OULUN AMMATTIKORKEAKOULU

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ASSESSMENT AND MANAGEMENT OF SEASONAL AND PERENNIAL ALLERGIC CONJUNCTIVITIS – GUIDELINE FOR FINNISH OPTOMETRISTS

- An Integrative Review

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ABSTRACT

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Introduction: Ocular allergies are common and often benign but subjectively harmful eye diseases. The most encountered ocular allergies are seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC). These two conditions could be mainly managed by optometrists which could partly alleviate the crowded eye health care system of Finland. Currently, there is no guideline on this subject in Finland that is comprehensive enough and utilizes the knowledge of optometrists.

Purpose: The purpose of this integrative review was to compile the necessary information for the guideline of assessing and managing seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC).

Methods: An integrative review is a type of literature review, used in healthcare sciences, that allows more diverse types of material as a source. For this integrative review, 8 articles and 3 guidelines were analysed. Appraisal of the articles was done with the help of SANRA (Scale for the Quality Assessment of Narrative Review Articles) and the chosen articles were graded between 5 to 11 on a scale of 0-12. Grade 4 or under was one of the exclusion criteria. There was no specific tool to assess guidelines but all the chosen guidelines were published by well-known and reliable publishers and the process of conducting them was opened thoroughly.

Results: The result of this study gives the tools for an optometrist to recognise the symptoms and assess the severity of SAC or PAC. It also gives directions in managing these conditions and emphasises the optometrist to recognize the limitations of personal competence while making clinical decisions. This integrative review gives a good baseline to further develop this into an official peer-reviewed guideline.

Conclusions: This integrative review confirms the relevancy of optometrists in ocular allergy treatment. Optometrists are often a more accessible and economical option compared to doctors and more specific compared to nurses. Additionally, these results promote Finnish healthcare to utilize optometrists and their already existing abilities in treating common ocular allergies like SAC and PAC, and this way reduces the stress on the crowded eye health care.

Keywords: allergic conjunctivitis, guideline, management, ocular allergy, optometrist, perennial allergic conjunctivitis, seasonal allergic conjunctivitis

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1 INTRODUCTION

Ocular allergic symptoms are common, affecting 10-20% of the population. Up to 40-60% of allergic patients have ocular symptomatology. These diseases must be diagnosed early and treated appropriately to improve the patient's quality of life (Villegas & Benitez-Del-Castillo, 2021). A Spanish study from 2002 measures the impact of ocular allergy on the quality of life. While it only considered one type of ocular allergy, seasonal allergic conjunctivitis (SAC), the results were clear. From 201 sufferers of SAC nearly 20% had taken time off work due to their symptoms and almost 45% stated that their productivity at work had decreased while their annual personal cost of the symptoms was estimated to be 350 euros. Costs for the employer or the society were not included in this study. (Smith et al., 2005.)

In Finland, the prevalence of allergic conjunctivitis is about 20% of the population while an estimated 30% have some allergic disease (Seppänen, 2019). It is justified to assume that the impacts of ocular allergies on the quality of life and economy are at least similar in Finland, another European country. The newsletter of Näe Ry (Finnish Association of Vision and Eyecare) from December 2022 tells us how the aging population has challenged the accessibility of eye care. Many areas in Finland cannot offer eye care appointments in the timeframe legally set. By improving the cooperation between ophthalmologists and optometrists and taking full advantage of the skills and education of optometrists the situation would improve. (Näe Ry, 2022b.) An optometrist is an optician with a limited right to prescribe medications and perform an eye health examination (Näe Ry, 2022). Well-timed guidance of patients with ocular allergy symptoms by optometrists could partly reduce the pressure of eye care.

To assess and manage ocular allergy symptoms efficiently and utilize the capacity of the optometrists, a guideline for optometrists about seasonal and perennial allergic conjunctivitis management is needed. This thesis concentrates on seasonal and perennial allergic conjunctivitis because of their regular prevalence in optometrists' practice. More serious or acute forms of ocular allergies need to be recognized but are managed by an ophthalmologist.

The purpose of this thesis is to create a guideline material for optometrists about the assessment and management of seasonal and perennial allergic conjunctivitis. The guideline will support an optometrist to recognize and manage the symptoms that can be managed at the optometrist's

practice and recognize the patients that need to be referred. This could alleviate the pressure on eye care elsewhere since optometrists encounter these symptoms regularly and are often in a better timeframe to give instructions to patients.

This project is done for the Finnish Ethical Council of Optometry (OEN). OEN supervises and directs the practice of licensed opticians in Finland and can also give instructions and recommendations in the field of optometry. In 2020 OEN made the statement to order guideline materials for the assessment and management of different eye conditions as thesis projects from Oulu University of Applied Sciences. In the project order, OEN keeps the rights to modify the materials that are supplied to OEN via Theseus.

2 OCULAR ALLERGIES

2.1 Guidelines Considering Ocular Allergies

Evidence-based clinical practice guidelines for healthcare are compiled with strictly pre-defined procedures. The procedure includes systematic search strategies. The search results are then evaluated and synthesized into guidelines. These processes include research specialists, boards of healthcare professionals, and interest groups that will have their comments on the process. (Duodecim, 2022; The College of Optometrists.)

Current Care Guidelines in Finland are national evidence-based guidelines designed to support any healthcare personnel in decision-making (Duodecim, 2022). In the United Kingdom, the Clinical Management Guidelines were produced specifically for optometrists in 2008, when optometrists started prescribing independently. Comprehensive existing guidelines were one condition for independent prescribing for optometrists in the United Kingdom. (The College of Optometrists.)

In the European field of optometry, the United Kingdom is a leading actor. Clinical Management Guidelines published by The College of Optometrists are clear and comprehensive on management but do not focus on pathology (Clinical Management Guidelines - College of Optometrists). Swedish Optometry Association (Optikerförbundet) also publishes guidelines but those do not cover ocular allergies (Optikerförbundets Riktlinjer: Optikerförbundet).

Outside Europe, the Japanese Society of Allergology publishes a review article guidelines for allergic conjunctival diseases, the latest revision of 2020, and the executive summary of 2021. The Japanese guideline article is very comprehensive on pathology and diagnosing but also structured to support clinical work. (Miyazaki et al., 2020, 2022). World Allergy Organization maintains educational resources for professionals and covers ocular allergies, diagnostics, differentials, and management (Katelaris & Smith, 2020). American Optometric Association (AOA) maintains guidelines but those do not cover ocular allergies (Clinical Practice Guidelines | AOA).

In Finnish Current Care Guidelines, ocular allergies are mentioned in the section on self-medication. This guideline is directed more generally to the healthcare personnel but also to the

public and covers only OTC (over-the-counter) - medication, which can be bought from a pharmacy without a prescription. The guideline also gives non-pharmacological self-care options and lists symptoms that require contacting a doctor. It only covers seasonal allergic symptoms and acute symptoms due to an insect bite. (The Working Group of The Finnish Medical Society Duodecim and The Association of Finnish Pharmacies, 2016.)

2.2 Regulations Considering the Management of Ocular Allergies in Finland

Opticians and optometrists are licensed health care professionals and are expected to follow the laws and regulations considering their work. The Decree on Health Care Professionals (564/1994, 16§) limits the right to independently prescribe glasses in certain situations. These situations are:

1. A child under eight years old,
2. A person who has had surgery directed to the eyeball,
3. A person who appears to have an eye disease,
4. A person whose vision is not corrected to the normal level with glasses.

Fitting contact lenses is allowed for licensed opticians after additional education for such competency and considering the previously mentioned restrictions. Licensed opticians should make sure there are no contraindications for contact lens use. (Decree on Health Care Professionals 564/1994,16§, n.d.)

The optometrist is allowed to prescribe certain medicines with Pro Auctore-prescription for clinical use at their reception but is not allowed to make a prescription for the patient (Act on Prescribing Medicine 1088/2010, 6§, n.d.). Licensed healthcare professionals can start the treatment considering their own education, experience, and job description, based on the patients' symptoms, available information, and the estimation of the need for the treatment. (Act on Health Care Professionals 559/1994, 23 a §, n.d.)

