CORRELATION OF CORNEAL ULCER SIZE AND DEPTH BY SLIT LAMP EVALUATION AND ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

By

DR. BHAVISHYA G, MBBS

DISSERTATION SUBMITTED TO

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH

TAMAKA, KOLAR

In partial fulfillment of the requirements for the degree of

MASTER OF SURGERY

IN

OPHTHALMOLOGY

UNDER THE GUIDANCE OF

DR. MANJULA.T. R, MBBS., MS, PROFESSOR,

DEPARTMENT OF OPHTHALMOLOGY

SRI DEVARAJ URS MEDICAL COLLEGE

TAMAKA, KOLAR – 563101

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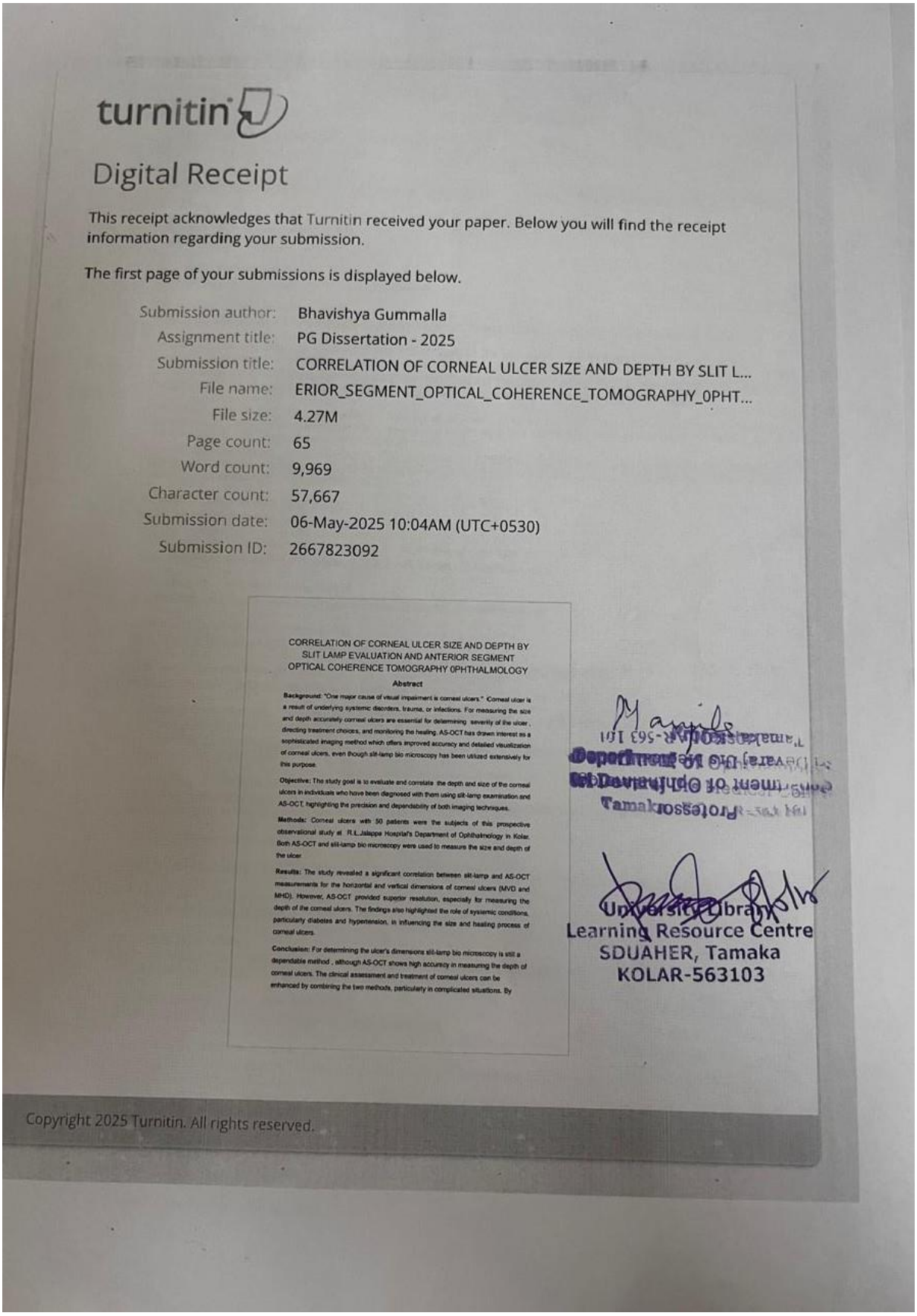

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Abstract

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Conclusion: For determining the ulcer's dimensions slit-lamp bio microscopy is still a dependable method , although AS-OCT shows high accuracy in measuring the depth of corneal ulcers. The clinical assessment and treatment of corneal ulcers can be enhanced by combining the two methods, particularly in complicated situations. By

