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Isolation and Characterization of Bacteria from Patients with Conjunctivitis in Thi-Qar Province

Conflict of interest: nothing to declare.
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Abstract

Background. Conjunctivitis, a conjunctival inflammation or infection of the conjunctiva, is a worldwide problem. It is prevalent among children and adults. Conjunctivitis varies in severity, differing from mild redness related to tearing to subconjunctival hemorrhage with purulent discharge and edema of the conjunctiva or eyelid.
Purpose. The purpose is to study the isolation and identification of common bacterial pathogens associated with conjunctivitis in children.
Materials and methods. In our study, seventy conjunctival swabs were subjected to isolate and identify the bacterial strains associated with conjunctivitis. Samples were collected from children suffering from conjunctivitis (of different ages) between February 6, 2023, and May 1, 2023, from Al-Haboubi Hospital, Ophthalmic Unit, from different places (Aledara almahaleia, AlSharqiyah, Arido, Batha, Shmoukh, Shuhadda, Sumer, Tathhiah and Ur). In this study, were diagnose the bacteria that cause conjunctivitis in children, the identification is made by API-20 E System, Vitek 2 System.
Results. The result of the current study showed that 14 (20.0%) of patients had a bacterial infection, while 56 (80.0%) had no bacterial infection. Their ages ranged between days and 13 years, and they were of both sexes. The current study showed that 4 (28.57%) male patients had a bacterial infection, and 10 (71.43%) females had a bacterial infection, in contrast, 11 (39.29%) males had no bacterial infection, and 34 (60.71%) females had not a bacterial infection. Also noted a non-significant difference of bacterial infection in conjunctivitis patients according to sex at p. value <0.05
Conclusion. The prevalence of bacterial conjunctivitis infection among male and female children and the transmission of the infection among children in schools or homes, Conjunctivitis is more common among children of all ages, from days to 12 years. The common type of bacteria that causes conjunctivitis in this study is Proteus mirabilis, followed equally by Staphylococcus aureus, Staphylococcus sciuri, Staphylococcus lentus, Pseudomonas aeruginosa, and Klebsiella pneumoniae.
Keywords: infectious disease, Conjunctivitis, conjunctiva, Proteus mirabilis, Staphylococcus aureus, Staphylococcus sciuri, Staphylococcus lentus, Pseudomonas aeruginosa, Klebsiella pneumoniae

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Характеристика бактерий у пациентов с конъюнктивитом в провинции Ти-Кар

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Резюме

Введение. Конъюнктивит, воспаление или инфекция конъюнктивы, является всемирной проблемой. Он распространен среди детей и взрослых. Конъюнктивит различается по степени тяжести от легкого покраснения, связанного со слезотечением, до субконъюнктивального кровоизлияния с гнойными выделениями и отеком конъюнктивы или века.

Цель. Изучить выделение и идентификацию распространенных бактериальных патогенов, связанных с конъюнктивитом у детей.

Материалы и методы. В нашем исследовании семьдесят конъюнктивальных мазков были подвергнуты изоляции и идентификации штаммов бактерий, связанных с конъюнктивитом. Образцы были собраны у детей, страдающих конъюнктивитом (разного возраста) в период с 6 февраля 2023 г. по 1 мая 2023 г. в больнице Аль-Хабуби, офтальмологическом отделении, из разных мест (Аледара аль-Махалия, Аль-Шаркия, Аридо, Бата, Шмукх, Шухадда, Шумер, Татхия и Ур). В этом исследовании были диагностированы бактерии, вызывающие конъюнктивит у детей, идентификация проводилась с помощью системы API-20 E, системы Vitek 2.

Результаты. Результат текущего исследования показал, что у 14 (20,0%) пациентов была бактериальная инфекция, в то время как у 56 (80,0%) – ее не было. Их возраст варьировал от дней до 13 лет, пациенты были обоего пола. Текущее исследование показало, что бактериальная инфекция наблюдалась у 4 (28,57%) мужчин и у 10 (71,43%) женщин, а у 11 (39,29%) мужчин и 34 (60,71%) женщин бактериальной инфекции не было. Отмечено несущественное различие бактериальной инфекции у пациентов с конъюнктивитом в зависимости от пола при $p<0,05$.