2.3 Ocular Immune System

Immunity means the capability of the host organism to be resistant to pathogens or foreign organisms (antigens). To enable this, the host requires an immune system. The immune system

divides into innate and acquired immunity. The innate system is a nonspecific first-line defence, creating a similar response to all foreign organisms whereas the acquired system has an immunological memory that allows it to create a specific response to each foreign organism. (Forrester et al., 2002, p. 297-298.)

2.3.1 The Innate Immunity of the Eye

The innate immunity of the eye consists of surfaces of the body such as skin (eyelids), and mucous membranes (conjunctiva) and is strengthened by secretions (tears). In addition, mediators in innate immunity include macrophages, eosinophils, natural killer (NK) cells, and cytokines among others. (D. G. I. Chigbu, 2009a; Forrester et al., 2002, p. 298.)

Skin covers the eyelids from the outside and consists of the outer layer epidermis and the inner, thicker layer, the dermis. The dermis is a connective tissue that contains blood vessels, nerve fibers, and lymphatic networks. Macrophages, fibroblasts, and mast cells are found in the dermis. Next to other glands, Meibomian glands are located in the lids and secrete lipids through openings in the lid margin to complete the tear composition. (Bowling, 2016. p. 2-3.)

The conjunctiva covers the inner part of the eyelid (palpebral conjunctiva) and the anterior eye (bulbar conjunctiva) reaching the limbus, the area between conjunctiva and cornea. It is a transparent tissue that has a rich vascular and lymphatic network. The mucus-secreting goblet cells are in the conjunctival epithelium, the surface of the conjunctiva, and the accessory lacrimal glands, producing essential tear film components, are found in the stroma of the conjunctiva. The stroma is the inner part of the conjunctiva and is mostly attached to the tenon capsule covering the sclera. (Bowling, 2016, p.132.)

The tear film has three layers and spreads over the conjunctiva and cornea with blinking. Tear film moisturizes and protects the surface of the eye. The outermost layer is the lipid layer, lipids secreted mainly from the Meibomian glands. These lipids prevent the evaporation of the tear film. The medial layer is an aqueous layer that consists mainly of water but has electrolytes, mucins, proteins, interleukins, and growth factors in addition. The inner layer is the mucin layer and it contains mucins secreted by conjunctival goblet cells and provides lubrication over the corneal and conjunctival

epithelial cells. The exact composition of the tear film is complex and regulated by hormonal and neural mechanisms. (Bowling, 2016, p.121.)

2.3.2 The Acquired Immunity of the Eye

When innate immunity fails to defend itself from the foreign antigen the acquired immune system takes over. The acquired immune system is composed of T-lymphocytes and B-lymphocytes that specifically recognize foreign antigens, molecules (immunoglobulins) that specifically work against foreign antigens, and non-specific molecules (cytokines) that are released by antigen-specific lymphocytes. (D. G. I. Chigbu, 2009a; Forrester et al., 2002, p. 298.)

The acquired immunity can be divided into humoral and cell-mediated immunity. Humoral immunity is B-lymphocyte-mediated. Antibodies produced by B-lymphocytes (B cells) remove the antigen. The cell-mediated immunity is mediated by antigen-specific T-lymphocytes (T cells), which release cytokines in response to the antigen. (D. G. I. Chigbu, 2009a; Forrester et al., 2002, p.298.)

Whereas innate immunity functions mostly with surface-bound extracellular antigens, acquired immunity has been developed to defend against intracellular antigens. This is possible since the acquired immunity can separate between self and non-self antigens. Another characteristic ability of the acquired immune system is the ability to produce a specific response to the antigen once the re-exposure happens. This requires the ability to memorize and differentiate antigens from one another. (D. G. I. Chigbu, 2009a; Forrester et al., 2002, p.298-299.)

2.4 Pathophysiology of Ocular Allergy

While the acquired immunity works to remove the antigen by causing an inflammatory reaction with minimum tissue damage, the allergic reaction happens when the response to the antigen is unnecessarily large. Allergic or hypersensitivity reactions happening in ocular tissues are immunoglobulin E (IgE) mediated or T cell-mediated. (D. G. I. Chigbu, 2009b.)

In IgE-mediated hypersensitivity reaction, traditionally called type I hypersensitivity reaction, mast cells degranulate and release inflammatory mediators like histamine. IgE-mediated hypersensitivity

reaction happens in three phases; sensitization phase, activation phase, and effector phase which divides into early and late phases of responses (figure 1). (D. G. I. Chigbu, 2009b.)

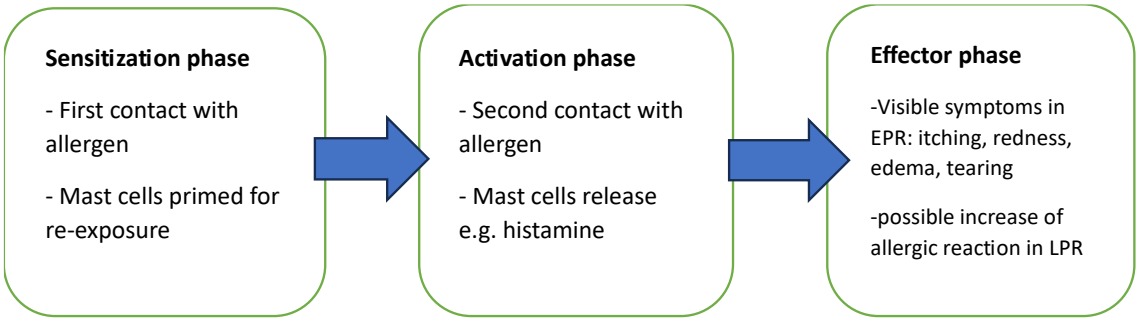

FIGURE 1. Three phases of IgE-mediated hypersensitivity reaction. EPR: early phase response, LPR: late phase response. Figure: Mari Suuronen

The sensitization phase means the first time the allergen meets the eye. At this point, there are no allergic symptoms, but the allergens (antigens) are processed by antigen-presenting cells (APC). APCs then present the antigens to T cells and the interaction between T and B cells leads the B cells to produce antigen specific IgE. These IgE antibodies then bind themselves to FcεRI -receptors at the surfaces of mast cells. This reaction primes the mast cell for re-exposure. (D. G. I. Chigbu, 2009b.)

As the eye meets the allergen again, the allergen (antigen) then binds to the antigen-specific IgE molecules attached to the FcεRI – receptors on the mast cells. This causes a process that leads to the degranulation of the mast cell. Mast cells then release inflammatory mediators, including histamine, and these start to formulate the allergic response. This is the activation phase and it is the beginning of the early phase response (EPR). (D. G. I. Chigbu, 2009b.)

In the EPR the allergic symptoms become clinically visible. EPR begins approximately 40 minutes after exposure. The histamine binds to its receptors, mainly histamine receptors H1 and H2 in the eye, and affects blood vessels, nerves, and glands. This causes typical allergic symptoms, redness, itching, edema, and tearing. (D. G. I. Chigbu, 2009b.)

The late phase reaction (LPR) happens a few hours after the early phase and mast cell degranulation. Mediators released in EPR attract inflammatory cells to the symptomatic area, increasing the allergic reaction. Th2 lymphocytes, produced by T cells, mediate a chronic allergic response together with emerged inflammatory mediators like leukotrienes and prostaglandins. LPR

reinforces the allergic response and plays a role when ocular allergy becomes chronic. (D. G. I. Chigbu, 2009b.)

T cell mediated reaction is another hypersensitivity type located in ocular surfaces and is traditionally called type IV hypersensitivity response. It begins when antigen-specific T cells react with the allergen (antigen) introduced by APC. This reaction produces Th2 lymphocytes that work as a mediator in allergic inflammation typically with chronic IgE production, mast cell degranulation, and eosinophil activation. Th1 lymphocytes mediate in contact ocular allergy, whereas Th2 is included in the process of atopic disease. (D. G. I. Chigbu, 2009b.)