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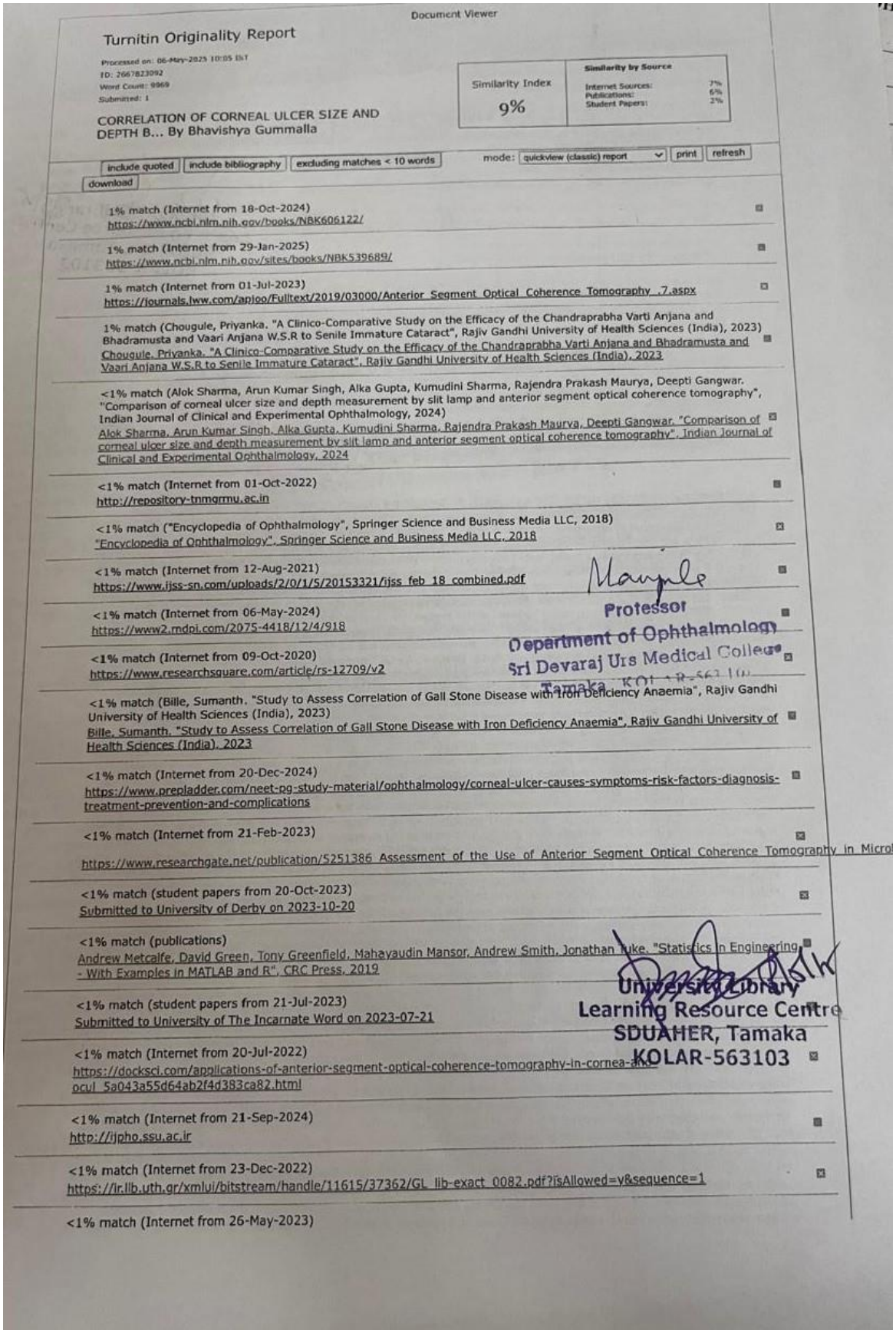