Вывод. Распространена бактериальная инфекция конъюнктивита среди детей мужского и женского пола, а передается инфекция в школах или дома. Конъюнктивит чаще встречается у детей всех возрастов – от нескольких дней до 12 лет. Исследование показало, что распространенным типом бактерий, вызывающих конъюнктивит, является Proteus mirabilis, за которым в равной степени следуют Staphylococcus aureus, Staphylococcus sciuri, Staphylococcus lentus, Pseudomonas aeruginosa и Klebsiella pneumoniae.

Ключевые слова: инфекционные заболевания, конъюнктивит, конъюнктива

INTRODUCTION

The conjunctiva is a thin mucous membrane that covers the posterior surface of the eyelids and the anterior surface of the eyeball itself. It is divided into three areas. The palpebral conjunctiva, the bulbar conjunctiva, and the conjunctival fornix [1]. Conjunctivitis is the inflammation of conjunctiva, sometimes known as pink eye [2]. Conjunctivitis infects people of all ages and is found everywhere; it is the most typical inflammation of the eye and ocular adnexa. Conjunctivitis can be divided into infectious and noninfectious causes. Allergy is the most common reason for the latter [3]. The sev eral types of conjunctivitis caused by viruses, chlamydia, bacteria, parasites, fungi, and antigens tend to share several signs and symptoms, but there are some clinical differences that suggest the proper identification and treatment [4]. Conjunctivitis is usually distinguished by dilatation of the conjunctival blood vessels, which results in swelling and reddening and is commonly accompanied by some discharge. It can be grouped into acute and chronic. Viral conjunctivitis is the most frequent cause of infectious conjunctivitis, followed by bacterial conjunctivitis. Bacterial conjunctivitis is distinguished by moderate to severe redness, mucopurulent discharge, and incidental matting of the eyelids. Allergic conjunctivitis typically presents with mild to moderate redness, itching, and tearing [5]. Neonatal conjunctivitis is often recognized as Ophthalmia neonatorum. It is defined as conjunctivitis that develops in a newborn during the first month of life [6]. Ocular allergy is the most prevalent form of non-infectious conjunctivitis and may have major impacts on productivity and quality of life. Some rare severe forms of ocular allergy can also threaten sight [7]. Environmental factors greatly influence the disturbances of the conjunctival flora. These factors can either be physical or environmental and unsanitary habits leading to dust particles and microorganisms invading the conjunctiva [8]. The transition of pathogens responsible for infectious conjunctivitis may be due to contact with contaminated fingers, and this is believed to be a common reason for contagious conjunctivitis, but bacteria can also enter the conjunctiva from the eyelid margins and adjacent skin, from the nasopharynx through the nasolacrimal duct, from contaminated eye drops or contact lenses, and more rarely from the genitals or through the bloodstream [9, 10].

In this study, we will study the incidence of conjunctivitis in children and the extent of its spread in schools, homes, and places.

MATERIALS AND METHODS

Patients

Swabs of conjunctiva were obtained from Thirty-five patients with conjunctivitis of age groups ranging from 37 days to 12 years from both sexes of the attendants of Ophthalmic Unit in Al-Haboubi Hospital and Health Center in Al-Batha District in Dhi Qar Governorate. during 4 months for the interval between February 6, 2023, and May 1, 2023, by questionnaire papers including information about age of patients, sex, and clinical features (ocular pain, redness, swollen eyelids, discharge).

Specimens Collection

Swabs of bacterial cultures were collected from patients suffering from conjunctival inflammation. Also, specimens were obtained from patients who did not receive any antibiotics. One sample of the conjunctiva of each eye was taken by rolling a cotton swab

over the conjunctiva of the lower fornix, and the swabs were put into transport medium in the sterilized swab tube, then they were sent to the investigating laboratory within two hours of collection. In the laboratory, they were placed and inoculated onto medium.

Inoculating the conjunctival swabs onto Blood agar, McConkey agar. After standard inoculation, the Blood agar, and MacConkey agar plates were incubated at 37Co for 24 hours.