2.5 Classification of Ocular Allergies

2.5.1 Seasonal and Perennial Allergic Conjunctivitis

Seasonal and perennial allergic conjunctivitises are the most common forms of ocular allergies. Seasonal allergic conjunctivitis (SAC) is triggered by seasonal outdoor allergens such as tree or grass pollens during the spring season and is often called hay fever conjunctivitis. Symptoms of SAC normally disappear during the winter season. Perennial allergic conjunctivitis (PAC) is similar but more chronic in nature and symptoms are usually milder. Reasons for PAC are year-round indoor allergens such as mold, dust mites or animals. (Kari & Saari, 2010; Villegas & Benitez-Del-Castillo, 2021.)

SAC and PAC are Immunoglobulin E (IgE) mediated type I allergic reactions, often co-existing with allergic rhinitis or asthma. Both types are usually bilateral and the hallmark symptom is itching. Other symptoms include redness and edema of conjunctiva, tearing, and possible lid edema. In addition, mild papillary reaction in the tarsal conjunctiva might be present. (Kari & Saari, 2010; Villegas & Benitez-Del-Castillo, 2021.) Symptoms are listed in figure 2.

In addition to seasonal and perennial classifications, suggested classifications are also based on the duration of the symptoms where the disease is called intermittent if the allergic symptoms last under 4 weeks and persistent when more than 4 weeks. The severity of the allergic symptoms is classified as mild, moderate, or severe, based on the subjective experience and clinical signs of the symptoms. (Sánchez-Hernández, Montero, et al., 2015.)

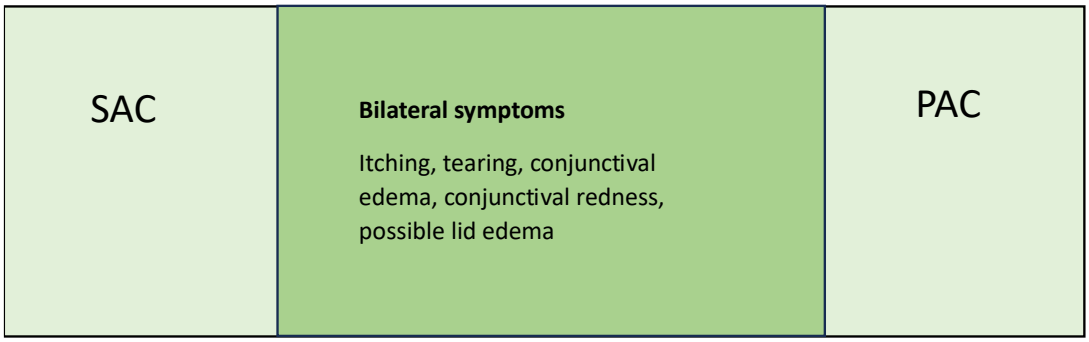

FIGURE 2. Typical symptoms of seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC) are similar but are different in timing. Figure: Mari Suuronen

When seasonal or perennial allergic conjunctivitis exists with other allergic diseases it is often undiagnosed or undertreated while evidently affecting the individual's quality of life. This may lead to self-medication without proper guidance and undesirable side effects like concurrent allergic symptoms from preservatives like benzalkonium chloride (BAK), drowsiness from oral antihistamines, or rebound vasodilation after the use of topical vasoconstrictors. (Dupuis et al., 2020.)

2.5.2 Other Relevant Ocular Allergies

Besides seasonal and perennial conjunctivitis, the most common ocular allergies, this thesis describes also further allergies affecting the eye. These allergies are vernal keratoconjunctivitis (VKC), atopic keratoconjunctivitis (AKC), acute allergic conjunctivitis (AAC), and contact blepharoconjunctivitis (CBC). The listed allergies are important to recognize for the appropriate management.

Vernal keratoconjunctivitis (VKC) is potentially sight-threatening chronic allergic inflammation of the ocular surface with seasonal exacerbations. VKC causes itching, redness, tearing, and stringy discharge. Photophobia and foreign body sensation indicate corneal involvement. It occurs mainly in children and typically resolves after puberty. Occasionally young adults are also affected. VKC is more likely to affect males. Warm and dry climates increase the probability of VKC. (D. I. Chigbu & Labib, 2021; Mehta et al., 2022.)

Papillae are the main symptom of the disease and VKC is classified in three forms based on the location of the papillae. In tarsal form, papillae are present at the palpebral conjunctiva, and in limbal form, papillae are in the limbal area. The third form is mixed form VKC, where the papillae are found in both tarsal and limbal locations. Papillae in palpebral conjunctiva are large, from 1 to 5 mm in diameter, and generate a risk of corneal complication. With blinking, the papillae simply cause a mechanical irritation to the cornea which can finally lead to a shield ulcer of the cornea. Limbal papillae are smaller and appear with a white top. They are called Horner-Trantas dots. (D. I. Chigbu & Labib, 2021; Mehta et al., 2022.)

Atopic keratoconjunctivitis (AKC) is a chronic ocular manifestation of atopic dermatitis. AKC is bilateral and involves conjunctiva, lids, and possibly cornea. The symptoms usually include redness of the conjunctiva and edema of the lids and conjunctiva. Also, papillae at the palpebral conjunctiva are common. Lids are typically eczematous and itchy. AKC affects typically young adults under 50 years of age and is more prevalent in males. (La Rosa et al., 2013; Villegas & Benitez-Del-Castillo, 2021.) Often mentioned complications of AKC are keratoconus, herpes simplex keratitis, retinal detachment, and Staphylococcus aureus-associated blepharitis. Cataracts can develop at a younger age in a patient with AKC. (Leonardi et al., 2012; Villegas & Benitez-Del-Castillo, 2021.)

Acute allergic conjunctivitis (AAC) has symptoms that are similar to SAC (redness, conjunctival edema, tearing, and photophobia), but symptoms develop more suddenly and might additionally include intense lid swelling and eczema of lids. SAC symptoms develop usually in a few weeks whereas symptoms of AAC can appear in thirty minutes and be relieved in 24 hours after the allergen exposure is over. (Seppänen, 2019.)

Contact blepharoconjunctivitis (CBC) or contact ocular allergy is a type IV hypersensitivity reaction typically due to substances like topical medication, preservatives, or nickel. Symptoms are typical allergic symptoms, especially itching, appearing on lids and possibly in conjunctiva. The most important treatment is recognizing and avoiding the allergen. (D. G. I. Chigbu, 2009a; La Rosa et al., 2013.)

2.5.3 Main Differential Diagnoses

When assessing ocular allergies patient history is essential to rule out other possible causes of the symptoms. Anamnesis should question if the patient has had topical medication or had exposure to infectious agents. Topically administered eyedrops and/or their preservatives may give allergic symptoms and recent encounters with infections might imply infectious reasons. Existing systemic autoimmune disease like rheumatoid arthritis often implies the possibility of dry eye whilst family or patient history of allergic disease like asthma supports the ocular allergy diagnosis. (Bielory et al., 2013.)

Dry eye disease (DED), giant papillary conjunctivitis (GPC), and bacterial or viral infections are the most common differential diagnoses when discussing ocular allergies (Bielory et al., 2013; Dupuis et al., 2020). These conditions will be briefly described to enable the appropriate management of ocular allergies.

TFOS DEWS II (2017) dry eye report defines the dry eye as follows: “Dry eye is a multi-factorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface in-flammation and damage, and neurosensory abnormalities play etiological roles.”. (Craig et al., 2017.)

According to the TFOS DEWS II report (2017), dry eye disease (DED) can be classified as aqueous-deficient or evaporative DED. Aqueous deficiency can be further divided into Sjögren Syndrome dry eye or non-Sjögren dry eye. Non-Sjögren aqueous deficiency can be a result of lacrimal deficiency, lacrimal duct obstruction, reflex block, or systemic drugs. Evaporative dry eye is divided into intrinsic and extrinsic dry eye. Intrinsic reasons for evaporative dry eye come from the eye and the TFOS DEWS II report lists the following reasons: Meibomian gland dysfunction, lid aperture dysfunctions, low blink rate, and drug action Accutane. Extrinsic reasons for evaporative dry eye come from outside the eye. These reasons are vitamin A - deficiency, topical drug preservatives, contact lens wear, and ocular surface diseases like allergies. Also, environmental factors for dry eye are listed and include aging, low blink rate, humidity, and occupational environment among others. (Craig et al., 2017.)

