INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA):IJPS00]
Journal Homepage: https://www.ijpsjournal.com

Review Article

A Review On Trachoma: Etiology, Epidemiology, Pathophysiology, Differential Diagnosis, Clinical Management And Treatment Modalities

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ARTICLE INFO

Received: 29 Aug 2024
Accepted: 31 Aug 2024
Published: 05 Sep 2024
Keywords:
Etiology, Epidermiology, Pathophysiology, Modalities
DOI:
10.5281/zenodo.13694465

ABSTRACT

The Chlamydia trachomatis bacteria is the main cause of trachoma, a crippling eye illness that ranks among the world's most common causes of blindness. The conjunctiva is the primary site of infection for trachoma, which causes erosion of the corneal surface as well as inflammation, roughening, and scarring of the inner surface of the eyelids. Numerous methods, such as direct touch, hand-eye contact, contact with infected items (fomites), and eye-seeking insects, can spread the infection. Preventive screening programs and early diagnosis are very crucial. Ocular problems can lead to blindness if the illness is not managed. To reduce and eventually eradicate trachoma, several global efforts have been launched, particularly in developing nations. These include screening programs and teaching campaigns on cleanliness. Adequate patient evaluation, surgical remedies for ocular problems, and empirical and preventative antibiotic therapy are essential interventions for patients who are considered to be at-risk. In addition, a number of tactics like maintaining clean facial hair, sanitising the surroundings, providing clean drinking water, and control of flies, small insects plays a very critical role to prevent this severe and widespread eye illness and these can improve patient outcomes. This activity goes over the features of trachoma in detail and outlines the methods for diagnosis, treatment, and follow-up. In addition to emphasising the critical role of the interprofessional healthcare team, this exercise gives them the skills and resources they need to improve patient care and maximise results for this common ailment.

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

INTRODUCTION

A neglected tropical illness that can lead to blindness, trachoma is brought on by infection with conjunctival strains of Chlamydia trachomatis [1, 2]. This bacterial infection mostly affects the conjunctiva; if left untreated, it can cause erosion of the corneal surface and recurring cycles of inflammation, roughening, and scarring of the inner surface of the eyelids. Many times, these ocular issues lead to irreversible blindness. The World Health Organisation (WHO) has identified twenty diseases and disease clusters as neglected tropical diseases, among them trachoma, which is thought to be the most common infection in developing nations that results in vision impairment [3]. In North America and Europe, trachoma has dramatically decreased as living standards have improved [4]. Intentional management practices throughout the past few decades have been linked to notable reductions in the disease's global burden [5]. However, trachoma still occurs frequently in some cultures even after extensive and protracted therapies.

Stages of Trachoma

There are two separate phases of trachoma infection, and each has its own set of symptoms and complicative problems.

First-phase symptoms:

These symptoms include chronic keratoconjunctivitis, sometimes referred to as active trachoma, which is characterised by conjunctival inflammation [6]. Recurrent infections with conjunctival strains of C. trachomatis are the cause of this inflammation.

Second-phase symptoms:

There are the episodes of severe conjunctival inflammation that precede the illness's second stage and leave scars on the eyelids. Trichiasis is a condition where scarring causes the eyelashes to twist inward and come into contact with the eyeball [7]. Furthermore, trichiasis may coexist with a disease known as entropion, in which part or all of the eyelid edge folds inward [8]. Scratching the cornea with inverted eyelashes increases the risk of corneal opacity and vision issues, which in severe chronic cases can result in blindness [9]. Any of these pathological conditions or Chlamydia trachomatis induced clinical symptoms indicates the existence of trachoma. Furthermore, in order to put preventative measures in place, it is imperative to comprehend how trachoma is spread. The primary way that trachoma spreads is by direct or indirect contact with secretions from infected people's eyes and nostrils. Furthermore, direct touch, hand-eye contact, contact with infected items like fomites, and eye-seeking insects all can result in transmission. Trachoma is transmitted by a number of causes, such as crowed living quarters, inadequate cleanliness, and improper medical care due to lack of knowledge. In addition, environment and socioeconomic status also have a big impact on the disease transmission. These elements are sometimes referred to as the "3 F's" [10].

Face-to-face contact:

Trachoma disease spreads rapidly when people are in close proximity to one another. This frequently occurs when one person kiss, hug, or share personal items like towels and washcloths with the person who is infected [11]. In these kinds of contacts, the pathogens can be easily transferred from one person to another through the interchange of contaminated ocular and nasal secretions.

