



The Analysis Study of Prevalence, Diagnosis and Management of Allergic Conjunctivitis: A Comprehensive Systematic Review

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ABSTRACT

Background: Allergic conjunctivitis (AC) is a common ocular condition that significantly impacts the quality of life of individuals worldwide. This systematic review aims to provide a comprehensive overview of the prevalence, diagnostic approaches, and management strategies for allergic conjunctivitis. **Methods:** The study followed PRISMA 2020 guidelines, reviewing English-language publications from 2014 to 2024. Editorials, duplicate reviews from the same journal, and papers lacking a DOI were excluded. The literature search was conducted using PubMed, SagePub, SpringerLink, and Google Scholar. **Result:** A total of 2,172 articles were initially identified through online databases (PubMed, SagePub, SpringerLink, and Google Scholar). After three rounds of screening, eight relevant studies were selected for full-text analysis. **Conclusion:** Allergic conjunctivitis is common and impacts quality of life. Management includes pharmacologic and non-pharmacologic treatments, with dual-acting antihistamine-mast cell stabilizers being key. Many remain undiagnosed or inadequately treated, highlighting the need for improved awareness, diagnostics, and future research.

Keywords: allergic conjunctivitis, prevalence, diagnosis, management

INTRODUCTION

Allergic conjunctivitis (AC) is a common ocular condition that significantly impacts the quality of life of individuals worldwide. Characterized by inflammation of the conjunctiva due to allergic reactions, AC is triggered by allergens such as pollen, dust mites, mold, and pet dander. The prevalence of this condition has been steadily increasing, with studies showing a growing burden in both developed and developing countries.¹⁻³

Accurate diagnosis of allergic conjunctivitis can be challenging, as its symptoms often overlap with other ocular conditions, such as viral or bacterial conjunctivitis. Typical symptoms include itching, redness, watery discharge, and swelling of the conjunctiva, which can significantly impair daily functioning. While a thorough patient history and clinical examination are essential, diagnostic tests such as conjunctival provocation tests and skin prick tests can provide additional support in confirming the allergic etiology of the condition.⁴⁻⁶

The management of allergic conjunctivitis generally involves the use of pharmacological interventions, aimed at reducing symptoms and preventing future episodes. First-line treatments typically include antihistamines, mast cell stabilizers, and nonsteroidal anti-inflammatory drugs (NSAIDs), while more severe cases may require corticosteroids.^{7,8} However, concerns regarding the long-term use of corticosteroids, particularly in children, have prompted the search for safer and more effective alternatives. Recent advances in immunotherapy, including sublingual and subcutaneous allergy vaccines, have also shown promise in providing long-term relief for patients with recurrent or persistent allergic conjunctivitis.⁹⁻¹¹

Beyond pharmacological treatments, patient education plays a pivotal role in the management of AC. Encouraging allergen avoidance strategies, such as reducing exposure to common triggers, using protective eyewear, and implementing regular cleaning routines, can significantly

improve the quality of life of patients. Additionally, lifestyle modifications, such as managing environmental allergens and optimizing indoor air quality, can further mitigate the frequency and severity of allergic episodes. A multifaceted approach that combines medical treatments with environmental control measures is essential for effective management.¹²⁻¹⁴

Despite the availability of various treatment options, challenges remain in addressing the needs of diverse patient populations. Variability in response to medications, differing levels of healthcare access, and socio-economic factors all contribute to disparities in the management of allergic conjunctivitis. Furthermore, the evolving landscape of environmental allergens due to climate change presents new challenges in managing this condition effectively. As the global prevalence of allergic diseases continues to rise, understanding the multifactorial aspects of AC and developing personalized treatment plans will be key in improving outcomes.^{15,16}

This systematic review aims to provide a comprehensive overview of the prevalence, diagnostic approaches, and management strategies for allergic conjunctivitis.

METHODS

Protocol

The author carefully followed the rules laid out in the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020. This was done to make sure the study met all its standards. The selection of this methodological approach was specifically aimed at ensuring the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic to compare the outcomes of conservative management and chest tube drainage in the treatment of pneumothorax based on literatures of the last 10 years. This study meticulously analyzed data on literatures to provide insights and enhance patient treatment strategies. The primary

objective of this paper is to highlight the collective significance of the identified key points.