Subjective symptoms of dry eye include itching or burning sensation, light sensitivity, and lowered tolerance for contact lenses. The symptoms may be associated also with allergies and these conditions may be simultaneous. Diagnosis of dry eye is based on careful anamnesis and tests like Tear Break Up Time (TBUT). Evaluation of tear film quality and Meibomian glands is essential. (Bielory et al., 2013; Dupuis et al., 2020.)

Giant Papillary Conjunctivitis (GPC) is traditionally listed with ocular allergies (Miyazaki et al., 2020; Villegas & Benitez-Del-Castillo, 2021). Although it has some similarities it shows no hypersensitivity reaction, rather than a reaction to a mechanical trauma caused by a foreign object in the eye. Contact lens-related GPC is the most common, but sutures or ocular prosthetics might also provoke the reaction. (Bielory et al., 2013; D. G. I. Chigbu, 2009a.) Irritation by mechanical trauma causes papillae hypertrophy in the tarsal conjunctiva which gives the feeling of a foreign body and itching. The cornea is only affected in serious stages of GPC. The main treatment is to remove the cause of the irritation. (D. G. I. Chigbu, 2009a; Villegas & Benitez-Del-Castillo, 2021.)

Bacterial infections are often eventually bilateral, usually acute with sticky, purulent discharge and conjunctival redness. The most common causes are Streptococcus pneumoniae, Staphylococcus Aureus, Haemophilus influenzae, and Moraxella catarrhalis. Symptoms vary depending on severity but almost 2/3 of cases resolve in five days without treatment although topical antibiotics are often prescribed. Systemic antibiotics are required when bacterial conjunctivitis is associated with systemic conditions like gonococcal infection in adults or ear infection caused by H. Influenzae in children. (Bowling, 2016, p.135-136.)

In the case of acute allergic conjunctivitis (AAC), one should recognize and rule out the possibility of preseptal and orbital cellulitis (The College of Optometrists, 2021). Preseptal cellulitis is a bacterial infection of subcutaneous tissue in front of the orbital septum and is less serious than orbital cellulitis behind the orbital septum with the possibility of life-threatening complications. Both types appear with swollen, red, and tender eyelids, but proptosis and painful restrictions in eye movements differentiate orbital cellulitis from preseptal. In the case of orbital cellulitis, the patient needs urgent care and intravenous antibiotics. (Bowling, 2016, p.87-89.)

Viral conjunctival infections are common and present with mild redness, watery discharge, and mild or absent lid edema. The most common cause is Adenovirus, which is highly contagious and is sometimes epidemic in schools or hospitals. Treatment is usually unnecessary since spontaneous

resolution happens in two to three weeks, but good hygiene is essential to reduce the transmission of the virus. Topical steroids might be required in more severe cases and topical antibiotics if secondary bacterial infection is present. (Bowling, 2016, p.141-144.)

2.6 Management of Seasonal and Perennial Allergic Conjunctivitis

2.6.1 Non-pharmacological Management and Prophylaxis

The most important mechanism of ocular allergy prophylaxis is the avoidance of the allergen (figure 3). Patients with SAC should be advised to be aware of pollen counts by weather forecasts and reconsider outdoor activities when the count is high. Also protecting indoors by keeping windows closed and filtering the incoming air is essential. Sufferers of PAC can protect from allergens by keeping the possible family pet out of the bedroom and keeping indoors clean and dry to avoid mold growth and dust. (Bielory et al., 2013; D. G. I. Chigbu, 2009a.)

After exposure to the allergen, good hygiene is helpful (figure 3). Washing the hands and hair and taking care of the lid hygiene reduces the carried amount of the allergen. Prescription-free moisturizing eye drops work as eyewash diluting the concentration of allergens and mediators in the tear film. (Bielory et al., 2013; Leonardi et al., 2019.)

Besides diluting the concentration of the tear film, moisturizing eye drops improves the stability of the tear film and this way offers a better physical barrier on the ocular surface against allergens (Leonardi et al., 2019). Keeping the moisturizing eye drops refrigerated and dosing cold eye drops, the patient can maximize the help of a cool compress on alleviating the effects of vasodilation; conjunctival and lid swelling (Chigbu, 2009). A cold compress may relieve the allergic symptoms by reducing the swelling and easing the itchiness when used for eyelids one or two times per day for 5-10 minutes at a time (Bielory et al., 2013). Non-pharmacological management options are listed in figure 3.

The effects of allergic conjunctivitis on quality of life are significant. The chronic nature of the disease is affecting the patients or their caregiver's perception of general health (Smith et al., 2005; Zhang et al., 2021). According to Leonardi (2019), the affected people should receive supportive education considering the evaluated course of their disease, possible complications, and

management of the disease. Psychological support may be necessary in some cases (Leonardi et al., 2019).

2.6.2 Pharmacological Management

While non-pharmacological management alleviates ocular allergy symptoms, in many cases, it is not enough. Some topical allergy medication is best to start prophylactically and others only if the symptoms persist or worsen. Vasoconstrictors, mast cell stabilizers, antihistamines, and their combinations are widely used and available whereas steroids and immunotherapy need a specialized ophthalmologist to prescribe and control the therapy. (Bilkhu et al., 2012.) Medications listed in this section are topical unless otherwise stated. Management of special populations such as kids, pregnant, or the elderly may need special considerations and are not included in this work. Pharmacological management options are listed in figure 3.

Vasoconstrictors are not widely used but are usually listed to alleviate allergic symptoms since the shrinkage of the ocular vessels removes conjunctival edema and redness. This medication is best used short term, since discontinuing especially after a longer period, vasoconstrictor might result in rebound-hyperemia. Vasoconstrictors are contraindicated for patients with angle-closure glaucoma, hyperthyroidism, or cardiovascular disease. (Bielory et al., 2013; D. G. I. Chigbu, 2009a.)

Mast cell stabilizers are safe to use and recommended to start prophylactically as there are no significant side effects (Owen et al., 2004). Mast cell stabilizers act to stabilize the membranes and this way prevent mast cell degranulation and the release of inflammatory cells. This leaves out the allergic symptoms but does not influence the histamines that have already been released and affecting. This is why mast cell stabilizers are not effective in acute reactions. (Bielory et al., 2013; D. G. I. Chigbu, 2009a.)

Antihistamines block the histamine receptors H1 and H2 efficiently preventing allergic symptoms in lids and conjunctiva. This mechanism allows it to act faster and administration can be started once the symptoms appear. Oral antihistamines should be considered with concomitant allergic symptoms elsewhere in the body. (Bilkhu et al., 2012.)

Mast cell stabilizers and antihistamines in combination are often considered to be superior to either one alone (Bielory et al., 2013; Dupuis et al., 2020; Leonardi et al., 2019). They provide the prophylactic benefits of mast cell stabilizers and immediate symptom relief by antihistamines (Chigbu, 2009). A combination of antihistamine and vasoconstrictors is often briefly mentioned, while other options are more suitable for the treatment of ocular allergy symptoms (Ackerman et al., 2016; Bilkhu et al., 2012; Chigbu, 2009)

The use of topical non-steroidal anti-inflammatory drugs (NSAIDs) reduces allergic symptoms by inhibiting inflammatory mediators like prostaglandins. NSAIDs affect mostly itching but also alleviate redness. (Ackerman et al., 2016; Sánchez-Hernández et al., 2015.)

Topical steroids are used in severe or chronic conditions. Steroids affect by suppressing the inflammatory mediators and inhibiting mast cell histamine production. While it cannot stabilize the mast cells it can prevent degranulation by affecting the mediators of the process. Steroids mainly target LPR reactions. (D. G. I. Chigbu, 2009a.) While topical steroids are used frequently in numerous cases of ocular allergies, like VKC and AKC, long-term use might increase the risk of high intraocular pressure (IOP) and the formation of cataracts. Although there is a new generation of topical steroids with fewer potential complications, the ophthalmologist is always involved in the treatment. (Ackerman et al., 2016.)