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Methods: Corneal ulcers with 50 patients were the subjects of this prospective observational study at R.L.Jalappa Hospital's Department of Ophthalmology in Kolar. Both AS-OCT and slit-lamp bio microscopy were used to measure the size and depth of the ulcer. Results: The study revealed a significant correlation between slit-lamp and AS-OCT measurements for the horizontal and vertical dimensions of corneal ulcers (MVD and MHD). However, AS-OCT provided superior resolution, especially for measuring the depth of the corneal ulcers. The findings also highlighted the role of systemic conditions, particularly diabetes and hypertension, in influencing the size and healing process of corneal ulcers. Conclusion: For determining the ulcer's dimensions slit-lamp bio microscopy is still a dependable method , although AS-OCT shows high accuracy in measuring the depth of corneal ulcers. The clinical assessment and treatment of corneal ulcers can be enhanced by combining the two methods, particularly in complicated situations. By employing these techniques, early and precise diagnosis is crucial to avoiding problems and enhancing patient outcomes. INTRODUCTION The outermost layer of the eye is cornea, located in front of the anterior chamber, iris, and pupil. It forms a junction with the sclera at the corneal limbus and is essential for refracting light as it enters the eye. The cornea have five distinct layers: "The Epithelium, Bowman's Membrane, Stroma, Duas layer ,Descemet's Membrane, and Endothelium," arranged from inner to outermost. Notably, albumin is primary soluble protein present in the human cornea. 1 Corneal development initiates with the emergence of the presumptive corneal epithelium from the surface ectoderm located near the lens placode. Subsequently, the migration of neural crest cells to the region between the presumptive epithelium and the lens leads to the formation of keratocytes, also known as stromal fibroblasts, as well as the corneal endothelium.1 The cornea's critical transparency necessitates the absence of blood vessels. Through diffusion, it obtains nutrients from the aqueous humor inside the eye as well as from the tear fluid on its exterior. Additionally, the nerve fibers that innervate the cornea provide essential neurotrophins. A corneal ulcer, characterized by a disruption in the outer corneal layer extending into the underlying stroma, is a serious condition considered an ocular emergency.2 Despite timely intervention, patients may still face significant complications, "This can lead to complications like posterior and anterior synechiae, corneal scarring or perforation, cataracts, Glaucoma," and loss of visions. Infectious keratitis can develop into endophthalmitis if treatment is not received, which could lead to blindness.3 The thousands of corneal ulcers incidence is estimated yearly, corneal transplants performed to treat microbial keratitis with around 12.2%4, it may either heal spontaneously without the medical treatment or advancement towards Perforations, leading to severe outcomes, including vision-threatening opacity. The Chronicity of the condition is impacted by several elements, such as geographic and regional variations, the developmental status of a country, contributing risk factors, and prevalent infections within the community.5-6 Determining the severity of corneal ulcers, monitoring their development, and assessing the effectiveness of treatment all depend on accurate assessment. Ophthalmologists typically employ slit-lamp bio microscopy as the conventional method for evaluating corneal ulcers. But there are several limitations to this approach, primarily with relation to accuracy and reproducibility, significantly measurements can be differ between observers due to its inherent subjectivity. Emerging imaging technologies, such as optical coherence tomography (OCT), have shown considerable potential. Because OCT offers a more thorough understanding of corneal illnesses, it has completely changed the clinical and surgical management of these conditions. Low-coherence interferometry is used in (AS- OCT), a non-contact in "vivo imaging technique", to quantify the echo time delay of light will be reflected off by tissue structures. Multiple axial scans are combined by AS-OCT to provide a comprehensive composite B-scan image.7 Fig-1:B.CORNEAL ULCER In the investigation of various corneal diseases, AS-OCT has been employed, including ,Ectatic illnesses, keratitis, corneal dystrophies and degenerations, and as well ocular surface conditions. and also instrumental in managing ocular trauma, planning keratoplasty and refractive surgeries, and monitoring post-operative Recovery. AS-OCT is helpful in identifying subtle or subclinical characteristics, even when the disorders' primary diagnosis is still clinical. Additionally, OCT makes it possible to precisely measure corneal alterations, which helps to

ACKNOWLEDGEMENT

First and foremost, I would like to thank the almighty for giving me the strength and ability to carry out this study.

I take this opportunity to express my deepest gratitude to my teacher and guide, **Dr.MANJULA T.R**, Professor, Department of Ophthalmology, Sri Devaraj Urs Medical College, Tamaka, Kolar, for her invaluable guidance, constant support and encouragement during the course of study and completion of dissertation.

I would like to thank **Dr. SANGEETHA.**T Professor and Head of Department of Ophthalmology, Sri Devaraj Urs Medical College, Tamaka, Kolar, for her constant guidance, support and advice to carry on this study.

I would like to express my heartfelt thanks and deepest gratitude to my Professors **Dr. USHA B R, Dr. RASHMI G**; my Associate Professors, **Dr.INCHARA N, Dr. CHAITRA M. C,** Assistant Professors, **Dr. APOORVA, Dr.NAVEENA A,Dr. NARENDRAN , Dr. ATHIRA,and senior resident Dr. SHWETHA Dr.LOHITH**, Sri Devaraj Urs Medical College Tamaka, Kolar, for their encouragement and suggestions during the course of this study and post-graduation course.

My sincere gratitude and thanks to **Dr. K. PRABHAKAR,** Principal, Sri Devaraj Urs Medical College, Tamaka, Kolar, for letting me use the college and hospital facilities and resources. I would also like to thank my Seniors **Dr.MEGHA VARNIKA, , Dr. SAMEEKSHA, Dr. SUSMITHA, Dr. HASAREEN AND Dr. DEVI SINDHUJA**, for all their help during this study and making my journey through it smooth.