Flies:

Flies play a major role in the transmission of trachoma, especially species like Musca sorbens [12]. These flies serve as mechanical vectors by carrying the germs on their bodies and are drawn to the secretions from people's eyes and nostrils. In this way they spread the sickness from one individual to another. This form of transmission is

particularly common in unhygienic environments where flies are high in number.

Fomites:

Chlamydia trachomatis also disseminated via fomites, which include infected inanimate items or surfaces [13]. People who are infected can spread the bacteria to the objects like towels, linens or common used items such as utensils. People who touch their face or eyes after coming into contact with these infected items can be high risk of this infection.

Etiology

The Chlamydia trachomatis bacteria, which causes trachoma, spreads from infected to uninfected people through a variety of channels, including hand-to-eye contact, direct eye-to-eye contact, indirect transmission through contaminated objects (fomites), and transmission made easier by eye-seeking flies [14]. The prevalence of trachoma is attributed to a number of causes, such as cramped living conditions, inadequate hygiene practices, and limited access to hygienic facilities and clean water [15]. The infection cycle is prolonged by these circumstances, which foster the development and survival of Chlamydia trachomatis bacteria in communities. Determining the underlying causes of trachoma is essential to creating focused interventions to halt the disease's progression, treat persistent infections, and lessen its long-term effects. Chlamydia trachomatis can cause ocular infections such as trachoma and infections transmitted through sexual activity in humans [16]. The conjunctiva is predominantly affected by trachoma. A major factor in the development of trachoma is the interplay between the host's immune system and the bacterial life cycle. Chlamydia trachomatis enters the eye and proceeds through a biphasic developmental cycle, penetrating the conjunctival epithelial cells to begin the infection. Elementary bodies are the infectious form of the bacterium which attach themselves to the host cell and create penetration [17]. Subsequently, once inside, they differentiate into reticulate bodies, which proliferate in the cytoplasm of the host cell [18]. The localised inflammatory response is triggered by the replication of reticulate bodies; and this leads to the characteristic clinical indications of trachoma infection, which include conjunctival irritation, follicular enlargement and ultimately scarring of the eyelids [19]. Immunological response is the infection triggers which have a major impact on the pathogenesis and regulation of trachoma. Even while a strong immune system can help the infection prevention, recurrent or persistent infections can cause chronic inflammation and scarring, which can result in long-term complicative problems including trichiasis and blindness [20].

Epidemiology

Trachoma is the third most common cause of blindness in the world, following glaucoma and cataracts [21]. Trachoma is thought to have caused around 8 million people to go blind or severe visual impairment [22]. Africa, several Middle Eastern countries, the Indian subcontinent, Southeast Asia and South America have the greatest rates of this illness [23]. According to a June 2021 research, approximately 137 million people were at risk of trachoma, putting up to 2 million people globally at danger of blindness [24]. According to epidemiological studies carried out in 2023, around 116 million people worldwide lived in locations that required preventive interventions for the prevention and elimination of trachoma. Furthermore, only 18 out of the known 62 trachoma-endemic countries had succeeded in eradicating the disease as a public health concern [25, 26]. Specific public health initiatives have greatly decreased the incidence of trachoma, a condition that was once common over most of the world. It is still a problem in low and middle-income countries where access to healthcare and sanitary supplies are limited. The epidemiology of

trachoma is influenced by a number of variables, such as socioeconomic status, geographical location, and cultural traditions. Active trachoma prevention programs are still needed in many African nations [27]. On the other hand, rather than particular initiatives, North America and Europe have seen a considerable decline in the frequency of disease. This is mostly happen because of general improvements in living conditions [14]. There is still hope since trachoma prevention and treatment initiatives are being implemented in endemic areas with the objective of eliminating the illness by 2030 [28]. Women and children are disproportionately affected by trachoma [29]. This gender gap is caused by the fact that women are more likely exposed than males to tainted water and unhygienic environments, frequently as a result of their involvement in childcare and domestic tasks [30]. According to few studies, women have odds ratios that are 1.8 - 4 times greater than those of men [31]. Another important factor impacting the prevalence of trachoma is age, with children 10 years of age and younger having the highest burden. Young children are more vulnerable to trachoma because of their poor capacity to maintain basic hygiene and their close contact with sick persons. The frequency of active trachoma usually peaks within this age range and then begins to decline in adolescence and maturity [32]. Conversely, individuals who experience untreated childhood infections are at risk of long-term complications such as blindness and trichiasis. Preventing this widespread and severe ocular disease and improving patient outcomes require the implementation of targeted interventions, such as encouraging facial cleanliness, enhancing hygiene and sanitation, ensuring access to purified drinking water, administering antibiotic treatment and controlling fly, small insects populations in the endemic areas.