Immunotherapy downregulates the antigen response. It is the only treatment that keeps the results after the administration of the medication has been discontinued. Immunotherapy can be given subcutaneously or sublingually and both give significant help with allergic conjunctivitis. The treatment usually continues for years with continual visits to the hospital. (Dupuis et al., 2020.)

When choosing the right treatment for the ocular allergy patient the clinician should consider the usability of the medication in addition to pharmacology. If the dosing of the medicine is complex or too expensive patient compliance will suffer. The clinician should also make sure that the patient knows how and why he must use this medication and what is the potential of their disease. (D. G. I. Chigbu, 2009a.)

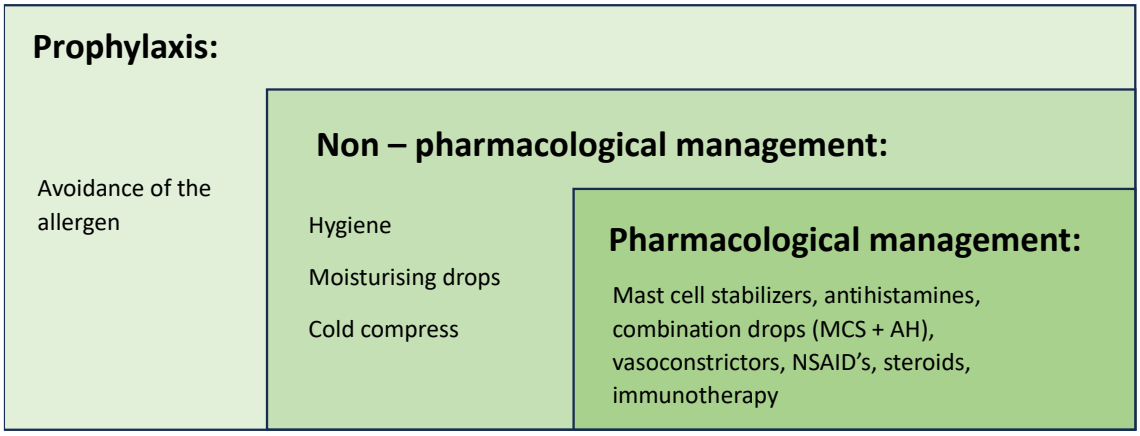

FIGURE 3. Different management options for seasonal and perennial allergic conjunctivitis are often used simultaneously. Figure: Mari Suuronen

3 THE PURPOSE AND OBJECTIVES OF THE THESIS

The purpose of this thesis is to familiarise the subject of seasonal and perennial allergic conjunctivitis and create a material for a guideline for optometrists about the assessment and management of SAC and PAC.

The purpose of the integrative review is to identify and synthesize the relevant information about the assessment and management of seasonal and perennial allergic conjunctivitis.

For these purposes, a guideline material for Finnish optometrists about the assessment and management of seasonal and perennial allergic conjunctivitis should be compiled. The material should promote the utilization of Finnish optometrists in the subject to alleviate the stress on health care elsewhere.

4 IMPLEMENTATION OF THE THESIS

This integrative review was written between February 2023 and August 2023. The initial orientation to the subject started in the spring of 2022 by studying the subject and different study methods. The thesis plan was written in the autumn of 2022. Writing of the thesis started with literature searches for the theoretical background in February 2023 and after the completion of the theoretical part, the author had the competence to conduct the literature search for the integrative review. The help of the library information specialist was used. The analysis of the search results was done in April 2023.

4.1 Integrative Review as a Method

An integrative review is a type of literature review, used in healthcare sciences, that allows more diverse types of material as a source compared to systematic review and meta-analyses that focus strictly on randomized clinical trials and evidence hierarchies. While the method approves a broad selection of research types, it enables a wider understanding of the subject under the research. Integrative review can combine information for example from both qualitative and quantitative research whereas other methods might only utilize the other type. (Whittemore et al., 2005)

Whittemore et al. (2005) have proposed a strategy to perform the integrative review to enhance the reliability of the method. The strategy includes five stages; the problem identification stage to address the review purpose. Clarity of the review purpose is essential for an accurate outcome and clarifies the next stages. The second stage is the literature search stage, where the clear and precise documentation of the literature search process and introduction of the inclusion and exclusion criteria support the reliability. In the third stage, the collected data is evaluated for example in terms of authenticity and methodological quality. The fourth stage is the data analysis stage which includes data reduction, planning of data display, data comparison, and consequently conclusion drawing and verification. The final stage is the presentation of the results. (Whittemore et al., 2005.)

4.2 Implementation of the Review

4.2.1 Problem Identification

For problem identification and defining the keywords, the PCC model was used.

P (population) = Patients with symptoms of seasonal or perennial allergic conjunctivitis
C (concept) = Guideline for the management of SAC and PAC for Finnish optometrists
C (context) = Management of SAC and PAC by a Finnish optometrist

Problem: Currently there is no guideline for Finnish optometrists on how to assess and manage ocular allergies. This can lead to a worsening of patient's situation but also cause pointless crowdedness of health care. Current guidelines do not utilize the skills of Finnish optometrists.

This integrative review focused on finding and synthesizing the relevant information on the subject of management of seasonal and perennial allergic conjunctivitis (SAC and PAC) to create the guideline material for Finnish optometrists.

4.2.2 Literature Search

From the PCC model, the following keywords were established; "seasonal allergic conjunctivitis", "perennial allergic conjunctivitis", "management" and "guideline". The words "optometrist" and "finnish" were not included in the keywords since the legislation varies in different countries and the words would have limited the results needlessly.

The first search was done on 14 April 2023 using all the prior established keywords in PubMed with filters Full text, Randomized Controlled Trial, Review, Systematic Review, in the last 10 years, English language. The results were too narrow (n=6) and inaccurate. After simplifying the keywords into "allergic conjunctivitis" AND "management" with the same applied filters the result was 95 articles.

In addition, the searches were made in EBSCO Host. This search covered databases Academic Search Premier, CINAHL (Cumulated Index to Nursing and Allied Health Literature) with Full Text,

and MEDLINE (National Library of Medicine) and was done also on 14 April 2023. Filters Full text, English language, last 10 years were applied. There was no possibility to choose the article type. Using the keywords “allergic conjunctivitis” AND “management” the result was 72 articles. The search engine automatically applied the filter to remove the exact duplicates.

Additional sources for this review literature search were national and international existing guidelines relevant to the subject. These guidelines were chosen after critical consideration based on the knowledge achieved while composing the theoretical background of this study. A few articles considering the management of ocular allergies were also handpicked after composing the theoretical background.

A literature search for the theoretical background was performed at the beginning of February 2023 using PubMed, CINAHL, and Google Scholar. Keywords were “allergic conjunctivitis” OR “acute allergic conjunctivitis” OR “atopic keratoconjunctivitis” OR “vernal keratoconjunctivitis” OR “ocular allergy” OR "seasonal allergic conjunctivitis" OR "perennial allergic conjunctivitis" AND “guideline” OR “assessment” OR “management”. Searches were made with different combinations of keywords until saturation was achieved. That was when the same results started to re-appear in the search results. Additionally, some well-known literature on the field was used and a few articles were handpicked from the reference lists of the already chosen articles. Existing guidelines and websites considering the subject were also utilized.

Inclusion and exclusion criteria were decided based on the PCC and the identified problem. To be included in the data, the article needed to handle SAC and/or PAC, their identification, and management of their symptoms. The article was excluded if the main subject was purely another allergic condition like VKC, it was pediatric or it presented the results of only one type of medication. Also, articles with other types of conjunctivitises (viral or bacterial) were excluded. Exclusion criteria were sharpened during the primary searches.