I would also like to thank my batch mates **DR.HIMATEJA** ,**DR.ATHMIKA, DR.HITHESH, DR.ANUNITHA, DR.HANEELA, DR.SANJANA, DR.PRAMUKH, DR.ALISHA, DR.RAVEENA** and all my juniors **Dr.PAVAN,DR.PABBA HARSHITHA,DR.HARSHITHA C,DR.SRILEKHA,DR,PRATIBHA**, my friends **Dr.CHANDANA, DR.VINEETHA DR.PRIYA KOSURU, DR.VISHNU, DR.ROHITH, DR.MAHESH** for their help and support.

I would like to thank my parents, **G.PRATHAP REDDY** and **G**.LAKSHMI DEVI, my in-laws, K.CHALAPATHI REDDY,K.LAKSHMI DEVI

whose countless sacrifices and blessings have made me who I am today. Thank you for always being with me and giving me strength at every step of my life. I would also like to express my sincere gratitude to my husband **K.ANIL KUMAR REDDY**, who is my constant source of happiness and inspires me to strive for excellence.

I Would like to thank my Brother **G.BHANU KIRAN REDDY** and Sis in law Mrs K.**ANISHA** for being my support in always.

I would like to thank my son, **K.VIHAAN REDDY** for his Love ,support ,patience and understanding, I want to thank him for being such a big support during my PG journey,his smile gives me the strength to keep going, he is my biggest motivation and I am so proud of him .

I thank all my patients involved in this study, without whose cooperation, this dissertation would have never materialized. I sincerely thank my institute Sri Devaraj Urs Medical College, Tamaka, Kolar for giving me a wonderful foundation and forum of knowledge in the field of Ophthalmology, which will stand with me for the rest of my life.

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LIST OF ABBREVIATIONS

MVD	– Maximum Vertical Diameter
MHD	– Maximum Horizontal Diameter
SL	– Slit Lamp
OCT	– Optical Coherence Tomography
PVD	– Posterior Vitreous Detachment
DM	– Diabetes Mellitus
HTN	– Hypertension
Keratitis	– Inflammation of the cornea
Fungal Keratitis	– Inflammation of the cornea caused by fungal infection
HSV	– Herpes Simplex Virus
IVCM	– In Vivo Confocal Microscopy
B-scan	– Brightness scan (used in imaging)
PR	– Post Refractive (could be relevant depending on the context)

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ABSTRACT

Background:

"One major cause of visual impairment is corneal ulcers." Corneal ulcer is a result of underlying systemic disorders, trauma, or infections. For measuring the size and depth accurately corneal ulcers are essential for determining severity of the ulcer, directing treatment choices, and monitoring the healing. AS-OCT has drawn interest as a sophisticated imaging method which offers improved accuracy and detailed visualization of corneal ulcers, even though slit-lamp bio microscopy has been utilized extensively for this purpose.

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INTRODUCTION

The outermost layer of the eye is cornea, located in front of the anterior chamber, iris, and pupil. It forms a junction with the sclera at the corneal limbus and is essential for refracting light as it enters the eye. The cornea have five distinct layers: "The Epithelium, Bowman's Membrane, Stroma, Duas layer ,Descemet's Membrane, and Endothelium," arranged from inner to outermost. Notably, albumin is primary soluble protein present in the human cornea. [1]

Corneal development initiates with the emergence of the presumptive corneal epithelium from the surface ectoderm located near the lens placode. Subsequently, the migration of neural crest cells to the region between the presumptive epithelium and the lens leads to the formation of keratocytes, also known as stromal fibroblasts, as well as the corneal endothelium.[1]

The cornea's critical transparency necessitates the absence of blood vessels. Through diffusion, it obtains nutrients from the aqueous humor inside the eye as well as from the tear fluid on its exterior. Additionally, the nerve fibers that innervate the cornea provide essential neurotrophins.

A corneal ulcer, characterized by a disruption in the outer corneal layer extending into the underlying stroma, is a serious condition considered an ocular emergency.[2] Despite timely intervention, patients may still face significant complications, "This can lead to complications like posterior and anterior synechiae, *corneal scarring* or perforation, cataracts, *Glaucoma*," and loss of visions. Infectious keratitis can develop into endophthalmitis if treatment is not received, which could lead to blindness.[3] The thousands of corneal ulcers incidence is estimated yearly, corneal transplants

performed to treat microbial keratitis with around 12.2%[4], it may either heal spontaneously without the medical treatment or advancement towards Perforations, leading to severe outcomes, including vision-threatening opacity. The Chronicity of the condition is impacted by several elements, such as geographic and regional variations, the developmental status of a country, contributing risk factors, and prevalent infections within the community.[5-6]