Inclusion criteria for this study entail: 1) Papers must be in English, and 2) Papers must have been published between 2014 and 2024. Exclusion criteria comprise: 1) Editorials; 2) Submissions without a DOI; 3) Previously published review articles; and 4) Duplicate entries in journals.

Search Strategy

The keywords used for this research are pneumothorax, chest tube, conservative management. The Boolean MeSH keywords inputted on databases for this research are: *((("pneumothorax"[MeSH Terms] OR "pneumothorax"[All Fields] OR "pneumothoraxes"[All Fields]) AND ("chest tubes"[MeSH Terms] OR ("chest"[All Fields] AND "tubes"[All Fields]) OR "chest tubes"[All Fields] OR ("chest"[All Fields] AND "tube"[All Fields]) OR "chest tube"[All Fields])) OR ("conservative treatment"[MeSH Terms] OR ("conservative"[All Fields] AND "treatment"[All Fields]) OR*

"conservative treatment"[All Fields] OR ("conservative"[All Fields] AND "management"[All Fields]) OR "conservative management"[All Fields])) AND ((y_10[Filter]) AND (clinicaltrial[Filter]))).

Data retrieval

The authors assessed the studies by reviewing their abstracts and titles to determine their eligibility, selecting relevant ones based on their adherence to the inclusion criteria, which aligned with the article's objectives. A consistent trend observed across multiple studies led to a conclusive result. The chosen submissions had to meet the eligibility criteria of being in English and a full-text.

This systematic review exclusively incorporated literature that met all predefined inclusion criteria and directly pertained to the investigated topic. Studies failing to meet these criteria were systematically excluded, and their findings were not considered. Subsequent analysis examined various details uncovered during the research process, including titles,

authors, publication dates, locations, study methodologies, and parameters.

Quality Assessment and Data Synthesis

Each author independently evaluated the research presented in the title and abstract of the publication

to determine which ones merited further exploration. The subsequent stage involved assessing all articles that met the predefined criteria for inclusion in the review. Decisions on including articles in the review were based on the findings uncovered during this evaluation process.

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	((("conjunctivitis, allergic"[MeSH Terms] OR ("conjunctivitis"[All Fields] AND "allergic"[All Fields]) OR "allergic conjunctivitis"[All Fields] OR ("allergic"[All Fields] AND "conjunctivitis"[All Fields])) AND ("epidemiology"[MeSH Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms] OR "prevalance s"[All Fields] OR "prevalences"[All Fields] OR "prevalent"[All Fields] OR "prevalently"[All Fields] OR "prevalents"[All Fields])) OR ("diagnosable"[All Fields] OR "diagnosi"[All Fields] OR "diagnosis"[MeSH Terms] OR "diagnosis"[All Fields] OR "diagnose"[All Fields] OR "diagnosed"[All Fields] OR "diagnoses"[All Fields] OR "diagnosing"[All Fields] OR "diagnosis"[MeSH Subheading]) OR ("manage"[All Fields] OR "managed"[All Fields] OR "management s"[All Fields] OR "managements"[All Fields] OR "manager"[All Fields] OR "managers s"[All Fields] OR "managers"[All Fields] OR "manages"[All Fields] OR "managing"[All Fields] OR "managment"[All Fields] OR "organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields])	466
Springer Link	((allergic conjunctivitis) AND (prevalence)) OR (diagnosis)) OR (management)	402
Sagepub	((allergic conjunctivitis) AND (prevalence)) OR (diagnosis)) OR (management)	500
Google Scholar	((allergic conjunctivitis) AND (prevalence)) OR (diagnosis)) OR (management)	804

