

## Research Article

# Comparison of Conjunctival Flora of Turkish and Syrian Individuals

## Türk ve Suriyeli Bireylerin Konjonktival Floralarının Karşılaştırılması

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### ABSTRACT

**Purpose:** The objective of this study is to explore the refugee problem and its global implications. The refugee problem has been a global concern for many years, with the scale of the issue increasing over time. Turkey is one of the leading countries hosting Syrian refugees. The present study aims to evaluate the conjunctival flora of Syrian refugees and Turkish individuals who presented at our clinic, and to compare the results.

**Material and Method:** The study population comprised a total of 96 patients, with 55 Turkish and 41 Syrian individuals. Swabs were taken from the conjunctiva of the lower eyelid of the patients with a sterile swab. The samples were then cultured on various agar media, including Eosin Methylene Blue (EMB), Sabouraud dextrose, chocolate, and 5% sheep blood agar, within the microbiology laboratory.

**Results:** The results showed that 53.7% of Syrian refugee samples and 52.7% of Turkish samples were culture positive ( $p=0.92$ ). Coagulase negative staphylococcus (CNS) was the most frequently isolated microorganism in Turkish individuals (32.7%) and Syrian refugees (46.3%) ( $p=0.19$ ). The most prevalent microorganism isolated in 32.7% of Turkish individuals was CNS, followed by *Streptococcus spp.* (18.2%), *Staphylococcus aureus* (12.7%), *Corynebacterium spp.* (10.9%), *Bacillus spp.* (12.7%), *Micrococcus spp.* (1.8%), and *Neisseria spp.* (1.8%). In conjunctival cultures of Syrian refugees, CNS was isolated in 19 (46.3%), *Corynebacterium spp.* in 7 (17.1%), *Streptococcus spp.* in 3 (7.3%), *Staphylococcus aureus* in 2 (4.9%), *Bacillus spp.* in 5 (12.2%), *Micrococcus spp.*

**Conclusion:** Conjunctival growth was found to be similar in both the Turkish and Syrian refugee groups, with CNS being the most frequently isolated bacterium. The bacterial species isolated were comparable in both groups, and there was no statistically significant difference in the incidence of these bacteria

**Keywords:** Conjunctival flora; Syrian refugee; Turkey

### Öz

**Amaç** Mülteci sorunu uzun yıllardır tüm dünyada devam eden ve giderek daha da büyük boyutlara ulaşan bir sorundur. Türkiye'ye gelen Suriyeli mültecileri misafir eden ülkelerin başında gelmektedir. Bu çalışmamızda kliniğimize başvuran Türk bireyler ile Suriyeli mültecilerin konjonktival floralarının değerlendirilmesi ve sonuçların karşılaştırılması amaçlandı.

**Gereç ve Yöntem** Çalışmaya 55 'i Türk, 41 'i Suriyeli toplam 96 hasta dahil edildi. Hastaların alt göz kapağı konjonktivasından steril eküvyon ile sürüntü örneği alındı. Alınan örneklerin mikrobiyoloji laboratuvarında Eosin Metilen Blue (EMB) agar, Sabouraud dekstroz agar, çukolatamsı agar ve %5 koyun kanlı agar besiyerlerine ekimleri yapıldı.

**Bulgular:** Suriyeli mültecilerde konjonktival kültür pozitifliği %53.7 iken Türk bireylerde %52.7 oranında pozitif kültür saptandı ( $p=0.92$ ). *Coagulase negative staphylococcus (CNS)* Türklerde (%32.7) ve Suriyeli mültecilerde (%46.3) en sık izole edilen mikroorganizma olarak bulundu ( $p=0.19$ ). Türklerde CNS 18'inde (%32.7), ikinci en sık izole edilen *Streptococcus spp.* 10'unda (%18.2), *Staphylococcus aureus* 7'sinde (%12.7), *Corynebacterium spp.* 6'sında (%10.9), *Bacillus spp.* 7'sinde (%12.7), *Micrococcus spp.* 1'inde (%1.8), *Neisseria spp.* 1'inde (%1.8) izole edilmiştir. Suriyeli mültecilerin konjonktival kültürlerinde ise CNS 19'unda (%46.3), *Corynebacterium spp.* 7'sinde (%17.1), *Streptococcus spp.* 3'ünde (%7.3), *Staphylococcus aureus* 2'sinde (%4.9), *Bacillus spp.* 5'inde (%12.2), *Micrococcus spp.* 1'inde (%1) izole edilmiştir.