From the 95 articles achieved from PubMed, 82 were excluded by the title, and three (3) were excluded based on the abstract. From the remaining 10 articles only five (5) were full-text accessible. The search with EBSCO Host produced 72 articles and 69 were excluded by the title. The remaining three (3) articles were rather general and commercial in their nature and were excluded as well. This process is further opened in figure 4.

The guidelines were included in this review if they were scientifically constructed and relevant geographically. Included guidelines needed to provide tools to recognize, differentiate, and manage SAC and PAC. Three (3) guidelines were included in the review. Handpicked articles were review-type articles that handled SAC and PAC managing and otherwise fulfilled the inclusion criteria. Three (3) handpicked articles were included in the review.

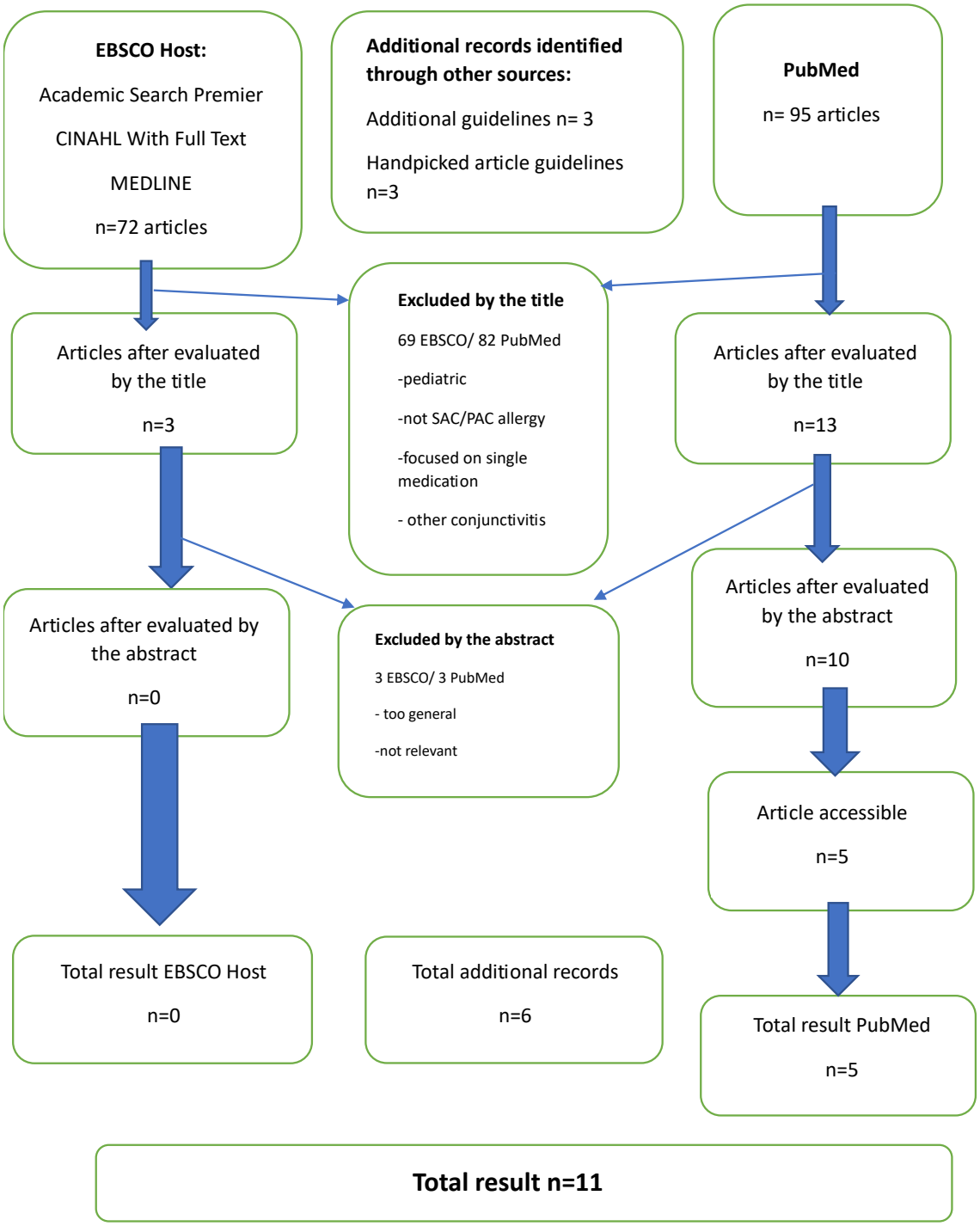

FIGURE 4. Data search results and exclusion of the data. Figure: Mari Suuronen

5 RESULTS

5.1 Results of the Review

In this chapter, the included results of the literature search are evaluated and analysed. The evaluation process confirms the validity of the chosen data with a well-known appraisal method and analysing the data condenses the information into a more accessible form.

5.1.1 Data Evaluation

Evaluating the quality of the sources in the integrative review method is complex since different styles of studies and data types require more than one appraisal method (Whittemore et al., 2005). The included guidelines (table 1) were constructed by scientific and strictly pre-defined procedures and are peer-reviewed. Structured procedures bring reliability to the guidelines. Duodecim and The College of Optometrists have used expert working groups and the guidelines are updated regularly. The guideline from The World Allergy Organization (WAO) has only one author and the procedure is not opened as thoroughly, but it also gives information about peer reviewers and updates. Publishers of all three guidelines are well-known and reliable.

Guideline	Author	Publisher	Peer reviewed
Conjunctivitis (seasonal & perennial allergic)	Working group by The College of Optometrists, 2023	The College of Optometrists (United Kingdom)	yes
Self-Medication	Working group appointed by the Finnish Medical Society Duodecim, Association of Finnish Pharmacies, 2016	Duodecim (Finland)	yes
Ocular Allergy	Professor Connie Katelaris, MD, PhD, 2020	The World Allergy Organization (WAO)	yes

TABLE 1. The Selected Guidelines. Table: Mari Suuronen

Additionally, optometry guidelines from the AOA (American Optometric Association) and Swedish Optometry Association were studied to explore the headings used. This supported the results to be in a generally approved form but did not have an impact on the content since these guidelines do not handle ocular allergies.

Selected articles (table 2) were peer-reviewed articles that are published in known publications. Articles in table 2 are listed with numbers for further reference. Articles from Dupuis et al. (2020), Bielory et al. (2013), Miyazaki et al. (2020), Bielory et al. (2020), and Ackerman et al. (2016) were found in the literature search, and articles from Chigbu (2009), Leonardi et al. (2019) and Sánchez-Hernández et al. (2015) are the handpicked articles. Articles from Dupuis et al. (2020), Miyazaki et al. (2020), Ackerman et al. (2016), and Chigbu (2009) were review articles with no description of the literature search process. The article from Bielory et al. (2013) is also a review-type article, mentioning to “outline current best practices” but the article type or the literature search is not clarified. The article from Bielory et al. (2020) does not clarify the method or the process but follows the methods of literature review. The article from Leonardi et al. (2019) is a systematic review with a description of the search process. The article from Sánchez-Hernández et al. (2015) mentions separately to use of the method of the systematic review but writing the document in the form of a narrative review.

No.	Article	Author	Main content
1.	A Contemporary Look at Allergic Conjunctivitis	Dupuis et al., 2020	Review article about different forms of ocular allergies, their symptoms, and management
2.	An Algorithm for the Management of Allergic Conjunctivitis	Bielory et al., 2013	Outlines current best practises to diagnose and treat ocular allergies
3.	Japanese Guidelines for Allergic Conjunctival Diseases 2020 (Update of "Japanese Guidelines for Allergic Conjunctival Diseases 2017")	Miyazaki et al., 2020	Summary of the definition, classification, assessment and therapies for allergic conjunctival diseases.
4.	Diagnosis and Management of Allergic Conjunctivitis	Bielory et al., 2020	Review article about classification, testing, evaluating and treating allergic conjunctivitis.
5.	Ocular Itch Associated with Allergic Conjunctivitis: Latest Evidence and Clinical Management	Ackerman et al., 2016	Presents the evolution of ocular allergy treatments. Concentrates on pharmacological treatments.
6.	The Management of Allergic Eye Diseases in Primary Eye Care	Chigbu, 2009	Review article about ocular allergy classification and treatments. Emphasizing pathophysiology.
7.	Management of Ocular Allergy	Leonardi et al.,2019	Systematic review to define mainly pharmacological treatments.
8.	Consensus Document on Allergic Conjunctivitis (DECA)	Sánchez-Hernández et al., 2015	Review by an expert panel to build a criteria to treat allergic conjunctivitis.