Table 2. JBI *Critical appraisal of Study*

Parameters	Leonardi (2015)	Blaiss (2014)	Leonardi (2014)	Kumah (2015)	Bilkhu (2014)	Carr (2016)	Hara (2014)	Michailopoulos (2017)
1. Bias related to temporal precedence Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation Was there a control group?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Bias related to confounding factors Were participants included in any comparisons similar?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Bias related to administration of intervention/exposure Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	No.	No.	No.	No.	No.	No.	No.	No.
5. Bias related to assessment, detection, and measurement of the outcome Were there multiple measurements of the outcome, both pre and post the intervention/exposure? Were the outcomes of participants included in any comparisons measured in the same way? Were outcomes measured in a reliable way?	Yes No. Yes	Yes No. Yes	Yes No. Yes	Yes No. Yes	Yes No. Yes	Yes No. Yes	Yes No. Yes	Yes No. Yes

6. Bias related to participant retention

Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?

Yes Yes Yes Yes Yes Yes Yes Yes

7. Statistical conclusion validity

Was appropriate statistical analysis used?

Yes Yes Yes Yes Yes Yes Yes Yes



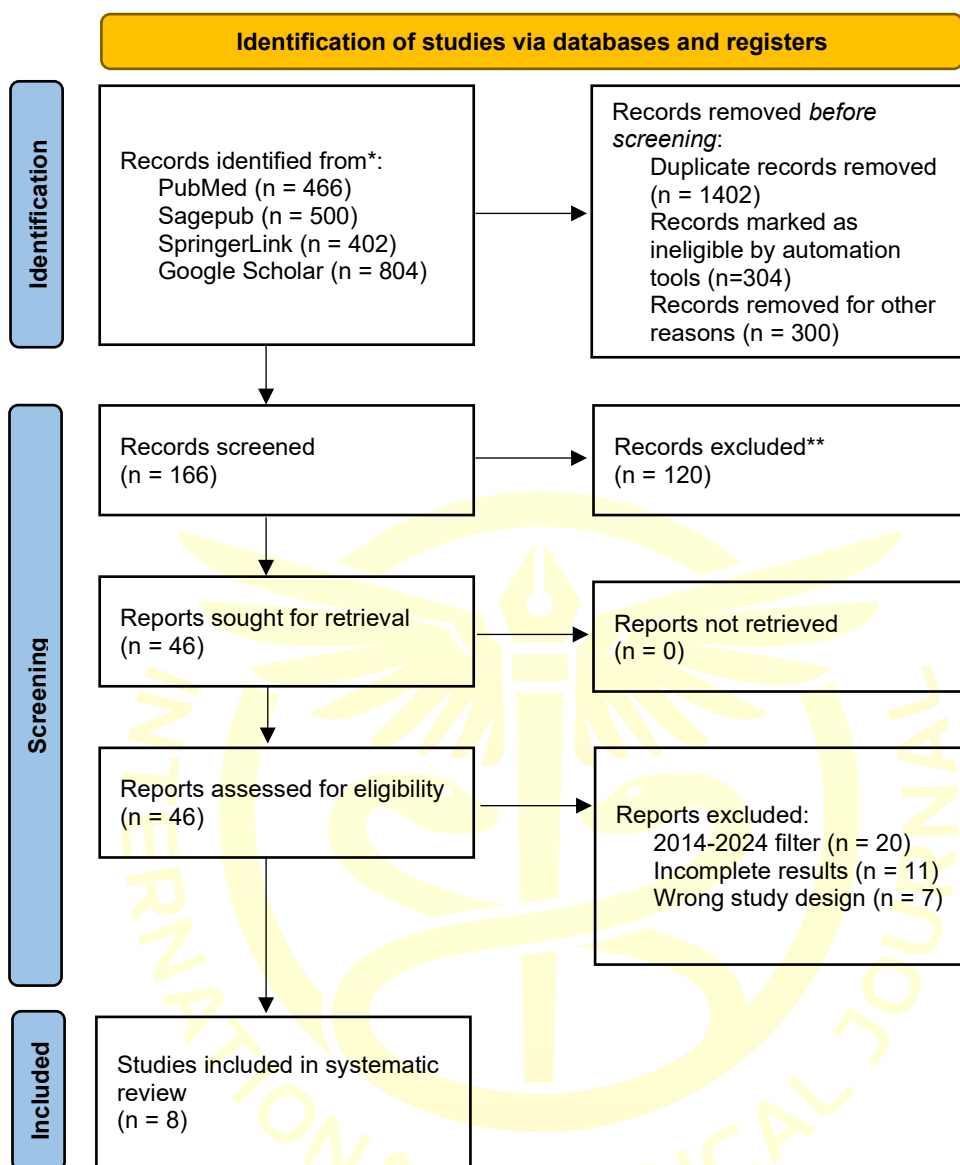


Figure 1. Article search flowchart

RESULT

The initial number of articles retrieved from online databases (PubMed, SagePub, SpringerLink, and Google Scholar) is 2,172 articles. After conducting three levels of screening, eight articles that directly relate to the current systematic review have been chosen for further assessment through full-text reading and analysis. Table 3 presents the selected literature included in this analysis.

Table 3. The literature included in this study

No.	Author	Origin	Method	Sample	Result
1.	Leonardi, et al. ¹⁷ (2015)	Italy	Cross sectional	3545 patients	The study included patients with a mean age of 38 ± 19 years. Seasonal allergic conjunctivitis was most common (55%), with perennial (18%) and vernal keratoconjunctivitis (9%) less frequent. Common symptoms were itching (90%) and redness (85%), and pollen was the main trigger, though pollutants and cigarette smoke were also noted. Only 35% of patients were tested for allergic sensitization, with 82% testing positive. Treatments included decongestants (43%), corticosteroids (41%), antihistamines (29%), and mast cell stabilizers (15%).