**Sonuç:** Türklerde ve Suriyeli mültecilerde konjonktival üreme benzer ve en sık izole edilen bakteri CNS bulunmuştur. İzole edilen bakteri türleri iki grupta benzerdir ve bu bakterilerin görülme sıklıkları açısından da istatistiksel olarak anlamlı fark görülmemiştir.

**Anahtar Kelimeler:** Konjonktival flora; Suriyeli mülteci; Türkiye

## INTRODUCTION

The microbiota present on the eyelids and conjunctiva are classified as saprophytic; however, under certain conditions, these microorganisms possess the capacity to assume a pathogenic role. This transition occurs when the body's innate defence mechanisms are compromised (1). These microorganisms may become pathogenic and lead to infections in cases such as surgical interventions performed on the eye, malnutrition and impaired body resistance (2-4).

The most prevalent organisms identified within the normal conjunctiva are *Staphylococcus epidermidis*, *Corynebacterium spp.*, *Staphylococcus aureus*, *Micrococcus spp.*, *Streptococcus spp.*, *Morexella catarrhalis*, *Haemophilus influenza*, *Klebsiella spp.*, *E. coli* and *Pseudomonas aeruginosa* (5). This conjunctival flora, which is established from birth, persists throughout life and may be subject to variation depending on environmental factors, season, age, body resistance and general hygienic conditions (6).

Following the Second World War, the number of refugees has exceeded 70 million, and there is concern that this figure will increase. The increasing number of refugees also gives rise to significant humanitarian problems. In recent times, millions of individuals have been compelled to flee their countries due to armed conflicts and systematic killings in the Middle East, becoming refugees or seeking asylum in neighbouring countries. These individuals predominantly seek refuge in neighbouring countries and developing nations (7).

The ongoing armed conflict in Syria, which commenced in 2011, has been a significant driver of displacement, with millions of Syrians compelled to seek refuge elsewhere. The war has resulted in the death of hundreds of thousands of Syrians and the displacement of millions more (8). In numerous cities across our nation, camps have been established for Syrian refugees by the Prime Ministry Disaster and Emergency Management Presidency (AFAD). The city under consideration in this study is one of those hosting such camps, with a significant population of Syrians residing in these camps for an extended period.

Syrian refugees in Turkey, who constitute the most significant refugee problem in recent years, are compelled to reside in substandard conditions, akin to those experienced by refugees in numerous other countries worldwide. This situation is accompanied by a prevalence of physical and psychological health complications (9,10).

A multitude of studies have demonstrated that the migration of war victims from their countries of origin to live as refugees in

other countries engenders various problems, particularly economic, social and health-related challenges. In the domain of ophthalmology, it is also important to ascertain the conjunctival flora of Syrian refugees, as this information is pivotal for the timely initiation of treatment or the implementation of precautionary measures in potential cases of postoperative infection and endophthalmitis.

The objective of this study was to investigate the conjunctival flora of individuals who have fled the Syrian war and have taken refuge in Malatya province of Turkey, and to compare these samples with the flora of the local population residing in this province. This approach was informed by the understanding that the conjunctival flora is susceptible to alterations in response to environmental factors, body resistance, and hygienic conditions. The presence of recurrent conjunctivitis cases among Syrian refugees seeking medical attention at our clinic further underscores the need for comprehensive investigation into this aspect of health in refugee populations.