Determining the severity of corneal ulcers, monitoring their development, and assessing the effectiveness of treatment all depend on accurate assessment. Ophthalmologists typically employ slit-lamp bio microscopy as the conventional method for evaluating corneal ulcers. But there are several limitations to this approach, primarily with relation to accuracy and reproducibility, significantly measurements can be differ between observers due to its inherent subjectivity. Emerging imaging technologies, such as *optical coherence tomography (OCT)*, have shown considerable potential. Because OCT offers a more thorough understanding of corneal illnesses, it has completely changed the clinical and surgical management of these conditions. Low-coherence interferometry is used in (AS-OCT), a non-contact in "vivo imaging technique", to quantify the echo time delay of light will be reflected off by tissue structures. *Multiple axial scans* are combined by AS-OCT to provide a comprehensive composite B-scan image.[7]

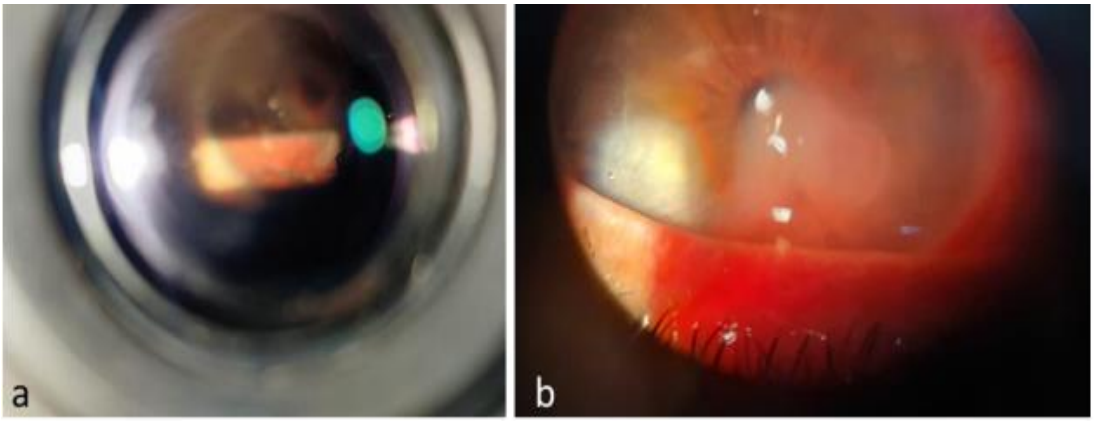
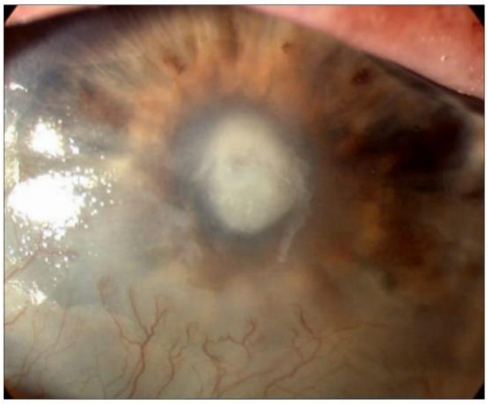


Fig-1:B.CORNEAL ULCER

In the investigation of various corneal diseases, AS-OCT has been employed, including ,Ectatic illnesses, keratitis, corneal dystrophies and degenerations, and as well ocular surface conditions. and also instrumental in managing ocular trauma, planning keratoplasty and refractive surgeries, and monitoring post-operative Recovery. AS-OCT is helpful in identifying subtle or subclinical characteristics, even when the disorders' primary diagnosis is still clinical. Additionally, OCT makes it possible to precisely measure corneal alterations, which helps to assess the condition's severity and monitor its progression over time.



There will be 6 layers in the Cornea : “The Epithelium, Bowman's Membrane, Stroma, Duas layer ,Descemet's Membrane, and Endothelium,”. Corneal ulcers are categorized based on the involvment, cause and location. The Etiology could be non-infectious (like neurotropic, neuroparalytic, vitamin A insufficiency, or Mooren's ulcer) or infectious (like bacterial, viral, fungal, pythium, and protozoa causes). The ulcer might be superficial or deep, and it can be central, paracentral, or peripheral.[8]

AIM & OBJECTIVES

AIM

To study correlation of corneal ulcer size and depth by Slit Lamp evaluation and Anterior segment optical coherence tomography

OBJECTIVES:

Primary outcome

To measure and correlate the depth and size of corneal ulcers, using Slit lamp examination and anterior segment optical coherence tomography .

REVIEW OF LITERATURE

Corneal ulcer size is a critical parameter in assessing its severity, monitoring the healing process and guiding treatment. The dimensions of a corneal ulcer are typically measured in terms of horizontal and vertical diameter, as well as the depth of the lesion, which collectively reflect the extent of stromal involvement and tissue damage.

Measurement Techniques[9,11]

- **Slit-Lamp Examination**:
  - A slit lamp with a cobalt blue filter is used with fluorescein dye to highlight the ulcer's edges.
  - The examiner measures the horizontal and vertical dimensions in millimetres using the calibrated scale on the slit lamp.
- **Optical Coherence Tomography:**
  - Offers high-resolution imaging for precise depth evaluation
  - Useful in monitoring deep stromal ulcers.
- **Photography**:
  - Digital imaging of the ulcer allows for more precise measurements and documentation.
  - Software tools may assist in quantifying ulcer dimensions over time.