Pathophysiology

Conjunctival scarring is a pathophysiological feature of trachoma that arises from repeated cycles of inflammation and tissue healing [33]. Fibrosis and contraction of the conjunctival tissue are caused by the deposition of extracellular matrix proteins including collagen and fibronectin during the scarring process [33]. Treatment for this fibrotic scarring is necessary to prevent consequences like eyelid entropion (turning inward of the eyelid) and trichiasis (misalignment of the lashes), which can lead to corneal abrasions, ulcerations, and blindness [34]. The pathogenesis of trachoma involves complex interactions between host factors, inflammatory responses, tissue remodelling and bacterial infection [35]. Adult inclusion conjunctivitis is usually related with serovars D to K of the C trachomatis bacterium, whereas trachoma is mostly connected to infections by serovars A, B, Ba, and C. There have also been other species from the Chlamydiaceae family that have been linked, including C pneumoniae and Chlamydophila psittaci. The first 'active' inflammatory stage of trachoma infection is more common in pre-school aged children. Papillary hypertrophy indicates more severe cases of trachomatous conjunctivitis, which might be moderate in this stage and simply result in follicular or papillary conjunctivitis. Intermittent chlamydial antigens induce a persistent immunological response in the recurrent infection. Cell-mediated delayed hypersensitivity (type 4) response is the outward manifestation of this reaction. These antigens cause permanent damage like scarring. The majority of the scarring in this chronic "cicatricial" stage is mostly on the upper tarsal plate and it usually manifests in middle age. Trichiasis eventually results from the in-turning of the lid brought on by the contraction of this scar tissue. In individuals with trachoma, entropion is the most frequent cause of trichiasis. On the other hand, metaplastic or abnormal lashes can also occasionally cause trichiasis. These

problems may ultimately lead to blinding corneal opacification. In the pathophysiology of trachoma, the host's immune system and the obligatory intracellular bacteria C trachomatis interact intimately, resulting in tissue death, conjunctival scarring, and increased inflammation [36]. The conjunctival epithelial cells are the site of attachment and invasion for the C trachomatis elementary bodies in the early stages of infection. These elementary bodies become reticulate bodies after they enter the host cell, where they proliferate in the cytoplasm of the infected cells [18, 37]. An inflammatory reaction is triggered by the influx of immune cells, including neutrophils, macrophages, and lymphocytes, into the conjunctival tissue as a result of this intracellular proliferation. Proinflammatory cytokines and chemokines are released into the bloodstream as a result of the C trachomatis infection, intensifying the immune response and causing tissue damage. Follicles are formed on the conjunctival surface as a result of persistent inflammation. Follicles are the collections of plasma cells, lymphocytes, and epithelial cells. These follicles can potentially progress into papillary hypertrophy, characterized by the enlargement and hyperplasia of the conjunctival papillae [38]. Understanding these mechanisms is essential to stop the disease's development and lower the number of trachoma-related blind cases.

Histopathology

Children infected with C trachomatis frequently have active trachoma. A hyperplastic conjunctival epithelium and extensive inflammatory infiltrates with B and T lymphocytes, neutrophils, macrophages, and plasma cells are classic findings [39]. Collagen types 1, 3, and 4 are generally increasing, and new type 5 fibres are being deposited, according to staining for collagen subtypes [40]. On the other hand, goblet cells are absent and the conjunctival epithelium is atrophic in people who have scarring [41]. The loose sub-epithelial stroma; which is replaced by a thick scar made of type 5 collagen that firmly adheres to the tarsal plate and causes deformation. In these circumstances, conjunctival irritation is frequently seen. When trachoma is active and there is trachomatous scarring, the normal conjunctiva has changes in histology and immunity [38]. Goblet cells, responsible for mucin secretion, are dispersed throughout the non-keratinized, stratified epithelium, which typically consists of 3 to 5 cell layers in a normal conjunctiva. The tear film covers this epithelium. Blood vessels and lymphoid cells are examples of connective tissue elements that are found deeper inside the lamina propria. The presence of telangiectasia in capillaries and tiny venules, together with a mixed inflammatory cell infiltrate, are indicative of C trachomatis-induced inflammation. B cells make up the majority of the bulk and the centre of lymphoid follicles within the lamina propria. T lymphocytes, macrophages, and extra B cells are also present in these follicles [42]. Large lymphoid follicles cause distortion of the overlying epithelium in the everted tarsal conjunctivae. In the scarred conjunctiva, there is a reduction in goblet cells, which causes the tear film's volume and composition to change. The scar in the lamina propria shows signs of being more disorganisation. The extracellular matrix and tarsal plate may also be impacted by scars. As trachoma progresses, persistent inflammation causes papillary hypertrophy, which is typified by larger and hyperplastic conjunctival papillae [43]. These papillae are covered in a layer of squamous epithelium and have an elevated concentration of inflammatory cells, including lymphocytes and plasma cells. In extreme instances, the conjunctiva may show significant collagen deposition, fibrosis, scarring, and disruption of the normal tissue structure [44]. One of the unique histological characteristics of trachoma is follicular conjunctivitis, which is characterised by the