## MATERIALS AND METHODS

### Study Design

The present study was conducted in accordance with the following material and methodological framework. Two groups, consisting of 41 Syrian refugees and 55 Turkish individuals, were admitted to the Ophthalmology Clinic. Prior to participation, all subjects were thoroughly informed about the study's objectives and procedures, and their consent was obtained in the form of a signed consent form. The principles of the Declaration of Helsinki were followed at all stages of the study. Ethical approval was obtained from the Malatya Clinical Research Ethics Committee (Decision No: 2020/130).

The demographic data of the participants, including their age, gender, the presence of systemic diseases, and the clinical information at the time of hospital admission, were thoroughly documented. Patients meeting the following criteria were included in the study: no symptoms or signs of ocular infection in the last three months; no systemic diseases such as diabetes mellitus; no history of eye surgery; and no eye disease other than refractive error, as determined by a complete ophthalmological examination. Following a thorough visual examination, biomicroscopic examination and fundus examination of the patients, the lower eyelid of the eligible patients was retracted and a sample was taken from the lower fornix by gently rubbing a sterile cotton swab. In order to avoid contamination from the eyelids and eyelashes, the swab was taken with the utmost care. The use of topical anaesthetic drops was avoided both before and during swab collection, owing to their inhibitory effect on

certain microorganisms. Immediately, cotton swabs were immersed in Stuart Transport Medium (BTR Stuart Transport Swab, Gülka sağlık, Ankara/Turkey) and transferred to the microbiology laboratory. The samples were then subjected to a process of culturing in Thioglycolate broth, a procedure that was initiated with alacrity to mitigate the risk of contamination. Subsequent transfer cultures were then performed on EMB (Eosin Methylene Blue) agar, Sabouraud dextrose agar, chocolate agar and 5% sheep blood agar media in the microbiology laboratory. These were then left to incubate at 37°C for a period of between 24 and 48 hours. Following this, Gram staining, catalase, oxidase, PYR and coagulase tests were performed on the pure colonies obtained, and preliminary nomenclature was made. These microorganisms were then identified at species level using a fully automated bacterial-yeast identification device (VITEK 2-compact, Biomerieux, USA).

### Statistical Analysis

The statistical analysis was conducted using SPSS Windows (ver. 22.0; IBM Corp., Armonk, NY, USA), a statistical software package. The results obtained were expressed as either the mean standard deviation (SD) or the number (%). The Shapiro-Wilk test was employed to ascertain the conformity of continuous variables to a normal distribution. The Mann-Whitney U test was employed for the analysis of quantitative data, while the Chi-Square test was utilised for the examination of qualitative data, with the objective of investigating the disparities between two groups. A value of  $P < 0.05$  was considered statistically significant.

## RESULTS

The mean age of Syrian refugees was 32.3 years ( $\pm 8.1$  years), while the mean age of the Turkish group was 25.6 years ( $\pm 7.6$  years). While 51.2% of Syrians were female and 48.8% were male, 60% of Turks were female and 40% were male. The age and gender distribution of the two groups is outlined in Table I.

**Table-1.** Distribution of Syrian Refugees and Turkish People by Age and Gender

	Turkish Individual (n:55)	Syrian Refugees (n:41)
Female	33(60%)	21(51.2%)
Male	22(40%)	20(48.8%)
Average Age	25.6 $\pm$ 7.6	32.3 $\pm$ 8.1

Growth in conjunctival cultures: 53.7% of Syrian patients exhibited growth in conjunctival cultures, with CNS being isolated most frequently (46.3%). In the Turkish patient group, 52.7% had positive cultures, and CNS was isolated most frequently (32.7%), although this difference was not statistically significant ( $p=0.17$ ). A subsequent analysis revealed no statistically significant difference between the two groups in terms of growth rates ( $p=0.92$ ).

