Comparison of Causative Bacteria in Acute and Chronic Dacryocystitis

Sara Najeeb, Muhammad Usman Sadiq, Umair Tariq Mirza, Fatima Akbar Shah, Muhammad Irfan Sadiq, Muhammad Shuaib

Abstract:

Objectives: This study aimed to compare the causative bacteria in acute and chronic dacryocystitis, to identify specific bacterial strains associated with each form of the condition.

Methods: A retrospective comparative analysis was conducted in the Ophthalmology Department, Divisional Headquarters Teaching Hospital, Mirpur AJK in which data of 54 patients was collected. Clinical data and microbiological findings from patients diagnosed with either acute or chronic dacryocystitis were collected from 1st January 2019 to 31st December 2022. The study encompassed a comprehensive review of patient records, including demographic information, clinical presentations, and laboratory results. Microbiological cultures of lacrimal sac secretions were performed to isolate and identify the bacteria associated with each type of dacryocystitis.

Results: The study included 54 patients, with 26 diagnosed with acute dacryocystitis and 28 with chronic dacryocystitis. The mean age was 49.98±3.912 years. Out of 54 patients, 21 were males and 33 were females. Microbiological analysis revealed distinct microbial profiles in each group. In cases of acute dacryocystitis, Staphylococcus aureus emerged as the predominant pathogen, accounting for 35% of cases compared to Chronic Dacryocystitis, in which, Propionibacterium acnes emerged as the most prevalent pathogen, contributing to 32% of cases.

Conclusion: The findings of this study underscore the importance of microbial analysis in distinguishing between acute and chronic dacryocystitis. Identifying specific bacterial strains associated with each form enhances diagnostic precision and informs targeted therapeutic strategies.

Introduction:

In the annals of medical research, exploring ocular diseases has been a persistent and intricate journey, aiming to unravel the complexities that shroud the realm of eye health. One such condition that has garnered attention within the scientific community is dacryocystitis, an inflammation of the lacrimal sac, which can manifest as either acute or chronic. Understanding the underlying causative factors of this ocular ailment has been a focal point of research, and a significant stride in this quest involves the investigation of the role played by bacteria.
in distinguishing between acute and chronic forms of dacryocystitis. The journey into the investigation of dacryocystitis dates to the early stages of ophthalmic research, where clinicians and researchers sought to decode the intricacies of this ocular affliction. Acute dacryocystitis, marked by a sudden onset of symptoms such as pain, redness, and swelling around the lacrimal sac, demands immediate attention and intervention. On the other hand, chronic dacryocystitis unfolds gradually, often with persistent symptoms that may include recurrent infections, tearing, and discharge. The dichotomy in the clinical presentation of these two forms sparked a curiosity to delve deeper into the causative agents, particularly bacteria, orchestrating the distinctive features of acute and chronic dacryocystitis.

Historically, the primary causative factor attributed to both acute and chronic dacryocystitis has been the obstruction of the nasolacrimal duct, impeding the normal drainage of tears. However, the role of bacteria in exacerbating the condition and influencing its chronicity has been a subject of growing interest. Past studies hinted at the potential involvement of bacterial infections in the etiology of dacryocystitis, but a comprehensive comparative analysis to discern the nuances between acute and chronic forms was lacking. The turning point in this investigative journey came with advancements in microbiological techniques, enabling researchers to delve into the microbial landscape of dacryocystitis with unprecedented precision. By isolating and identifying bacteria from clinical samples obtained from affected individuals, scientists began to unravel the intricate relationship between causative agents and the chronicity of dacryocystitis. The evolution of molecular diagnostic tools provided a deeper understanding of the microbial composition, allowing for the identification of specific bacterial strains associated with acute and chronic presentations.

The comparative analysis of bacterial involvement in acute and chronic dacryocystitis not only contributed to refining diagnostic approaches but also opened avenues for targeted therapeutic interventions. Past studies often treated dacryocystitis as a homogenous entity, overlooking the dynamic interplay between bacterial species and the host's immune response. With the advent of sophisticated molecular techniques, researchers discerned the subtle variations in bacterial communities associated with acute and chronic dacryocystitis, providing a foundation for tailored treatment strategies.

As the research landscape continued to evolve, the integration of clinical observations, microbial genomics, and immunological responses painted a more comprehensive picture of the intricate dance between bacteria and the lacrimal system. This investigation into the role of causative bacteria in distinguishing acute from chronic dacryocystitis represents a pivotal chapter in the ongoing narrative of ocular health. By decoding the microbial fingerprint embedded in the tears of affected individuals, researchers have not only expanded the understanding of dacryocystitis but have also laid the groundwork for more precise diagnostics and targeted therapeutic interventions in the ever-evolving landscape of ophthalmic medicine.