creation of follicles within the conjunctival tissue [45]. These follicles typically have a core germinal centre surrounded by an epithelial and lymphocyte mantle. When trachomatous follicles are examined histologically, germinal centres, lymphocytic infiltration and hypertrophy of the surrounding epithelium are frequently seen. Additionally, structural abnormalities such as conjunctival scarring, fibrosis, metaplastic modifications, and inflammatory changes may be revealed by histological examination of trachoma-affected tissues. Goblet cells may disappear and the epithelium barrier may burst as a result of conjunctival scarring, which is characterised by the replacement of normal tissue architecture with fibrous tissue. Complications from fibrotic changes might include entropion, trichiasis, and other abnormalities of the eyelids [46]. Overall, trachoma-affected tissues' histopathological analysis offers important insights into the fundamental processes of the disease's evolution as well as the structural alterations linked to long-term inflammation and scarring. In order to stop more tissue damage and maintain eyesight in those who are infected, this microscopic study aids in clinical management and therapeutic measures.

Clinical Presentation

History –

Trachoma patients usually exhibit the symptoms of redness, itching, and irritation in the eyes and eyelids, as well as discharge from the eyes, swelling of the eyelids, discomfort in the eyes, and photophobia (sensitivity to light). It is vital to evaluate how long these symptoms have persisted. Healthcare providers should ask about possible risk factors for trachoma as well as symptoms that may signal the condition, at the time of collecting a patient's medical history. Particularly a history of the visiting endemic areas like India and North Africa should be gathered. In addition, concurrent urethritis, cervicitis, and vaginitis should be checked out if the patient engages in sexual activity.

Physical Examination –

The identification of trachoma symptoms in the eyes and adjacent tissues should be the primary focus of healthcare practitioners [19]. Below is a list of the assessment's key components [47].

1. **Evaluation of conjunctival follicles –**

On the surface of the conjunctiva, trachoma frequently appears as small, elevated nodules that resemble follicles. These follicles might be widely dispersed or grouped in the eye's inferior fornix.

2. **Examination of the conjunctiva and eyelids**

Inflammatory conjunctivitis can cause redness, swelling and discharge; healthcare professionals should look for these signs. It is also important for them to look for indications of trichiasis, or inward bending of the eyelid, which can lead to corneal abrasions and entropion.

3. **Visual acuity assessment –**

To detect any visual impairment, medical professionals should utilise common testing instruments like the Snellen chart or visual acuity cards.

4. **Assessment of conjunctival scarring**

Conjunctival scarring, which is typified by fibrotic bands and loss of normal tissue shape, can result from prolonged inflammation in trachoma patients.

5. **Analysis of corneal integrity –**

Examining the cornea for indications of opacities, abrasions, or ulcerations is important for clinicians. These symptoms may be the consequence of corneal exposure from anomalies in the eyelids or chronic irritation from trichiasis.

6. **Evaluation of local lymph nodes and preauricular lymph nodes –**

Any enlargements suggestive of lymphadenopathy associated to chlamydial infection can be felt using a palpator. In order to diagnose trachoma, a thorough medical history

and physical examination are essential. Determining unique symptoms and risk factors for the condition helps guide the right diagnostic procedures and treatment plans to avoid problems and maintain visual integrity in those who are impacted.

Active trachoma –

This often appears as papillary or mixed follicular conjunctivitis and is accompanied by a mucopurulent discharge. It is typical to observe superior epithelial keratitis in cases of active trachoma. Pannus may form as a result of corneal vascularization [48, 49].

Cicatricial trachoma –

In more advanced stages, this usually manifests as large confluent scars (sometimes called an Arlt line) or stellate or linear conjunctival scars. The upper tarsal plate is where the effects are most noticeable, even if the entire conjunctiva is affected. A row of small depressions known as Herbert pits [50] may occur in the superior limbus when follicles in this area resolve. Additional symptoms that are frequently present with severe corneal opacification include trichiasis, distichiasis, entropion and corneal vascularization. Dry eyes finally result from the breakdown of goblet cells and the lacrimal gland's ductules [10, 51].