2.	Blaiss, et al. ¹⁸ (2014)	USA	Retrospective cohort	2765 participants	Most adult respondents had allergic conjunctivitis diagnosed by family practitioners (46%), while children were typically diagnosed by pediatricians (41%). Allergy testing was more common among

					patients diagnosed by allergists/immunologists (94.9%) and otolaryngologists (62.7%) than by family practitioners (61.3%) or pediatricians (64.9%). Most patients (75.8%) used over-the-counter medications, with 53.5% on prescription drugs. Allergen immunotherapy was mainly provided by allergists/immunologists (33% adults, 28% children) and otolaryngologists (25% adults, 24% children).
3.	Leonardi, et al. ¹⁹ (2014)	Italy	Prospective cohort	78 patients	The study identified 78 proteins in tear samples from patients with vernal keratoconjunctivitis (VKC). Serum albumin, transferrin, and hemopexin levels were up to 100 times higher in VKC samples than in controls, with these levels correlating to disease severity. Hemopexin, transferrin, mammaglobin B, and secretoglobulin 1D were significantly over-expressed in VKC samples. Patients treated with topical cyclosporine or corticosteroids showed a dramatic reduction in these protein levels.
4.	Kumah, et al. ¹² (2015)	Ghana	Cross sectional	1571 participants	In a cross-sectional community-based study of 1571 students from 11 basic schools, the prevalence of allergic

					conjunctivitis (AC) was found to be 39.9%. The mean age of participants was 8 ± 0.65 years. AC was significantly associated with gender ($p < 0.05$), but not age ($p > 0.05$). Notably, 70% of students with AC had never received any treatment.
5.	Bilkhu, et al. ²⁰ (2014)	UK	RCT	18 subjects	The study found that nonpharmaceutical treatments, such as cold compress (CC) and artificial tears (AT), were more effective than no treatment in reducing bulbar conjunctival hyperemia, ocular symptoms, and returning temperature to baseline ($P < 0.05$). The combination of artificial tears and cold compress reduced hyperemia more than other treatments ($P < 0.05$). The effect of eye antihistamine (EH) was enhanced when combined with CC ($P < 0.001$), and cold compress combined with either ATs or EH reduced ocular surface temperature to below baseline. EH combined with CC provided the most significant symptom reduction ($P < 0.014$).
6.	Carr, et al. ²¹ (2016)	USA	Retrospective study	100 patients	Topical pharmacologic treatments are commonly used to manage allergic conjunctivitis (AC), but most require multiple daily