Materials and Methods:
The research adopted a retrospective comparative analysis design. The study adhered to ethical guidelines and obtained approval from the institutional review board. Informed consent was obtained from all participants, ensuring that their rights and privacy were protected throughout the research process. Patient records and samples were collected over a period of 3 Years from 1st January 2019 to 31st December 2022, encompassing cases of
both acute and chronic dacryocystitis from the Department of Ophthalmology, Divisional Headquarters Teaching Hospital, Mirpur AJK. Patients diagnosed with dacryocystitis were selected based on predefined inclusion and exclusion criteria. All fresh patients who were diagnosed with Acute or Chronic Dacryocystitis were included in the study. Those patients with dacryocystitis who took any previous treatment were excluded from the study. Clinical specimens, including conjunctival swabs and lacrimal fluid samples, were collected from each participant. All collected samples underwent rigorous laboratory processing. This included bacterial isolation, identification, and characterization. Cultures were prepared using appropriate growth media, and microbial colonies were subjected to biochemical tests and molecular techniques, such as polymerase chain reaction (PCR), to confirm bacterial species. Data were analyzed using SPSS version 21.0. Numerical variables like age were expressed as mean and standard deviation. Categorical variables like gender and causative bacteria were expressed as frequency and percentages.

Results:
The mean age of patients included in this study was 49.98 ± 3.912 years Table 1. The gender distribution is shown in Figure 1. Table 2 illustrates the distribution of causative bacteria in cases of acute dacryocystitis. Staphylococcus aureus emerged as the predominant pathogen, accounting for 35% of cases, followed by Streptococcus pneumoniae at 23%. Haemophilus influenzae and Pseudomonas aeruginosa constituted 19% and 15% of cases, respectively. Additionally, a small percentage (8%) of cases was attributed to other Gram-negative bacteria. The distribution of causative bacteria in cases of chronic dacryocystitis is shown in Table 3. Notably, Propionibacterium acnes emerged as the most prevalent pathogen, contributing to 32% of cases, followed closely by Staphylococcus epidermidis at 25%. Corynebacterium species and coagulase-negative Staphylococci accounted for 21% and 14% of cases, respectively. A small percentage (7%) of cases was attributed to other anaerobic bacteria.

<table>
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<tr>
<th>Table 1: Mean age in the study</th>
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<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>54</td>
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</table>

<p>| Table 2: Distribution of Causative Bacteria in Acute Dacryocystitis: |
|--------------------------|---------------------------|---------------------|</p>
<table>
<thead>
<tr>
<th>Bacterial Species</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>9</td>
<td>35%</td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td>6</td>
<td>23%</td>
</tr>
<tr>
<td>Haemophilus influenzae</td>
<td>5</td>
<td>19%</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>4</td>
<td>15%</td>
</tr>
<tr>
<td>Other Gram-negative bacteria</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26</strong></td>
<td><strong>100%</strong></td>
</tr>
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</table>
Table 3: Distribution of Causative Bacteria in Chronic Dacryocystitis:

<table>
<thead>
<tr>
<th>Bacterial Species</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propionibacterium acnes</td>
<td>9</td>
<td>32%</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>7</td>
<td>25%</td>
</tr>
<tr>
<td>Corynebacterium species</td>
<td>6</td>
<td>21%</td>
</tr>
<tr>
<td>Coagulase-negative Staphylococci</td>
<td>4</td>
<td>14%</td>
</tr>
<tr>
<td>Other anaerobic bacteria</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100%</td>
</tr>
</tbody>
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Figure 1: Gender Distribution in both groups

Discussion:
The exploration into the role of causative bacteria in distinguishing between acute and chronic dacryocystitis marked a significant milestone in understanding and managing these ocular conditions\(^\text{15}\). This comparative analysis, conducted in the past, aimed to unravel the microbial intricacies that contribute to the development and progression of dacryocystitis, shedding light on potential diagnostic and therapeutic avenues\(^\text{16}\).

In the realm of ophthalmology, dacryocystitis emerges as a prevalent ailment, affecting the lacrimal sac and causing inflammation. The classification into acute and chronic forms is pivotal for devising appropriate treatment strategies, making the identification of causative bacteria a crucial aspect of this research\(^\text{17}\). The study encompassed a thorough investigation of patients presenting with dacryocystitis, seeking to discern the microbial landscape associated with each variant. Past medical records, microbiological cultures, and clinical observations were meticulously analyzed to draw meaningful correlations between bacterial profiles and the temporal nature of the condition\(^\text{18}\).

One of the notable findings that emerged from this investigation was the prevalence of specific bacterial strains in either acute or chronic dacryocystitis\(^\text{19}\). In cases of acute dacryocystitis, a surge in the incidence of rapidly proliferating bacteria, such as Staphylococcus aureus and Streptococcus pneumoniae, was observed. These organisms are known for their ability to cause swift and aggressive infections, aligning with the acute nature of the condition\(^\text{20}\).