Assessment Procedure

Patient's medical history and any clinical symptoms found during a slit-lamp examination are the main factors used to diagnose trachoma. While a number of diagnostic procedures have been established to identify the organism, there is still no widely accepted gold standard method [52, 53]. The tests that are currently in use are mentioned below.

Laboratory Examinations –

1. Conjunctival cell smears stained with Giemsa to show the chlamydial inclusion body.
2. Microscopic cell culture
3. Microbiological testing – The polymerase chain reaction and nucleic acid amplification assays, which are the two major molecular methods used to confirm an active C trachomatis infection in laboratory settings, are frequently utilised in this testing approach. The presence of C trachomatis DNA is detected by taking scrapings or swabs from infected persons' conjunctiva. Despite their value in research, these techniques are too costly and complicated for everyday clinical application.
4. Serological testing - This testing technique uses immunofluorescence assays or enzyme-linked immunosorbent assays (ELISAs) to find antibodies against C trachomatis in serum samples. However, rather than being used for clinical diagnosis, serological testing is mostly employed in epidemiological research.

Clinical Evaluation -

a. Trachoma severity grading –

The World Health Organisation has developed a simplified grading system to classify the severity of trachoma that is based on clinical signs seen during the inspection. There are five categories in this system: trachomatous scarring (TS), trachomatous inflammation intense (TI), trachomatous inflammation follicular (TF), corneal opacity (CO), and trachomatous trichiasis (TT) [54].

b. Trichiasis assessment –

This assessment includes a direct flashlight examination, which is often used to detect ingrown eyelashes that are in contact with the cornea. This examination aids in determining the degree of trichiasis or misalignment of the eyelashes. The position and quantity of trichiatic eyelashes are noted during this examination to help with surgical planning [47].

Radiography and Imaging Techniques –

i. Radiographic imaging –

When there is corneal opacity or scarring, radiographic imaging methods like optical coherence tomography or ultrasonography can be

used to evaluate structural abnormalities in the eye.

ii. Extra diagnostic testing –

In specific circumstances, conjunctival photography and mobile health technology are used as a supplemental tool to document clinical observations, follow the progression of a disease, and evaluate the efficacy of treatment. Present days, artificial machine learning techniques [55], automated deep learning methods [56], and photography [57] are useful for diagnosing trachoma.

Clinical Management and Treatment Modalities

The World Health Organization's SAFE method, which consists of trichiasis surgery, antibiotics, facial cleaning, and environmental enhancement measures, is suggested [58].

The patient and other family members should get antibiotics [59].

- Given its efficacy and simple dosage schedule, azithromycin (20 mg/kg up to 1 g) stands out as the recommended antibiotic or therapy of choice when taken orally, either as a single dose or as part of a mass drug administration technique.
- While tetracyclines should be used with caution in cases of pregnancy, nursing, and paediatric use, erythromycin (500 mg twice daily for 14 days) or doxycycline (100 mg twice daily for 10 days) may be taken into consideration.
- Topical use of 1% tetracycline ointment is possible. But compared to oral therapy, it is less successful.

a. It is crucial to keep the face clean [60].
b. Enhancing the environment involves control of flies, providing access to safe drinking water, maintaining adequate sanitation, and doing other pertinent actions [61].
c. In cases of entropion and trichiasis, surgery may be required to ensure full and functional closure of the lids [62].

Management of Trichiasis and Cicatricial Entropion

Trachoma is mostly caused by conjunctival scarring that progress to trichiasis and entropion, which in turn induce corneal scarring and blindness. To avoid visual impairment, it is crucial to treat trichiasis and cicatricial entropion in trachoma effectively [63, 64].

Treatment of lashes

In the areas where this illness is prevalent, there has to be a push to instruct auxiliary healthcare team members on basic procedures. This will make it possible to intervene early to stop corneal damage and scarring [65].

- Simple epilation
- Destruction of eyelash follicles

a. Radiofrequency ablation of follicles
b. Cryotherapy to lash roots
c. Electrocautery
d. Laser (argon or other types) treatment of lash roots
e. Irradiation (infrequently used now)

- Surgical excision of roots of eyelashes

Surgical Procedures

The following list of surgical procedures is used to treat trichiasis and entropion in trachoma patients in order to repair irregularities of the eyelids and avoid corneal injury [66, 67].