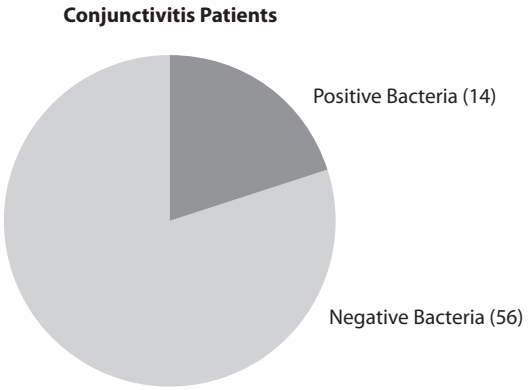
■ RESULTS

Prevalence of Bacterial Infection in Conjunctivitis Patients

The current study involved seventy patients with conjunctivitis and showed that 14 (20.0%) of patients had a bacterial infection, while 56 (80.0%), had no bacterial infection, the results also noted a significant difference between sources of conjunctivitis at p. value <0.05, as in fig. 1.

Prevalence of Bacterial Infection in Conjunctivitis Patients According to Sex

The current study showed that 4 (28.57%) male patients had a bacterial infection, and 10 (71.43%) females had a bacterial infection, in contrast, 11 (39.29%) males had no bacterial infection, and 34 (60.71%) females had not a bacterial infection, the results also noted a non-significant difference of bacterial infection in conjunctivitis patients according to sex at p. value <0.05, as in table 1.



$CalX^2 = 12.6$ $TabX^2 = 3.84$ DF = 1 p. value <0.010

Fig. 1. Prevalence of bacterial infection in conjunctivitis patients

Table 1
Prevalence of Bacterial infection in conjunctivitis patients according to sex

Sex	Male		Female		Total	
	No.	%	No.	%	No.	%
Positive Bacteria	4	28.57	10	71.43	14	20.0
Negative Bacteria	22	39.29	34	60.71	56	80.0
Total	26	37.14	44	62.86	70	100
$CalX^2 = 2.228$ $TabX^2 = 3.84$ DF = 1 p. value 0.136						

Prevalence of Bacterial Infection in Conjunctivitis Patients According to Age Groups

The current study showed that high positive bacterial infection was in the first age group 8 (36.4%), followed by the fourth age group 4 (25.0%), also noted non-infection cases in the second age group, in contrast, the high non-infected age group was third age group 18 (90.0%)m and the lowest non-infected age group were first age group 14 (63.6%), the results also noted a significant difference of bacterial infection in conjunctivitis patients according to age groups at p. value <0.05, as in table 2.

Prevalence of Bacterial Infection in Conjunctivitis Patients According to Residency

The current study showed that high positive bacterial infection was in the sumer 4 (33.3%), also noted a non-infection case in the Al-Salihya, Al-Fidaa, Aledara almahaleia, Mansouriya, and Thawra, the results also noted a significant difference of bacterial infection in conjunctivitis patients according to age groups at p. value <0.05, as in table 3.

Identification of Bacteria Species in Conjunctivitis Patients

This study showed the most bacteria isolated was P. mirabilis 4 (28.57%), while the other bacterial type was equal to 2 (14.28%), as in Fig. 2.

Table 2
Prevalence of Bacterial infection in conjunctivitis patients according to age groups

Age groups	Positive		Negative		Total	
	No.	%	No.	%	No.	%
Days – 3 years	8	36.4	14	63.6	11	31.43
4–6 years	0	0.0	12	100.0	6	17.14
7–9 years	2	10.0	18	90.0	10	28.57
10–12 years	4	25.0	12	75.0	8	22.86
Total	14	20.0	56	80.0	35	100
$CalX^2 = 52.1$ $TabX^2 = 7.81$ DF = 3 p. value <0.001						

Table 3
Prevalence of Bacterial infection in conjunctivitis patients according to residency

Residency	Positive		Negative		Total	
	No.	%	No.	%	No.	%
Al Salihya	0	0.0	6	100.0	6	8.57
Al Shmoukh	2	20.0	8	80.0	10	14.29
Al-Fidaa	0	0.0	4	100.0	4	5.71
Al-Sharqiyah	2	100.0	0	0.0	2	2.86
Arido	2	50.0	2	50.0	4	5.71
Batha	2	12.5	14	87.5	16	22.86
Aledara almahaleia	0	0.0	4	100.0	4	5.71
Mansouriya	0	0.0	4	100.0	4	5.71
Sumer	4	33.3	8	66.7	12	17.15
Thawra	0	0.0	2	100.0	2	2.86
Ur	2	33.3	4	66.7	6	8.57
Total	14	20.0	56	80.0	70	100
$CalX^2 = 8.90$ $TabX^2 = 18.31$ DF = 10 p. value 0.541						