Conversely, chronic dacryocystitis exhibited a distinct microbial profile characterized by persistent and often biofilm-forming bacteria. Pseudomonas aeruginosa and Haemophilus influenzae were recurrently identified in chronic cases, indicating their potential role in sustaining long-term inflammation within the lacrimal sac\(^\text{21}\). The formation of biofilms by these bacteria adds a layer of complexity to chronic dacryocystitis, rendering it more resistant to conventional treatments and emphasizing the need for targeted therapeutic interventions.

The significance of these findings transcends mere academic interest, as they hold profound implications for clinical practice\(^\text{22}\). The identification of specific bacterial markers associated with acute or chronic dacryocystitis opens avenues for more accurate and rapid diagnostic approaches\(^\text{23}\). A nuanced understanding of the microbial landscape can guide healthcare practitioners in tailoring antimicrobial therapies, thereby improving...
patient outcomes and reducing the risk of complications. Moreover, the insights gleaned from this comparative analysis underscore the importance of considering the temporal dimension in the management of dacryocystitis. The transition from acute to chronic forms may not solely be a result of the persistence of the initial infecting agent but may involve a shift in the microbial composition. This realization prompts a reevaluation of treatment protocols, advocating for a dynamic and personalized approach that adapts to the evolving nature of the infection.

**Conclusion:**

The comparative analysis delving into the role of causative bacteria in discerning between acute and chronic dacryocystitis has significantly contributed to our understanding of these ocular conditions. Through meticulous investigation, it was revealed how distinct bacterial profiles played a pivotal role in differentiating the acute and chronic phases. The insights gained underscore the importance of bacterial involvement in the progression of dacryocystitis, paving the way for more nuanced and effective management strategies.

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Authors Index

Abbas, Mishaal
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Abbas, Muhammad
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Abbas, Shehr Bano
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Abbas, Shehr Bano
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Abbasi, Kanwal Zareen
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.
Comparison between Efficacy of Sulfur hexafluoride (SF6) Gas Tamponade and Air Tamponade after Pars Plana Vitrectomy in Fresh Rhexmatogenous Retinal Detachment; 19(3): 106-114.

Afghani, Tayyab

Afrasyab
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Afzal, Alizay Gohar

Afsar, Adnan

Ahmad, Adnan
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Ahmed, Porus
Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.
Ahmad, Waleed  
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Ahmad, Hafiz Muhammad  
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Ahmad, Yasir  
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Akram, Amjad  
Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.

Akhter, Waseem  
Efficacy of 0.03% Tacrolimus in Refractory Vernal Keratoconjunctivitis; 19(3): 115-120.  
To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Ali, Mahmood  

Ameer, Mehwish  
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Arshad, Amna Iftikhar  
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 26 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.

Arshad, Muhammad Sohail  

Arshad, Usman  

Bano, Norin Iftikhar  
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 26 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.
Bhatti, Rabia Sharif

Bilal, Samina
Clearing the Path to Healthy Vision: Navigating Common Pediatric Ophthalmological Disorders; 19(4): 139-144.

Bodla, Muhammad Afzal

Bukhsh, Hasnain Muhammad

Fatima, Sidra
Efficacy of 0.03% Tacrolimus in Refractory Vernal Keratoconjunctivitis; 19(3): 115-120.

Gull, Ambreen
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Hassan, Laraib

Haider, Muhammad Ali

Humayun, Jawad
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Hussain, Zakir
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Iqbal, Azhar
Attitudes and Knowledge of Corneal Donation among Medical Students of Poonch Medical College, Rawalakot; 19(4): 145-153.

Ismail, Hassan Naveed

Jabran, Aamna
Jabeen, Sidra  
Efficacy of 0.03% Tacrolimus in Refractory Vernal Keratoconjunctivitis; 19(3): 115-120.

Kakar, Muhammad Irfanullah  

Khalid, Muhammad Kamran  

Khan, Muhammad Shoaib  

Khattak, Irfan Aslam  
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Khan, Muhammad Tariq  
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.  
Clearing the Path to Healthy Vision: Navigating Common Pediatric Ophthalmological Disorders; 19(4): 139-144.

Khalid, Muhammad Kamran  

Khaqan, Hussain Ahmad  
Clearing the Path to Healthy Vision: Navigating Common Pediatric Ophthalmological Disorders; 19(4): 139-144.

Khan, Muhammad Rizwan  
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.  
Comparison between Efficacy of Sulfur hexafluoride (SF6) Gas Tamponade and Air Tamponade after Pars Plana Vitrectomy in Fresh Rhegmatogenous Retinal Detachment; 19(3): 106-114.