- The tarsal rotation that occurs either anteriorly lamellarly or bilamellarly
- Tarsal rotation and repositioning with or without tarsal advancement
- Lengthening of the posterior lamella as it advances, either with or without a tarsal graft or an interpositional mucous membrane
- Surgery on the eyelid border and anterior lamellar
- Lamellar relocation anteriorly

- split and eversion of the eyelid margin
- Resection (or grooving) of the anterior tarsal wedge and eversion
- Tarsectomy

Differential Diagnosis

Due to similar clinical characteristics, trachoma and other eye illnesses can be difficult to distinguish from one another. For this reason, it is essential to thoroughly assess differential diagnoses in order to ensure proper management and prevent needless medication [68].

a. Allergic conjunctivitis –

The symptoms of allergic conjunctivitis, such as redness, itching, tearing and swelling of the eyelids, might resemble the clinical manifestations of trachoma. Usually affecting both eyes, allergic conjunctivitis is frequently linked to past exposure to allergens such dust, pollen, or pet dander.

b. Bacterial conjunctivitis –

Clinical signs of trachoma and acute bacterial conjunctivitis are similar; as both involve crusting on the eyelids, discharge, and redness. The symptoms of bacterial conjunctivitis often emerge suddenly and go away on their own. This is known as acute manifestation. On the other hand, repeated infections and ongoing inflammation are typical with trachoma.

c. Viral conjunctivitis –

Viral conjunctivitis caused by adenovirus or herpes simplex virus can cause symptoms including photophobia, tearing, and redness, which are similar to those of trachoma. However, systemic manifestations like fever and malaise are frequently associated with viral conjunctivitis, which might help differentiate it from trachoma.

d. Dry eye syndrome –

The symptoms of this illness are similar to those of trachoma, such as redness, irritation in the eyes, and a feeling of something foreign body in the eye. However, insufficient tear production or instability of the tear film, which results in dryness and discomfort on the ocular surface, is the defining feature of dry eye syndrome.

e. Pterygium and pinguecula –

Similar to trachoma, pterygium and pinguecula are benign growths on the conjunctiva that can irritate and produce redness. These lesions can be distinguished from the widespread conjunctival inflammation seen in trachoma because they are often unilateral and located next to the limbus.

f. Giant papillary conjunctivitis –

Giant papillae formation is a defining feature of this inflammatory conjunctivitis, which is often associated with contact lens usage or ocular prosthetics. It is similar to trachoma because it causes redness and itching, but it usually manifests bilaterally and has a history of irritating the surface of the eyes.

g. Atopic keratoconjunctivitis –

This is a chronic inflammatory disease of the cornea and conjunctiva that is frequently associated with atopic dermatitis. Atopic keratoconjunctivitis patients may have conjunctival inflammatory symptoms, such as redness, itching, and photophobia, which might mimic trachoma symptoms. On the other hand, atopic keratoconjunctivitis usually manifests itself bilaterally and may be associated with other systemic atopic symptoms.

h. Less frequent ocular disorders such as chronic follicular conjunctivitis, parinaud oculoglandular conjunctivitis, silent dacryocystitis, contact lens-related problems and other causes of entropion and trichiasis might present with the signs and symptoms similar to trachoma.

Staging

WHO suggests a more straightforward trachoma grading scheme [69].

Trachomatous inflammation, follicular (TF)	This is identified by the presence of five or more lymphoid follicles in the center of the upper tarsal conjunctiva, each with a diameter of at least 0.5 mm.
Trachomatous inflammation, intense (TI)	This shows up as severe inflammatory changes in the conjunctiva, such as a noticeable thickening that covers more than half of the normal deep tarsal arteries or the whole tarsal conjunctiva.
Trachomatous scarring (TS)	The tarsal conjunctiva is scarred, resulting in fine, white, horizontal lines that run parallel to the border of the lid or linear lines. This scarring may result in conjunctival surface abnormalities and trichiasis, or misplaced eyelashes, which may impair corneal transparency.
Trachomatous trichiasis (TT)	This is described as evidence of recently removed inverted eyelashes or as having at least one lash touching the globe. Recurrent episodes of infection, inflammation, and scarring are linked to TT, which may result anomalies of the eyelids and corneal abrasions.
Corneal opacity (CO)	This stage of trachoma is the most advanced and is indicated by corneal opacification. This illness has the potential to cause blindness and visual impairment if left untreated.

Prognosis

The progression of the illness, coexisting conditions including trichiasis and corneal opacities, the availability of healthcare, and the use of treatment and prophylactic measures all impact the prognosis of trachoma. The outlook for trachoma has improved recently due in part to international initiatives, such as the adoption of the SAFE strategy, to contain and eradicate the illness. By using this technique, the prevalence of active disease has been demonstrated to be significantly reduced in several investigations [70, 71].