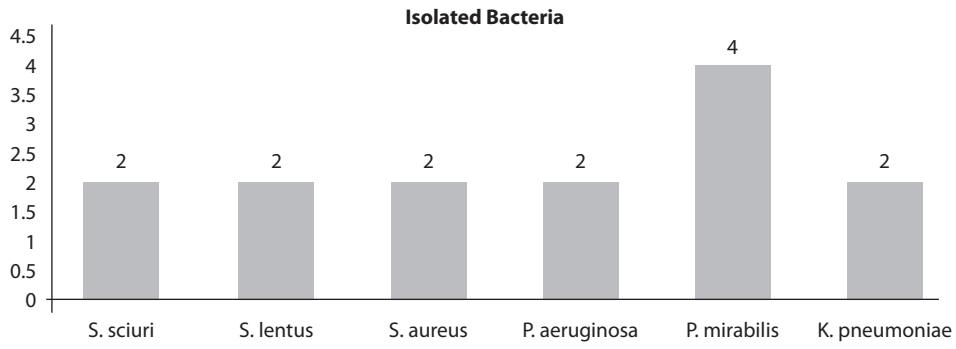


Fig. 2. Bacteria isolation percentage

■ DISCUSSION

In this study, 70 conjunctival swabs from patients (male and female) suffering from conjunctivitis of age groups ranging from 37 days to 12 years were taken. The eye is a functionally and structurally complex organ, that experiences a variety of bacterial, fungal, viral, and parasitic infections. Bacterial infections (Both Gram-positive and Gram-negative) contribute to 32 to 74% of ocular infections globally [11]. In the other study of the incidence of isolated bacteria was 24.2% [12]. Another study showed that 24.1% of samples were positive for bacterial infections while 75.9% of samples gave negative results, which means conjunctivitis happens because of other causes [13]. Ocular infections are common in most of the developing world. Mainly, conjunctivitis, blepharitis, endophthalmitis, and keratitis [14]. Conjunctivitis, periorbital cellulitis, blepharitis, and orbital are the most spread external ocular infections. Infections like these are linked to higher rates of morbidity and blindness worldwide [15].

This study showed that 4 (28.57%) male patients had a bacterial infection, and 10 (71.43%) females had a bacterial infection. in contrast, 11 (39.29%) males had no bacterial infection, and 34 (60.71%) females had not a bacterial infection, as shown in table 3. The differences in the genetic composition of both genders could be responsible for the observed difference [16]. Relating to the gender variable, showed that bacterial conjunctivitis was higher between females (15.25%) compared to males (8.04%). This result is similar to those recorded in different countries. Males and females have equal natural resistance to bacterial conjunctivitis. Gender has less effect than age on the ocular microbiota composition. Some studies have revealed that there is no difference between males and females [17]. Another study showed that females were more infected than males [18]. The range of microorganisms varies in different individuals through variations in genetic makeup, age, gender, nutrition, race, immunosuppression, dry eye, ocular inflammation, contact lens wear, surgery, antibiotic use, external exposure, and climate [19]. Bacterial conjunctivitis notably affects public health, inclusive of more than one-third of eye diseases reported worldwide. It is an infection caused by numerous pathogenic bacteria is very contagious, and has a high happening of bacterial resistance to the antibiotics that are used for treatment [20].

The study showed that high positive bacterial infection was in the first age group 8 (36.4%), followed by the fourth age group 4 (25.0%), also noted non-infection cases in the second age group, in contrast, the high non-infected age group was third age group 18 (90.0%) and the lowest non-infected age group were first age group 14 (63.6%), that showed in table 3. Neonatal eye infections happen in babies exposed to infection through delivery, especially during movement through an infected birth canal [21]. The prevalence in infants and children can be associated with the fact that children play more in a dusty contaminated environment likely due lack of good hygiene [22]. This prevalence is because children with conjunctivitis in schools help spread the infection to other fine children by contact with discharge from the eyes or upper respiratory tract of infected children and it can spread by contaminated fingers or vomits [23]. Conjunctivitis may easily spread in school classrooms because of absences or lost time from work for parents. In children, the occurrence of acute infectious conjunctivitis is higher than in adults and the causative bacteria may differ from that in adults [24].