TABLE 2. The Selected articles for further data analysis. Table: Mari Suuronen

According to Whittemore et al. (2005) evaluation of different study types can be challenging but calculating their quality by any appraisal tool will improve the reliability of an integrative review (Whittemore et al., 2005). As most of the critical appraisal tools are developed for systematic reviews, SANRA (Scale for the Assessment of Narrative Review Articles) is an adequate tool to appraise narrative reviews that are not as strictly structured as systematic reviews. SANRA scale measures six different aspects of the study on a scale from 0 to 2, 12 being the maximum total score. The scale comes with brief explanations of each aspect to support the assessment. The

creators of the scale did not want to strictly explain the quality of the appraised studies by the result score but clarified that a score of 4 or under means poor quality of the study. (Baethge et al., 2019.)

Although one of the used articles was a systematic review, all the articles were evaluated with the same scale. This clarified the comparison of the articles. The results of the SANRA scale were between 5 and 11 in the chosen articles (table 3). Predictably the articles that followed systematic review methods got the best results although the SANRA method is evaluating the methods more loosely. None of the articles were excluded based on this appraisal.

No.	Article	SANRA Score
1.	A Contemporary Look at Allergic Conjunctivitis	7
2.	An Algorithm for the Management of Allergic Conjunctivitis	7
3.	Japanese Guidelines for Allergic Conjunctival Diseases 2020 (Update of "Japanese Guidelines for Allergic Conjunctival Diseases 2017")	5
4.	Diagnosis and Management of Allergic Conjunctivitis	8
5.	Ocular Itch Associated with Allergic Conjunctivitis: Latest Evidence and Clinical Management	6
6.	The Management of Allergic Eye Diseases in Primary Eye Care	6
7.	Management of Ocular Allergy	11
8.	Consensus Document on Allergic Conjunctivitis (DECA)	11

TABLE 3. Results of the SANRA scale. Table: Mari Suuronen

5.1.2 Data Analysis

The first phase of data analysis is data reduction where the chosen data is organized into subgroups (Whittemore et al., 2005). For this integrative review, the subgroups were defined from the subheadings found in the articles and guidelines based on how often the subheadings appeared. The subgroups that were picked up from the material are presented in table 4.

Headings	In articles	In Guidelines	Subgroup
Pathophysiology	5	0	Background
Classification	6	0	Background
Diagnosis	5	2	Diagnose making
Differential diagnosis	5	2	Diagnose making
Non-pharmacological management	8	1	Management
Pharmacological management	8	1	Management
Referral need	0	2	Follow-up care
Control	1	1	Follow-up care

TABLE 4. Subgrouping based on the quantity of the subheadings of the data. Table: Mari Suuronen

The “classification” in the subgroup “background” classifies different types of ocular allergies, whereas this work concentrates purely on SAC and PAC. Pathophysiology was included in the analysed guidelines only by mentioning the main mediators, mostly IgE. Since the aim of this review was to create the material for assessing and managing SAC and PAC, the subgroup “background” was excluded at this stage. Follow-up care was mentioned less than other subgroups, but these subheadings were found specifically from existing guidelines which makes it relevant to include in the analysis and results.

In the next stage, the data was coded under the subgroups to be displayed and compared. Once coded under the pre-defined subgroups, it was observable which terms appeared the most in the assessing and managing of SAC and PAC (table 5). Conclusions could not be straightforward, since the management is often individual instead of statistics based. Coding did confirm some points of assessment and management to be critical, these were mentioned several times, whereas some aspects were mentioned only once or twice in the whole analysed data.

In addition, the restrictions of Finnish optometrists had to be taken into consideration and recognize which management options need a referral. Since the analysed data is from various countries with different legislation, this information had to be combined by the author.

Subgroup: Diagnose making	Subgroup: Management	Subgroup: Follow-up care
Symptoms: Itching 8, redness: 4, conjunctival edema: 4, lid edema: 2, FBS: 2, tearing/discharge: 8, papillae: 2	*Non-pharmacologic:* moisturizing drops: 7, cold compress: 7, avoidance: 9	*Referral if non-pharma and/or OTC won't help:* 7
Anamnesis: positive family history: 7, other allergic diseases: 7	*Pharmacologic:* mast cell stabilizers: 10, antihistamines: 9, dual action(mast+AH): 8, vasoconstrictors: 6, (steroids: 8), NSAIDs: 7	*Re-visit/control in 2-4weeks:* 3
Differentials: dry eye: 3, GPC: 1, reaction to medications/preservatives: 5, infection: 5, other types of ocular allergy: 3	*Immunotherapy:* 7	
Warning signs: Photophobia: 1, Corneal involvement: 3, Severe FBS: 1, Decrease in VA: 1, unilateral symptoms: 1		
Tests: response to antihistamines: 1, skin test: 5, total serum IgE: 5, in vivo: 2		

TABLE 5. Coding of the data under the subgroups. The number after each term indicates how often this term appeared in analysed data. GPC: giant papillary conjunctivitis, FBS: foreign body sensation, VA: visual acuity, AH: antihistamines, NSAID: nonsteroidal anti-inflammatory drug, OTC: over-the-counter medicine (prescription free). Table: Mari Suuronen

5.2 Synthesis and Presentation of the Analysed Data

These results provide material for Finnish optometrists to assess and manage seasonal and perennial allergic conjunctivitis. As health care personnel, optometrist should always recognize their limitations skilfully but also legally. The results appreciate the current legislation but the level of one's knowledge should be considered individually by every optometrist. Management of special populations such as kids, pregnant, or the elderly may need special considerations and are not included in this work.

5.2.1 Assessment

The main symptom of SAC and PAC is itching. This hallmark symptom usually distinguishes allergy from dry eye where the symptom is prescribed more like a burning sensation. Anamnesis of other allergic diseases in the patient or the family of the patient often confirms the diagnosis. The

prevalence and severity of other allergic symptoms (tearing, redness, conjunctival edema, papillae, or foreign body sensation) define the severity of the disease (table 6).

MILD STAGE	MODERATE STAGE	SEVERE STAGE
No subjective harm from 1-3 symptoms	1-3 symptoms causing irritation	4 or more symptoms causing irritation
No effect on vision	Effects vision	Effects vision
No effect on daily tasks	Effects on daily tasks	Effects on daily tasks
Warning signs in all stages:		
Photophobia, corneal involvement, unilateral symptoms		

TABLE 6. Classification of SAC and PAC symptoms (tearing, redness, conjunctival edema, papillae, or foreign body sensation). Table: modified from Sánchez-Hernández MC et al. (2015). Table and warning signs added by Mari Suuronen.

When assessing the symptoms of suspected SAC or PAC, the evaluation of anterior eye surfaces with a biomicroscope is essential. Lids and possible eczema on the skin can be evaluated with a bare eye. Visual acuity and intraocular pressure (IOP) should be measured in addition. Clinically there are no tests available for Finnish optometrists to test the patient's allergy. Although, if the situation is not acute the patient can try topical antihistamines. As they help, the diagnosis is allergy based.

In the analysed data, the most mentioned differential diagnoses were other types of ocular allergies (VKC and AKC), dry eye, and allergic symptoms from topical medication and/or their preservatives. The anamnesis and clinical observation of the symptoms help differentiate the dry from the allergic eye. In SAC and PAC, the cornea is normally not involved whereas dry eye might cause corneal erosion. The irritation caused by topically administered agents is usually observed only in the lower half of the bulbar conjunctiva and only in the lower palpebral conjunctiva. In case of giant papillae and/or corneal involvement, one should suspect the possibility of VKC or AKC.