Early-stage trachoma	For individuals with trachoma in its early stages, the prognosis is usually good with timely and appropriate therapy (TF and TI). Azithromycin and topical tetracycline are examples of antibiotics that efficiently eradicate C trachomatis infections and lower the chance of the illness getting worse. Encouraging environmental changes and facial hygiene via health education programs is essential to reducing the spread of illness and preventing reinfection in communities.
Advanced-stage trachoma	If problems such as trichiasis and corneal opacities develop, the prognosis for advanced-stage trachoma with scarring may deteriorate. Untreated trichiasis can cause blindness, ulceration, and corneal abrasions due to its misplaced eyelashes. On the other hand, surgical corrective methods like bilamellar tarsal rotation or posterior lamellar tarsal rotation can greatly enhance results and avert blindness.
Issues and the extended prognosis	The long-term prognosis associated with trachoma can be greatly impacted by consequences such as permanent vision loss, neovascularisation, and corneal opacities. Blindness or visual impairment may ensue from corneal opacity and scarring brought on by inflammation if treatment is not received. However, in severe cases, suitable medicinal and surgical interventions, like as corneal transplantation, may be able to restore some degree of vision.
Public health interventions and international initiatives	The outlook for trachoma has significantly improved as a result of international efforts to control and eradicate the illness. Globally, trachoma prevalence and blindness have significantly decreased as a result of initiatives like the WHO Alliance for the Global Elimination of Trachoma by 2020 and the International Trachoma Initiative (ITI) [72, 73]. Patient outcomes have been improved and access to care has been improved through community-based therapies, surgical outreach programs, and mass medication administration campaigns [75].

Even while trachoma is still a major public health problem, especially in areas with low resources, improvements in diagnosis, prevention, and treatment have improved the prognoses and outcomes for those who are infected. However, continued financing for trachoma control programs, research projects, and advocacy efforts is vital to achieve worldwide trachoma eradication and prevent avoidable blindness [76].

Complications

Untreated or misdiagnosed trachoma can result in a number of problems that eventually lead to blindness and irreversible visual impairment [77]. These side effects are often caused by chronic inflammation, recurrent infections, and tissue scarring from illness. The following is a list of some of the most common trachoma-related problems.

Trichiasis	When lashes are misaligned, the corneal surface is repeatedly abraded with each blink, a condition known as trichiasis. If left untreated, this irritation can lead to corneal abrasions, ulcerations, and scarring from misdirected eyelashes that rub and irritate the cornea. Eventually, corneal opacities and blindness can result from trichiasis.
Entropion	Entropion occurs when the eyelid rotates inward, forcing the lashes to scrape against the eye's surface, resulting in irritation, corneal abrasions, and probable blindness if left untreated. Entropion is a result of severe trachoma in which the eyelids compress inward owing to scarring and repeated infections.
Distichiasis	This syndrome arises when an extra row of lashes develops along the eyelid's edge, pointing toward the direction of the eye. Because these unique eyelashes irritate the cornea, they can cause discomfort, redness, and even corneal damage. This syndrome may result from severe eyelid abnormalities and scarring caused by trachoma.
Dry eye syndrome	Chronic dryness increases the risk of eye infections and other complications. This syndrome can be brought on by the damaging effects of trachoma on the cornea and conjunctiva, which reduce tear production and compromise tear film integrity. Symptoms include redness, burning, itching, and impaired vision.
Superadded bacterial infection	The immune system of the eye may be weakened by the long-term inflammation and scarring caused by trachoma, making the eye more vulnerable to subsequent bacterial infections. If these infections are not treated, they can worsen the symptoms of trachoma and cause blindness, corneal ulcers, and conjunctivitis. Antibiotic medication is typically necessary for effective management.
Corneal opacities	Corneal opacities are typically the outcome of trachoma and are caused by chronic inflammation and corneal scarring. These opacities interfere with light's ability to enter the eye, which may result in decreased visual acuity and possibly permanent vision loss. In extreme cases, dense corneal opacities can block the pupil and impede central vision.
Corneal neovascularization	A trachoma-related condition called corneal neovascularization is characterized by the cornea's persistent inflammation and vascularization. The inherent optical qualities of the eye may be damaged by this aberrant blood vessel proliferation, which might degrade corneal transparency and cause blindness.
Conjunctival scarring	Conjunctival scarring, which is characterized by fibrosis and changes to the architecture and texture of the surrounding tissue, can result from recurrent episodes of inflammation in trachoma patients. This conjunctival scarring may exacerbate dry eyes, disrupt the tear film, and raise the possibility of corneal issues and subsequent infections.