2. Classification by Size

- **Small Ulcers**:

  Diameter < 2 mm, minimal stromal involvement, typically seen in early stages or superficial infections.

- **Medium-Sized Ulcers**:

  Diameter 2–6 mm, moderate stromal thinning, indicative of progressive infection.

- **Large Ulcers**:

  Diameter > 6 mm or involvement of multiple corneal quadrants, often associated with severe infection and complications like perforation.

3. Depth Assessment

- **Epithelial Ulcers:**

  Limited to the epithelial layer with no stromal penetration.

- **Superficial Stromal Ulcers:**

  Involve the anterior stroma generally more responsive to treatment.

- **Deep Stromal Ulcers:**

  It extends into the posterior stoma and may approach Descemet's membrane, thereby increasing the risk of perforation.

- **Perforated Ulcers:**

  Full-thickness involvement leading to a breach in the corneal integrity.

4. Clinical Significance of Size

- **Larger Ulcers**:
  - Higher risk of complications such as scarring, perforation, or secondary infections.
  - Often associated with virulent pathogens like *Pseudomonas aeruginosa* or fungal organisms.
- **Smaller Ulcers**:
  - More localized, better prognosis if treated early.
  - Typically seen with minor trauma or less aggressive pathogens.

5. Factors Influencing Size

- **Pathogen Type:**

  Bacterial ulcers progress faster, fungal ulcers are often larger and deeper, and viral ulcers may have dendritic or geographic shapes.

- **Immune Response**:

  Delayed treatment or systemic immunosuppression can allow the ulcer to enlarge.

- **Treatment Delays**:

  Inadequate or delayed therapy increases the risk of ulcer expansion.

6. Monitoring Progression

- Regular measurements of ulcer dimensions are essential to evaluate treatment efficacy.

- Indicators of healing include a reduction in size, re-epithelialization, and resolution of stromal edema.

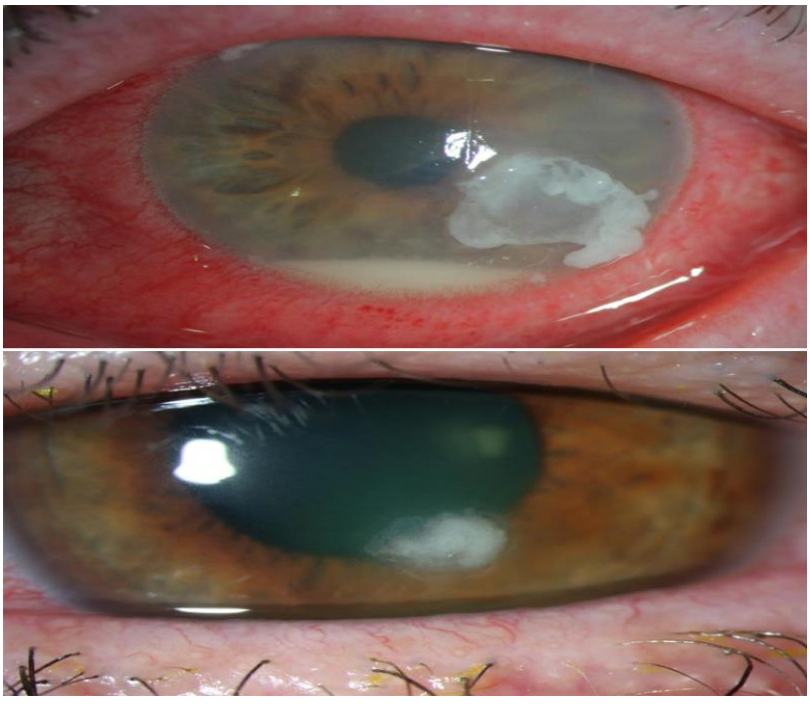
- Lack of improvement or enlargement warrants re-evaluation of the diagnosis and treatment strategy.

7. Clinical Implications[10]

Corneal ulcer size directly impacts the treatment approach and prognosis:

- **Small/Localized Ulcers**: Managed with topical antibiotics or antivirals and regular monitoring.
- **Large/Extensive Ulcers**: May require intensive therapy, systemic medications, or surgical interventions such as corneal transplantation.
- **Perforated Ulcers**: Emergency surgical repair with tissue adhesive or keratoplasty.