The most prevalent bacterial isolate in Turkish patients was *Streptococcus spp.* (18.2%), followed by *Corynebacterium spp.* (17.1%). *Staphylococcus aureus* was isolated at a rate of 12.7% in the Turkish population and 4.9% in the Syrian refugee population ( $p=0.19$ ); *Bacillus spp.* was isolated at a rate of 12.7% in the Turkish population and 12.2% in the Syrian refugee population ( $p=1.00$ ); and *Micrococcus spp.* was isolated at a rate of 1.8% in the Turkish population and 2.4% in the Syrian refugee population ( $p=1.00$ ). *Neisseria spp.* was isolated at a rate of 1.8% in the Turkish population but not among Syrian refugees in conjunctival cultures. Growth in conjunctival cultures is demonstrated in Table II.

**Table-2:** Growth in Conjunctival Cultures

Types of Bacteria	Turkish Individuals	Syrian refugees	p value
<i>Staphylococcus aureus</i>	7(12.7%)	2(4.9%)	0.19
<i>Coagulase negative staphylococcus (CNS)</i>	18(32.7%)	19(46.3%)	0.17
<i>Streptococcus spp.</i>	10(18.2%)	3(7.3%)	0.12
<i>Corynebacterium spp.</i>	6(10.9%)	7(17.1%)	0.38
<i>Neisseria spp.</i>	1(1.8%)	0	1.00
<i>Bacillus spp.</i>	7(12.7%)	5(12.2%)	1.00
<i>Micrococcus spp.</i>	1(1.8%)	1(2.4%)	1.00

## DISCUSSION

The normal flora of the conjunctiva is the primary source of contamination following intraocular surgery (11,12). *Coagulase-negative staphylococci* (CNS), *Staphylococcus aureus* and *Corynebacterium species*, which are most frequently isolated from conjunctival and eyelash flora, are the most common agents of postoperative infections (13). These microorganisms have the potential to become pathogenic, leading to infections in conditions such as surgical interventions performed on the eye, malnutrition and impaired body resistance (2-4).

The ongoing Syrian conflict has resulted in a significant exodus, with more than two million individuals compelled to flee their

homeland. Access to healthcare has emerged as a pressing concern for these refugees, underscoring the need for effective health systems. The predominant health challenges experienced by refugees pertain to infections and acute diseases associated with malnutrition (14). In the initial stages of their arrival, Syrian refugees residing in camps have received complimentary health education, along with essential amenities such as shelter, nutrition, and education, with the aim of mitigating the risk of infections and diseases. The most prevalent health concerns experienced by Syrian refugees who sought care at our ophthalmological clinic pertain to spectacle requirements due to refractive errors, conjunctivitis, pterygium requiring surgical intervention, cataract, and glaucoma. The present study aims to evaluate the conjunctival flora of Syrian refugees in Malatya who presented at our clinic and to compare the results with those of Turkish individuals.

It is important for healthcare professionals to possess a comprehensive understanding of the normal conjunctival flora, as this knowledge is crucial for the effective evaluation of culture results in pathological conditions (15). In the context of Syrian refugees, it is of particular significance to be acquainted with their conjunctival flora, as this information is pivotal for the timely initiation of treatment or the implementation of precautionary measures in cases of potential postoperative infection and endophthalmitis. This is especially salient in cases of diseases such as pterygium and cataract, which have increased surgical requirements. It is important for healthcare professionals to recognise that migration can lead to increased intensity in operating theatre activities and personnel workload (16). Healthcare personnel must be cognisant of the needs of migrant groups and possess the ability to interact with them effectively (17). As ophthalmologists, we have been and continue to perform essential examinations and treatments for Syrian refugees, both in outpatient clinics and in surgical settings. This study was conducted to investigate how we should approach eye infections in Syrian refugees, given the knowledge of the normal conjunctival flora.

The bacterial isolation rate in normal conjunctiva varies between 15% and 100% (18-21). Coagulase-negative *staphylococci* and diphtheroids are found in the normal flora of the conjunctiva commensally and are the most frequently isolated species. Potentially pathogenic bacteria, including *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Pseudomonas spp.* and *Escherichia coli*, are isolated less frequently (22-25). In the present study, the isolation rates of bacteria from conjunctival cultures of Turkish and Syrian refugees were found to be comparable, with 52.7% of Turks and 53.7% of Syrians exhibiting bacterial growth. A statistical analysis revealed no significant difference between the two groups with respect to growth rates ( $p=0.92$ ).