					applications. Dual-acting antihistamine-mast cell stabilizers are considered first-line treatments due to their ability to provide immediate relief and block persistent inflammation. A newly developed, higher-concentration formulation of this treatment has shown a 24-hour duration of action with once-daily dosing.
7.	Hara, et al. ²² (2014)	Japan	Retrospective cohort	13 patients	After controlled antigen challenge (CAC), the temperature increased more in the artificial tear-treated eyes ($0.67 \pm 0.10^{\circ}\text{C}$) compared to the levocabastine-treated eyes ($0.21 \pm 0.06^{\circ}\text{C}$) ($p < 0.05$). Conjunctival injection and chemosis scores were higher in the artificial tear group (1.38 ± 0.24 and 0.85 ± 0.25 , respectively) than in the levocabastine group (0.62 ± 0.27 and 0.08 ± 0.08 , respectively) ($p < 0.01$). A significant correlation was found between the temperature increase and conjunctival injection scores ($r = 0.63$; $p < 0.001$).
8.	Michailopoulos, et al. ²³ (2017)	Greece	Retrospective study	1242 patients	Allergic conjunctivitis was found in 40% (497 out of 1242) of patients with allergy symptoms. It was slightly more common in women, while rhinitis was more common in men. Patients with both conjunctivitis and rhinitis

					were more likely to undergo skin prick tests (SPTs) and had a higher rate of positive results. The presence of multiple comorbidities increased the likelihood of an IgE-mediated allergy compared to having each condition alone.
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Leonardi, et al.¹⁷ (2015) provided valuable epidemiological insights into the clinical features and treatment options for various forms of ocular allergy

Blaiss, et al.¹⁸ (2014) showed that most patients relied on nonprescription treatments and general practitioners, who seldom performed allergy testing. Allergy specialists were more likely to use testing and offer immunotherapy.

Leonardi, et al.¹⁹ (2014) concluded that LC MALDI MS and isobaric tag techniques can effectively characterize tear proteins, potentially aiding in the diagnosis and management of VKC and other inflammatory ocular surface conditions.

Kumah, et al.¹² (2015) showed that AC is an endemic condition in basic schools in Kumasi, requiring

proactive measures to reduce its impact. Public health interventions may be necessary to address the burden of this condition.

Bilkhu, et al.²⁰ (2014) found that cold compress and artificial tears effectively treated allergic conjunctivitis symptoms after exposure to grass pollen. The combination of CC with ATs or EH was the most effective, with CC enhancing the effect of EH and reducing symptoms to baseline within an hour of antigenic challenge

Carr, et al.²¹ (2016) showed that dual-acting medications are highly effective and well-tolerated for chronic use. The new once-daily formulation may be the preferred treatment for patients with seasonal or perennial AC.

Hara, et al.²² (2014) showed the correlation between conjunctival

surface temperature and the severity of allergic conjunctivitis suggests that temperature measurements using optical surface thermography (OST) can objectively evaluate the efficacy of topical anti-allergic treatments.

Michailopoulos, et al.²³ (2017) showed that allergic conjunctivitis can occur alone or alongside asthma and/or rhinitis, with the coexistence of these conditions being the strongest indicator of IgE-mediated allergies.

DISCUSSION

Allergic conjunctivitis (AC) remains a significant public health concern, as it affects a large proportion of the population worldwide. Studies, including those conducted by Leonardi et al. (2015), Blaiss et al. (2014), and Michailopoulos et al. (2017), have provided valuable insights into the prevalence, diagnosis, and management of this condition. In particular, the research consistently highlights the high prevalence of AC, with rates varying depending on geographical location, age, and the

presence of comorbidities such as rhinitis and asthma.^{17,18,23}

Leonardi et al. (2015) found that seasonal allergic conjunctivitis (SAC) was the most prevalent form, accounting for 55% of cases, followed by perennial allergic conjunctivitis (PAC) and vernal keratoconjunctivitis (VKC).^{17,24} The prevalence of AC also varies by age and gender, with children being more frequently affected, especially in regions like Kumah et al. (2015) found in Ghana, where 39.9% of students from basic schools were diagnosed with AC. The study also highlighted the lack of treatment in a large proportion (70%) of affected students, emphasizing the need for public health interventions and educational programs to raise awareness and promote early intervention in childhood cases.¹²

