not available yet, but ongoing sensitisation studies will eventually supply more details for each area.

The routine use of total serum IgE as a screening method should be avoided.

Specific nasal IgE testing is not widely available in clinical practice but it can help differentiate local allergic rhinitis (LAR) from non-AR. Forty-six per cent of patients with negative SPTs can still have local allergy from nasal IgE production, known as LAR, that might still benefit from immunotherapy.¹⁴

Nasal cytology smears can help with diagnosing non-AR.

The Phadiotop assay is a very reliable laboratory test used to screen for inhalant allergies. It contains a mixture of aeroallergens and uses an Immunocap to confirm allergy to these allergens. It has excellent sensitivity and specificity. However, it does not give any information regarding food, drug or chemical allergens and should not be used for a work-up of food allergies or urticaria. A positive test should be followed up by a panel of SPTs or specific IgE testing to confirm a specific allergen.¹¹

TABLE II: DRUG-RELATED RHINITIS²

TYPE OF DRUG-INDUCED RHINITIS	GENERAL DRUG CATEGORY	SPECIFIC DRUG CATEGORY	EXAMPLES
Local inflammatory			• NSAIDs (ibuprofen, indomethacin, diclofenac, sulindac, ketoprofen, naproxen, flurbiprofen, fenoprofen, piroxicam, meclofenamate, etodolac); • aspirin; • Ketorolac (if administered via nasolacrimal duct)
Neurogenic and neuromuscular	α- and β-adrenergic receptor modulators	α-antagonists	• α-1: doxazosin, silodosin, prazosin, tamsulosin, alfuzosin, indoramin; • α-1, α-2: phentolamine
		Presynaptic α-2 agonists	Clonidine, methyl dopa, guanfacine, piribedil
		β-antagonists	• β-1: metoprolol, atenolol, bisoprolol • β-1, β-2: pindolol • β-1, β-2, α-1: carvedilol, labetalol
		Presynaptic depletion of norepinephrine stores	Guanethidine
	Phosphodiesterase inhibitors	Phosphodiesterase-3 specific	Cilostazol
		Phosphodiesterase-5 specific	Sildenafil, tadalafil, vardenafil
		Non-selective phosphodiesterase	Pentoxifylline
	Angiotensin converting enzyme inhibitor		Ramipril, captopril, lisinopril, benazepril, quinapril, enalapril
Idiopathic		Psychotropics	Chlorpromazine, thioridazine, amitriptyline, alprazolam, reserpine, risperidone, mianserin
		Immunomodulators	Cyclosporine
		Hormones	Estrogen, oral contraceptives
		Other	Gabapentin, ginkgo biloba



Figure 5: Skin-prick test

Immunocap-specific IgE is a molecular allergology test that is both sensitive and precise in the detection of allergen-specific IgE antibodies. The Immunocap ISACCRD component-resolved diagnosis is a molecular diagnostic test that should not be used for screening but which should guide decisions regarding immunotherapy and allergen avoidance in a polysensitised patient. An SPT and a specific IgE identify sensitisation, but they do not identify the specific allergen responsible for the clinical symptoms in a polysensitised patient. There is also cross-reactivity between different allergens with a similar structure; for example, the pollen–food syndrome, and also cross-

reactivity between different grass species. Component-resolved diagnosis (CRD) utilises purified native or recombinant allergens to detect IgE sensitivity to individual allergen molecules responsible for an allergic reaction. It differentiates between the true reason for the symptoms and guides decisions with regard to allergen avoidance and immunotherapy.¹¹

PHARMACOTHERAPY

Nasal saline irrigation: a low-cost treatment regime with a good safety profile. It helps to clear the nose of inflammatory mediators, mucus and allergens and aids mucociliary clearance by improving ciliary beat frequency. In adults, a buffered, isotonic, slight alkaline solution appears best, but in children the hypertonic solution works best.²

Intranasal corticosteroids: the medication of choice. They are effective against nasal and ocular symptoms. The newer nasal sprays provide great efficacy and low systemic absorption rates. Patient education on the technique of application and the importance of long-term daily use is essential. The direction of the spray should be in a superolateral direction.²

Oral antihistamines: newer H1 antihistamines are preferred. They are very effective against itchy nasal symptoms, sneezing and pharyngeal irritation. But they are less effective against nasal obstruction. There is limited evidence that the combination of oral antihistamines and intranasal corticosteroids (INCS) improves symptoms but might increase costs.

Intranasal antihistamines: proven to be more effective than INCS for most nasal symptoms except congestion. They are also more effective in treating ocular symptoms and can be considered as a first-line agent due to their low adverse-effect profile. The taste of this agent might prevent adherence to treatment, however.²

Oral corticosteroids should not be used as the first-line agent

because of their possible adverse-effect profile. A short course might be effective in the management of severe persistent patients.

Oral decongestants are discouraged because of their limited efficacy with an adverse-effect profile.

Intranasal decongestants should be used very sparingly and with proper patient education about the side-effects, as mentioned previously.

Leucotrine receptor antagonists: should not be used as monotherapy. They should be considered in patients where oral antihistamines and INCS are not well tolerated. They may also be considered in patients with AR and asthma. They are less effective than first-line agents and should be considered sparingly.²

Cromolyn is less effective than INCS, but is an option if use of INCS is limited.

Intranasal anticholinergics are very effective against chronic watery rhinorrhoea, but not very effective against other symptoms.²

Probiotics can be used.

Allergen immunotherapy is an ideal management for patients who fail their management plan. It remains an expensive option, however, and is not covered by many medical aids. Moreover, it requires dedication on the part of the patient, because it should be used for a three-year period.

Other: surgical options include turbinate reduction and septoplasty in order to reduce other obstructive components.

STEPWISE MANAGEMENT OF PATIENTS WITH ALLERGIC RHINITIS

1. Do symptoms and signs fit with possible AR?
 - If unsure, confirm allergy sensitisation with Phadiotop or SPT.
2. Type of symptoms and signs and severity will dictate the management plan.
 - Use the ARIA guidelines to decide whether the symptoms are mild, moderate or severe, as determined by the impact on quality of life.
 - Are the symptoms intermittent or persistent?
3. Patient education.
4. Allergen avoidance.
5. Intranasal saline irrigation.
6. First-line agents: INCS, oral or intranasal antihistamines or combination INCS+intranasal antihistamine.
 - If effective but still symptomatic: continue.
 - If symptoms mild or gone: consider stopping.
 - If not effective: consider step-up in management to include other agents.
 - If not effective: consider referral to ENT surgeon for exclusion of another cause.

- If not effective and a suitable candidate for immunotherapy: consider referral to allergologist.

CONCLUSION

It is often difficult to manage patients with seasonal AR resulting from grass sensitisation. Bermuda grass sensitisation is very common in multiple biomes of South Africa. Many grass species have a very long period of pollination and cross-react with numerous other grass species. Seasonal AR due to grass pollen creates the baseline inflammation in the nose that is often complicated by patient self-medication. Coexistence with other types of rhinitis often complicates the clinical presentation. The

long-term effective management of this condition is often difficult because of several factors, including patient education and cost. A good, thorough history and examination with confirmation of the diagnosis, is imperative to start the long journey in the management of AR. Patient education regarding their condition and any limitation on self-medication can improve the overall success in their management and decrease costs.

DECLARATIONS OF CONFLICT OF INTEREST

The author declares no conflict of interest.

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