Coagulase-negative staphylococci were the most frequently isolated bacteria in both the Turkish population (32.7%) and the Syrian refugee population (46.3%). The remaining *staphylococci*, excluding *S. aureus*, were designated as CNS. Among these, *S. epidermidis* was the most frequently isolated. *S. epidermidis* has been observed to be prevalent in terms of its localisation and has frequently been identified as an opportunistic pathogen (26). It is typically present in the ocular flora but can become pathogenic in the appropriate environment, leading to chronic blepharoconjunctivitis. Strains that are infective can produce *S. aureus*-like toxins (27-31).

In the present study, *Streptococcus spp.* (18.2%) was identified as the most prevalent bacterium isolated from CNS in the Turkish population, while *Corynebacterium spp.* (17.1%) was the second most common isolate in the Syrian refugee population. *Neisseria spp.* was isolated from the conjunctival cultures of Turks (1.8%) but not from the conjunctival flora of Syrian refugees. However, this difference was not statistically significant. The frequencies of the other isolated bacteria were comparable between the two groups, with no statistically significant differences observed.

The resident flora of the conjunctiva may resemble the transient flora as a result of any environmental change (32). Given that the conjunctival flora may be influenced by environmental and hygienic factors, it was observed that the conjunctival flora of Syrian refugees who had been residing in Malatya for an extended period during the adaptation process was similar to that observed in the conjunctiva of Turks.

Disturbances in the balance between transient and resident flora within the conjunctiva have been shown to facilitate the process of microbial proliferation and disease development (32). Chronic diseases, including diabetes, hypertension, and chronic obstructive pulmonary disease, emerge as a significant concern due to the absence of comprehensive long-term plans and programmes in sectors such as health and education (7). In cases where there is a decrease in body resistance due to these diseases, microorganisms in the conjunctival flora may become pathogenic, leading to infections.

With regard to ophthalmic diseases, the facilitation of access to healthcare services for the purpose of averting potential ocular complications arising from chronic conditions can serve to diminish the prevalence of severe pathologies. However, a significant proportion of refugees are unaware of how to access healthcare services (33). A significant proportion of refugees, 77.4%, are unaware of the procedures to be performed prior to surgery, while 51.4% lack knowledge on how to use prescribed medication. The majority of refugees reportedly consult with their neighbours for guidance on how to use their medication. The correlation between linguistic barriers, educational levels, and these outcomes is noteworthy (34). Consequently, the role of physicians is rendered more arduous, and this scenario

underscores the necessity for the implementation of preventive measures.

## CONCLUSION

In conclusion, the most frequently isolated bacterium from conjunctival cultures in Turks and Syrian refugees was CNS. The bacterial species isolated were found to be similar in both groups, with no statistically significant difference in the frequency of these bacteria. The hypothesis that this phenomenon may be attributable to the geographical and climatic similarities between the province where the study was conducted and Syria is substantiated by the proximity of the two regions. This phenomenon may also be attributed to the shared cultural characteristics and genetic similarities between the two populations. However, it is acknowledged that an epidemiological evaluation based solely on patients admitted to our clinic may not be sufficient to reflect the situation of all refugees. Conducting studies that include Syrian refugees who do not seek healthcare in health centres is also recommended. Achieving solutions to challenges related to health and education in our country, where there is a gradual increase in the number of refugees, necessitates both national and international cooperation.

## Declarations

**Ethics Committee Approval:** The study was approved by the Malatya Clinical Research Ethics Committee (Decision No: 2020/130) and conducted in accordance with the Declaration of Helsinki.

**Informed Consent:** The consents were obtained from all of the authors for this article.

**Author Contributions:** All authors contributed to every stage of the study.

**Conflict of Interest:** None.

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