The study showed that high positive bacterial infection was in the Sumer 4 (33.3%), also noted a non-infection case in the Al Salihya, Al-Fidaa, Aledara almahaleia, Mansouriya, and Thawra, as shown in table 3. Conjunctivitis is worldwide, and the exact spread is very variable related to the country and even in different regions of the same country. These differences appear to reflect the highly diverse nature of the diseases [25]. Some factors such as personal hygiene, sociodemographic or economic status, living conditions, ocular trauma, frequency of face washing, the appearance of systemic disease, and cigarette smoking were considered related factors for bacterial ocular infections [26]. Due to the various environments as well as patterns of administration and different ethnic groups, global epidemiology designates that the spectrum of conjunctival sac pathogens and resistance patterns vary between geographic locations. Reports of microbial isolates from either diseased or preoperative ocular tissues differ widely according to published studies [27].

The study showed that most bacteria isolated were Proteus mirabilis 4 (28.57%), while the other bacterial type was equal to 2 (14.28%). The normal microbial flora of conjunctiva and the eyelids consists of a heterogeneous bacterial gathering that is controlled by intrinsic mechanisms (metabolic inhibition, nutrient competition, and enzyme production) and by host mechanisms (the immunological system and anatomical barriers) [28]. The organisms may be spread from hand-to-eye contact or through adjoining mucosal tissue colonization such as sinus mucosa or nasal [29].

In another study, four isolates were obtained from P. mirabilis [30]. The pathogenic bacteria cause eye infections through several factors, inclusive of bacterial virulence and the host's defense mechanisms [31]. Contact lenses change the natural ocular environment by introducing a bio-burden of microorganisms to the eye's surface from contaminated lenses and hands [32]. Staphylococcus aureus is frequently found in the nose and skin of a person, among the most common causes of ocular infections, including blepharitis, conjunctivitis, dacryocystitis, and endophthalmitis [33].

About 20–30% of individuals are continuously and asymptomatically colonized with S. aureus in the nose, the remainder constitute sporadic carriers, and phases of colonization alternate with phases of non-colonization, emergence and continuous spread of multi-resistant S. aureus strains, like methicillin-resistant and vancomycin-resistant, make complex the treatment of staphylococcal infections and cause a notable economic burden [34].

Staphylococcus sciuri and Staphylococcus lentus is known as an invasive pathogen to abscesses in humans, urine, blood, and wound infections, the agents are often found in a large difference of hosts and environments, and recurrent contact with livestock and pets has been stated to cause skin colonization and wounds, and dust is an important tool in the transport of these bacteria [35, 36].

Pseudomonas aeruginosa is not an inhabitant bacterium on the ocular surface, and is seldom isolated from conjunctivitis except those of patients who have some kind of artificial device in the eye [37]. P. aeruginosa isolated from the ocular surface was acquired from the patient's home environment. This suggests that the bacteria colonizing humid home environments such as the bathroom can infect ocular surfaces in association with biomaterials. Biomaterials such as sutures, punctual plugs, intraocular lenses, and contact lenses can serve as hotbeds for bacterial infections [38] Klebsiella pneumoniae frequently found in the mouth, skin, and intestinal tract, and most infections are nosocomial infections [39, 40], which are a common cause of infections in both neonatal intensive care units and community. The bacteria were recovered from three neonates, one clinical sample from the conjunctiva, and two routine screening samples [41, 42].

■ CONCLUSIONS

The prevalence of bacterial conjunctivitis infection among male and female children and the transmission of the infection among children in schools or homes, Conjunctivitis is more common among children of all ages, from days to 12 years. The common type of bacteria that causes conjunctivitis in this study is Proteus mirabilis, followed equally by Staphylococcus aureus, Staphylococcus sciuri, Staphylococcus lentus, Pseudomonas aeruginosa, and Klebsiella pneumoniae.

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