In case of symptoms that indicate a different diagnosis, the patient should be guided to seek help from the appropriate direction. Photophobia, pain, unilateral symptoms, and ropy and stringy discharge implicate more severe conditions and the patient needs to be referred to an

ophthalmologist. In Finland, optometrists cannot make referrals independently but should be aware of where to guide the patient and what is the urgency of the needed treatment.

5.2.2 Management

Once the SAC or PAC has been recognized and the severity is assessed, management can be initiated (table 7). The optometrists should educate the patient about the disease and its course. Understanding the situation improves patient compliance and the results of the treatment.

The data analysis confirmed the priority to be the avoidance of the allergen. As this is sometimes impossible (e.g., family pet or mold in the everyday building), non-pharmacological options are the next step. These measures include cold compress and preservative-free lubrication of the eye for alleviating the symptoms. The patient should be advised not to rub their eyes because this mechanically enhances the degranulation of mast cells and worsens the symptoms.

Optometrists cannot prescribe medicine for the patient in Finland, but in the case of SAC and PAC, most of the recommended medications for mild and moderate symptoms are available over the counter, without a prescription. Depending on the optometrist's level of knowledge, they can provide information on the helpful medication and the dosing or simply advise the patient to ask for consultation from the pharmacist. The medications are listed in table 7.

PROPHYLAXIS	MILD STAGE	MODERATE STAGE	SEVERE STAGE
Patient education	Ocular lubricants, cold compresses	Maintain the treatments from previous steps	Topical steroids
Avoidance	Topical mast cell stabilizers	Topical dual-action agent (combination of antihistamine and mast cell stabilizer)	Topical dual-action agent
	Topical antihistamines		

TABLE 7. The proposed management of SAC and PAC. Table modified from Sánchez-Hernández MC et al. (2015). Table and prophylaxis added by Mari Suuronen.

Once the treatment has begun, the patient should be controlled after 2-4 weeks. If symptoms persist, the classification and treatment regimen should be updated to the next stage. It is important to note that if symptoms worsen regardless of the treatment the reconsideration of the diagnosis is necessary. Worsening and severe symptoms should be referred to an ophthalmologist.

When the mild symptoms resolve the treatment can be stopped. After moderate symptoms resolve, it is beneficial to maintain the treatment for a few weeks. All things considered, the focus in the SAC and PAC management by an optometrist is on prophylaxis and patient education. It is critically important for an optometrist to recognize the limitations of personal competence and act accordingly.

6 DISCUSSION

The purpose of this integrative review was to compile the necessary information for assessing and managing seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC). SAC and PAC are IgE-mediated allergic diseases of the eye where SAC is linked to e.g., pollen in specific seasons, and PAC is more chronic, caused by dust, pet dander, or mold. SAC and PAC are usually benign clinically but can seriously affect individuals' quality of life, e.g., while working in the mold affected building.

Patient history and clinical assessment of the symptoms (itching, tearing, redness, edema, and/or papillae) are essential while considering the diagnosis and the severity of the disease. It is also important to be aware of differential diagnoses like dry eye, other types of ocular allergies (VKC and AKC), or allergic reactions by components of topical ocular agents. Important warning signs indicating something more severe are corneal involvement, photophobia, pain and unilateral symptoms.

The first line of management of SAC and PAC is avoidance of the allergen. Patient education on non-pharmacological treatment measures (cold compress and lubricating agents) is also essential. Mild and moderate symptoms can be managed also with topical antihistamines and/ or mast cell stabilizers in addition to non-pharmacological treatments. Finnish optometrists cannot prescribe these medicines but can advise the patient to purchase them from the pharmacy with the help of the pharmacist since the necessary medication at this point is prescription free.

If the ocular allergy symptoms are severe, persist, or worsen despite the treatment, the patient should be referred to an ophthalmologist. Severe or chronic stages of ocular allergies might require topical steroids which are always used under the surveillance of an ophthalmologist.

For this integrative review, 8 articles and 3 guidelines were analysed. Appraisal of the articles was done with the help of SANRA (Scale for the Quality Assessment of Narrative Review Articles) and the chosen articles were graded between 5 to 11 on a scale of 0-12. Grade 4 or under was one of the exclusion criteria. There was no tool to assess guidelines but all the chosen guidelines were published by well-known and reliable publishers and the process of conducting them was opened thoroughly.

Currently, there are no clear directions in the Finnish Current Care Guidelines on how to utilize optometrists in ocular allergy treatment (Seppänen, 2019; The Working Group of The Finnish Medical Society Duodecim and The Association of Finnish Pharmacies, 2016). These often objectively mild but subjectively significant symptoms are often undertreated in health care (Bielory et al., 2020; Dupuis et al., 2020; Leonardi et al., 2019). Lack of patient education might lead to ineffective use of allergy medicines (D. G. I. Chigbu, 2009a).

This integrative review reinforces the authors' knowledge of ocular allergies and hopefully does so for as many colleagues as possible. Better knowledge of SAC and PAC helps the optometrist to treat the symptoms efficiently and the patient gets help in earlier stages and potentially avoids the worsening symptoms and the crowded eye care system.

Although the role of the optometrist is evolving toward a more clinical direction, this review provides information and instructions that any optician or optometrist can implement right away. If future legislation brings more tools to an optometrist, the instructions will be easy to update. In the present situation, the differentiation of allergic eyes from dry eyes is important since the availability of dry eye treatments has increased significantly. In case of misdiagnosis, the treatment of the allergic eye disease might be delayed.

6.1 Reliability and Ethics of the Thesis

The reliability of this integrative review was ensured by following the known method of integrative literature review (Whittemore et al., 2005). Method was chosen with the help of the thesis instructors and their experience was utilized by carefully following their proposals to improve any part of the thesis. The chosen articles were critically appraised and included only if they met the criteria of the chosen scale.

The author has little or no experience in making literature reviews and unfortunately, this might have caused the problems when conducting the literature search from EBSCO Host – resulting in zero articles. However, the results from PubMed were satisfactory and the guidelines included in the data were reliable. Discussions with co-author(s) about the different solutions during the thesis

project would have raised the reliability of this integrative review but this thesis was made alone. The included articles however appeared in several reference lists of peer reviewed articles and other sources which confirms their credibility by pointing out that authors with more experience have approved them as well.

As for the ethicality of the thesis, the instructions of the Oulu University of Applied Sciences (OUAS) were followed. Additionally, the responsible conduct of research guidelines by the Finnish National Board on Research Integrity (TENK) and ethical recommendations for thesis writing at universities of applied sciences, and instructions for the data management plan by Arene were followed. The thesis did not include human participants. (Arene, 2019; Finnish National Board on Research Integrity TENK 2023, 2023; Oulu University of Applied Sciences, 2023.)

7 CONCLUSIONS

Seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC) are common and benign ocular allergies that can significantly affect an individual's quality of life. To efficiently recognize and treat SAC and PAC, material for a guideline for Finnish optometrists was composed within this integrative review. If untreated, SAC and PAC can increase pointless pressure on already crowded Finnish eye health care.

This integrative review analysed 8 articles and 3 existing ocular allergy management guidelines to compose relevant information on assessing and managing SAC and PAC as a Finnish optometrist. Local legislation was considered.

The importance of avoiding the allergen and patient education is emphasized but also non-pharmacological treatments are the main ways to treat SAC and PAC as a Finnish optometrist. Pharmacological, OTC medications are recommended based on optometrists' competence. Differential diagnoses, warning signs, and referral needs should be considered when making treatment decisions.

The results of this integrative review give a good baseline to further develop this into an official peer-reviewed guideline made with formal steps where relevant authorities can make their statements. This integrative review also confirms the relevancy of optometrists in ocular allergy treatment. Optometrists are often a more accessible and economical option compared to doctors and more specific compared to nurses. The lack of slit lamp examination at general doctors or nurses office can lead to delays in diagnosing and treating other eye conditions.

Further research could investigate how to educate the Finnish healthcare personnel to understand the possibilities of the resource and competence of optometrists. In addition, it would be useful for optometrists to have a summary of ocular OTC medication available.

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