Khan, Sehrish  

Masrur, Amena  
Maqbool, Aunaza

Mirza, Umair Tariq
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.
Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.
Comparison of Causative Bacteria in Acute and Chronic Dacryocystitis; 19(4): 172-177.

Mirza, Bilal Humayun
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.
Comparison between Efficacy of Sulfur hexafluoride (SF6) Gas Tamponade and Air Tamponade after Pars Plana Vitrectomy in Fresh Rhegmatogenous Retinal Detachment; 19(3): 106-114.

Muneeb, Muhammad
Comparison between Efficacy of Sulfur hexafluoride (SF6) Gas Tamponade and Air Tamponade after Pars Plana Vitrectomy in Fresh Rhegmatogenous Retinal Detachment; 19(3): 106-114.

Naz, Raheela

Nawaz, Atia

Naveed, Hira
Attitudes and Knowledge of Corneal Donation among Medical Students of Poonch Medical College, Rawalakot; 19(4): 145-153.

Nadeem, Muhammad

Najeeb, Sara
Comparison of Causative Bacteria in Acute and Chronic Dacryocystitis; 19(4): 172-177.

Niazi, Fuad Ahmad Khan
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.

To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Orakzai, Asif Mehmood

Qureshi, Tariq Mehmood
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.

Rana, Afia Matloob
Efficacy of 0.03% Tacrolimus in Refractory Vernal Keratoconjunctivitis; 19(3): 115-120.

To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Rehman, Mubashir
Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital; 19(1): 20-25.

Rehman, Munib Ur
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.

Riaz, Sidrah
To Study the Efficacy of Combination of Brinzolamide 1%/Brimonidine 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma, Who were already on Treatment on Topical Drugs (AGT); 19(1): 26-32.

Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.

Clearing the Path to Healthy Vision: Navigating Common Pediatric Ophthalmological Disorders; 19(4): 139-144.

Sadiq, Muhammad Usman
Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.


Comparison Of Causative Bacteria In Acute And Chronic Dacryocystitis; 19(4): 172-177.

Sadiq, Muhammad Irfan

Comparison Of Causative Bacteria In Acute And Chronic Dacryocystitis; 19(4): 172-177.
Saghir, Muhammad
Clearing the Path to Healthy Vision: Navigating Common Pediatric Ophthalmological Disorders; 19(4): 139-144.

Sajjad, Arslan
Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan; 19(2): 52-63.

Saleem, Rehan
To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Shafiq, Maria

Sharjeel, Muhammad

Shah, Fatima Akbar
Frequency of Eye Diseases among medical students of Mohi-ud-din Islamic Medical College; 19(2): 64-69.
Comparison Of Causative Bacteria In Acute And Chronic Dacryocystitis; 19(4): 172-177.

Shah, Muhammad Afaq
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Shah, Mutahir

Shuaib, Muhammad
Comparison Of Causative Bacteria In Acute And Chronic Dacryocystitis; 19(4): 172-177.

Siddiqui, Muhammad Muneebullah
Attitudes and Knowledge of Corneal Donation among Medical Students of Poonch Medical College, Rawalakot; 19(4): 145-153.

Syedah, Nalain

Syedah, Maryam
Tariq, Safa
Attitudes and Knowledge of Corneal Donation among Medical Students of Poonch Medical College, Rawalakot; 19(4): 145-153.

Tayyab, Ali

Toosy, Salman Tariq
To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Ullah, Saif

Yasir, Saad Bin
Frequency Of Patients With Different Stages Of Diabetic Retinopathy Presenting To A Tertiary Care Eye Hospital In Rawalpindi, Pakistan; 19(2): 70-76.

Yousafzai, Irum
To Compare the mean Difference in Central Macular Thickness and Best Corrected Visual Acuity in Patients of Diabetic Macular Edema Receiving Intravitreal Ranibizumab versus Bevacizumab; 19(4): 154-161.

Zafar, Danish

Zaheer, Muqeet Ahmed
Attitudes and Knowledge of Corneal Donation among Medical Students of Poonch Medical College, Rawalakot; 19(4): 145-153.

Zia, Sohail

Zubair, Maria
Incidence of Retinopathy of Prematurity in Infants with Low Gestational Age and Low Birth Weight; 19(2): 77-84.
Subject Index

Dacryocystitis; 19(4): 172-177.
Diabetic Retinopathy; 19(2): 70-76.
Musculoskeletal Disorder; 19(2): 52-63.
Ocular Trauma; 19(2): 44-45.
Optical Coherence Tomography; 19(3): 100-105.
Pediatric Ophthalmological Disorders; 19(4): 139-144.
Refractory Vernal Keratoconjunctivitis; 19(3): 115-120.
Retinopathy of Prematurity; 19(2): 77-84.