Comorbidities such as rhinitis, asthma, and eczema are commonly associated with AC, and the presence of multiple conditions increases the likelihood of IgE-mediated allergies, as observed by Michailopoulos et al. (2017). This comorbidity association further complicates diagnosis and

treatment, as patients with multiple allergic conditions may require a more integrated, multidisciplinary approach to care. The interplay between AC and other allergic conditions reinforces the need for comprehensive allergy testing and the use of treatments that address multiple allergic pathways simultaneously.²³

In terms of diagnosis, AC is often underdiagnosed or mismanaged, particularly by general practitioners, who rely heavily on symptomatology and may not conduct comprehensive allergy testing. Blaiss et al. (2014) revealed that a significant proportion of patients diagnosed by family practitioners or pediatricians did not undergo allergy testing. In contrast, specialists such as allergists and otolaryngologists performed allergy tests more frequently, with 94.9% of patients under allergist care receiving testing. This disparity underscores the importance of specialized care for proper diagnosis and management, especially considering the role of IgE-mediated allergic responses in the pathophysiology of AC.^{18,25}

The management of AC involves a combination of pharmacologic and non-pharmacologic treatments. Non-pharmacologic approaches, such as the use of cold compresses and artificial tears (AT), have been shown to provide significant relief. Bilkhu et al. (2014) demonstrated that cold compresses combined with ATs effectively reduced bulbar conjunctival hyperemia and ocular symptoms, returning temperature to baseline faster than no treatment. Additionally, cold compresses were found to enhance the effect of antihistamine eye drops, indicating that these simple interventions can offer quick symptomatic relief.^{20,26}

Pharmacologically, dual-acting antihistamine-mast cell stabilizers are considered first-line treatments for AC. These agents provide rapid relief of symptoms by blocking histamine receptors and stabilizing mast cells, thus preventing further allergic responses. Carr et al. (2016) reported that a newly developed, higher-concentration formulation of these medications offers a 24-hour duration of action

with once-daily dosing, making it a convenient and effective treatment option for patients with both seasonal and perennial forms of AC. This represents a significant advancement in the management of AC, as traditional medications often require multiple daily applications.²¹

For patients with more severe or persistent symptoms, corticosteroids and mast cell stabilizers are often used. Leonardi et al. (2015) observed that corticosteroids were used in 41% of patients, highlighting their role in managing chronic or more severe cases of AC. However, these treatments are typically reserved for short-term use due to potential side effects such as increased intraocular pressure and cataract formation with prolonged use.^{19,27}

In addition to pharmacologic treatments, allergen immunotherapy (AIT) remains a key strategy for long-term management. This approach aims to desensitize patients to the allergens responsible for triggering AC. Blaiss et al. (2014) found that allergists and otolaryngologists were the primary providers of AIT, with

33% of adults and 28% of children under allergist care receiving this treatment. AIT is particularly beneficial for patients with persistent symptoms who do not respond adequately to other treatments.¹⁸

The role of biomarkers in diagnosing and managing AC is an area of ongoing research. Leonardi et al. (2014) used advanced techniques such as LC MALDI MS and isobaric tag for relative and absolute quantitation (iTRAQ) to identify proteins in tear samples from patients with vernal keratoconjunctivitis (VKC). This study found that elevated levels of serum albumin, transferrin, and hemopexin were associated with disease severity, suggesting that these proteins could serve as potential biomarkers for VKC and other forms of AC. This kind of biomarker-based approach may help clinicians better understand the underlying mechanisms of AC and tailor treatment strategies more effectively.¹⁹

CONCLUSION

Allergic conjunctivitis is common and impacts quality of life.

Management includes pharmacologic and non-pharmacologic treatments, with dual-acting antihistamine-mast cell stabilizers being key. Many remain undiagnosed or inadequately treated, highlighting the need for improved awareness, diagnostics, and future research.

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