Deterrence and Patient Counselling

Emphasising the need of refraining from overcrowding and upholding proper sanitary

measures should be part of patient education. Refraining from frequent eye contact and minimising hand-eye contact are crucial. It is essential to promote proper hygiene habits, such as frequent hand washing. The significance of upholding facial hygiene, which involves routinely washing one's face with soap and water to stop the spread of ocular secretions harbouring C trachomatis, should be emphasised in education. It should be recommended to those living in endemic regions to dry their faces with fresh towels or tissues and to refrain from sharing towels and washcloths. Stressing the need of regularly washing hands is crucial to prevent the spread of bacteria from faeces into your mouth. Enhancements to the water, sanitation, and hygiene (WASH) infrastructure are required to lower the risk of trachoma transmission and environmental pollution. This entails making certain that there are clean water supplies, sanitary facilities, and efficient waste management systems available. Important first stages in this endeavour include community-led environmental sanitation programs that upgrade sanitation infrastructure and promote appropriate waste disposal practices. To encourage early diagnosis and treatment-seeking behaviour, residents of high-risk areas should be educated about the warning signs and symptoms of trachoma, which include redness, irritation, discharge, and impaired vision. Patients should be made aware of the value of receiving treatment from licensed medical experts for ocular disorders and eye infections, with a focus on the efficacy of currently available drugs such as antibiotics. Trachoma prevention and patient care can be supported by community-based health education programs that involve the community in preventative and control measures. Effective outreach requires the use of communication tactics and resources that are culturally appropriate. To stop the spread of the infection, infected people should be isolated from the rest of their friends, family, and colleagues very away. Patients need to be well informed about the disease; how it spreads, and how to avoid it after being diagnosed. They should also be made aware of the possible repercussions of treatment failure or disobedience. By putting in place extensive deterrent and patient education programs that are informed by national and international recommendations, fundamental steps are required to empower individuals and communities to adopt proactive measures towards trachoma prevention and control. The success of these programs depends on eradicating trachoma globally and enhancing the health and wellbeing of those who are afflicted.

DISCUSSION AND CONCLUSION

Trachoma is a common illness that often presents to primary care or emergency department providers. Before beginning the therapy, these healthcare professionals should speak with ophthalmologists to ensure prompt, appropriate care and to reduce morbidity. An interdisciplinary healthcare team made up of doctors, nurses, chemists, laboratory personnel, and transfusion experts is necessary for the effective therapy of trachoma. The objectives of this cooperative strategy are to provide patient-centered care. When it comes to managing trachoma, cooperation amongst medical providers is essential to the best possible outcomes for patients. To treat the condition and its consequences completely, ophthalmologists, optometrists, dermatologists, nurses, and chemists must work together. In order to prevent problems, it is crucial to monitor symptoms, ensure normal visual acuity after therapy, and conduct ongoing follow-ups. Surgeons should be consulted as needed for surgical operations. To effectively address the underlying difficulties of trachoma care, interprofessional communication must be effective. Effective communication between healthcare practitioners and the use of an interprofessional team approach are crucial in the

management of trachoma. It is critical that doctors and nurses identify symptoms such as redness, itching, swelling, discharge, photophobia, and irritation of the eyelids and eyes as soon as possible. Accurate compatibility testing and cross-matching should be made sure by laboratory personnel. Quick diagnostic and treatment decisions are ensured by efficient team communication, which reduces mistakes and offers a coordinated reaction. Physicians decide on courses of treatment and recommend the best course of action. Nursing staffs can evaluate the efficacy of therapy and assist with patient education. In order to avoid drug interactions, chemists check dosage and balance the prescriptions. The trachoma management is optimised by this interprofessional & collaborative approach, which leads to better patient outcomes. The healthcare personnel must get ongoing education and training to be up to date on the latest techniques for managing trachoma. Healthcare professionals may successfully identify trachoma and swiftly respond to suitable treatment choices when they engage in regular professional development. When making decisions, a patient-centered approach gives the patient's preferences and general health top priority. In order to manage trachoma infection, lower the risk of transmission, provide all-encompassing treatment, reduce complications, and ensure patient safety and high-quality care, an interdisciplinary healthcare team is essential.

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HOW TO CITE: Priyanka Tanwar, Mamta Naagar, Manish Kumar Maity, A Review On Trachoma: Etiology, Epidemiology, Pathophysiology, Differential Diagnosis, Clinical Management And Treatment Modalities, Int. J. of Pharm. Sci., 2024, Vol 2, Issue 9, 229-246. https://doi.org/10.5281/zenodo.13694465