Corneal Ulcer



Etiology

Bacterial:

Bacterial pathogens are the most common cause of infectious corneal ulcers, which typically develop after keratitis (corneal inflammation) following a disruption in the corneal epithelium allows bacteria to invade the stroma. Ocular trauma, corneal abrasions, and contact lens use are frequently linked to these epithelial breaches. Diabetes, previous eye surgeries, long-term eye disorders, corticosteroid use, tainted eye drugs, and agricultural labor are other risk factors. Pseudomonas aeruginosa, coagulase-negative staphylococci, and Staphylococcus aureus are common bacterial infections. In cases of polymicrobial keratitis, Staphylococcus epidermidis and Staphylococcus fusarium are often implicated, with trauma being a significant contributing factor. Other causative bacteria include Streptococcus pyogenes and Streptococcus pneumoniae. [12-17]

Viral:

These epithelial breaches are often associated with contact lens use, corneal abrasions, and ocular trauma. Other risk factors include corticosteroid use, tainted eye medications, diabetes, prior eye surgeries, long-term eye conditions, and agricultural work. Common bacterial infections include Staphylococcus aureus, coagulase-negative staphylococci, and pseudomonas aeruginosa.

Fungal:

Fungal infections account for 5–10% of corneal ulcer cases and are more prevalent in warm, humid regions. These infections often follow trauma involving plant or vegetable material. Common fungal pathogens include "Aspergillus, Fusarium, Scedosporium apiospermum, phaeohyphomycetes, and Candida species."

Protozoan :

"Acanthamoeba, a free-living protozoan commonly found in soil and freshwater," is a significant cause of keratitis and corneal ulcers, especially among contact lens users.,

Pythium

Protozoan Pythium will cause Pythium keratitis is a relatively recent and highly virulent cause of vision-threatening keratitis. It often leads to severe complications and poor outcomes.

Autoimmune Disease:

While the majority of corneal ulcers are infectious, non-infectious factors such as autoimmune diseases also contribute. Peripheral ulcerative keratitis (PUK), frequently linked with systemic autoimmune disorders, it is the second most common ocular problem following anterior uveitis. Collagen vascular diseases, particularly rheumatoid arthritis, are responsible for about 50% of PUK cases. Wegener granulomatosis, recurrent polychondritis, polyarteritis nodosa, Churg-Strauss syndrome, and microscopic polyangiitis are further autoimmune diseases linked to PUK.

Epidemiology[17-20]

In the United States, keratitis causes about one million clinic and ED visits each year and frequently precedes corneal ulcers. Although corneal ulcers can develop in people of any age, they are more common in contact lens wearers, particularly those who use extended-wear lenses. According to a California study, females between the ages of 25 and 34 had the highest prevalence of bacterial corneal ulcers, with a rate of 60.3 per 100,000 person-years.

Ocular herpes infections, primarily caused by HSV-1, have an estimated incidence of 5to 20cases per 10,000 per year in developed countries. Bilateral cases are rare (1.3–12%) and tend to be more severe, often occurring in younger individuals.

"Fungal keratitis is rare but more commonly seen in young male outdoor workers and is more prevalent in tropical and subtropical regions". In the UK

"The incidence of fungal keratitis is approximately 0.32 cases per million person-years, whereas in tropical regions, fungal infections may account for up to 50% of all infectious keratitis cases. Peripheral ulcerative keratitis, whether occurring independently or in association with autoimmune conditions, has an estimated annual incidence of 3 cases per million people."

Pathophysiology[21-22]

The eye's primary defense mechanisms include the corneal epithelium (serving as a mechanical barrier), the conjunctiva (acting as a cellular and chemical barrier), and the tear film, which offers biological protection. These defenses can be categorized into anatomical, mechanical, and antimicrobial barriers

- **Anatomical Barriers:**

1. Bony orbital rim
2. Eyelids
3. Conjunctival epithelium
4. Corneal epithelium

- **Barriers - Mechanical:**

- Tear film, particularly the mucus layer

- Lacrimal drainage system

- **Barriers - Antimicrobial:**

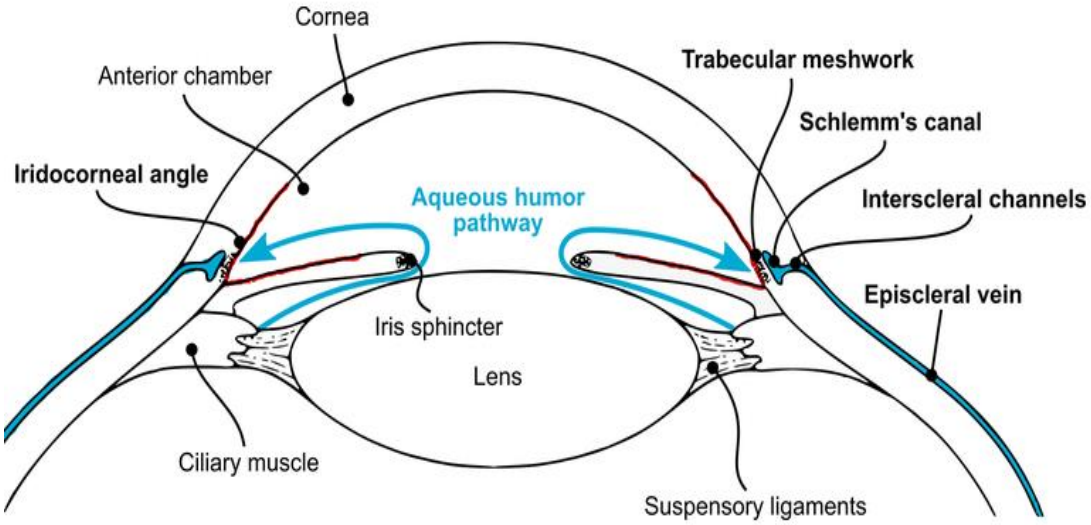
- Conjunctiva-associated lymphoid tissue (CALT)
- Beta lysins, lactoferrin, complement proteins, lysozyme, and IgA are examples of tear film constituents.

Microorganisms adhere to the corneal surface when a corneal abrasion occurs, proliferate, penetrate the stromal layers, releasing toxins and lytic enzymes that intensify tissue damage. This initiates an immune response, with polymorphonuclear neutrophils migrating from the limbal vessels and tears to the affected site. "The release of interleukins, cytokines, free radicals, and proteolytic enzymes contributes to further corneal tissue necrosis. This results in the typical saucer-shaped defect with raised edges and stromal edema. Furthermore, the degenerative process is made worse by fluid infiltration into the corneal stroma within the grey zone of infiltration."

Optical coherence tomography of the anterior segment, or ASOCT

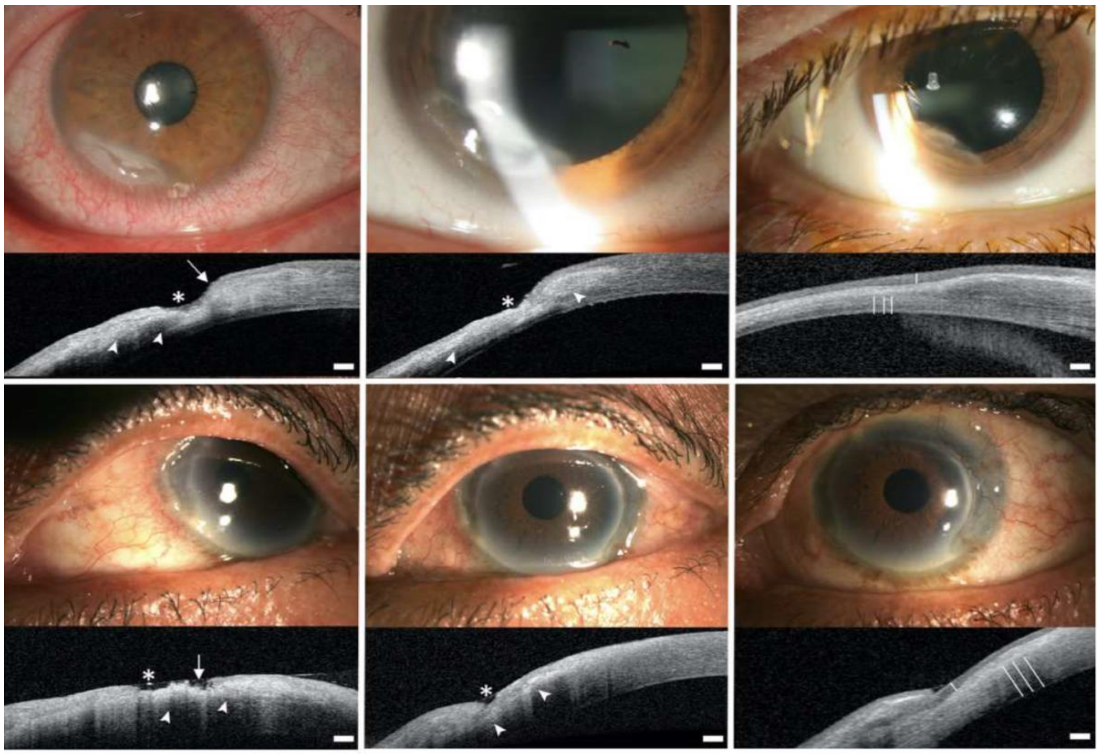
A non-invasive imaging method called anterior segment optical coherence tomography (AS-OCT) produces high-resolution pictures and quantitative information on the anterior segment and its anatomical features. OCT technology has advanced quickly during the last 20 years, moving from time-domain to Fourier-domain OCT devices. These developments have made AS-OCT devices adaptable instruments for analyzing the anterior segment and ocular surface in clinical and research contexts. The purpose of this article is to examine OCT technology, AS-OCT devices, and their scientific and clinical uses. First, we outline the various forms of OCT technology, how they are modified for AS-OCT imaging, and how AS-OCT

devices differ from one another. AS-OCT can be used to image the anatomical characteristics and aqueous outflow structures of the anterior segment, such as Schlemm's canal, trabecular meshwork, and anterior chamber angle. In addition to evaluating glaucoma treatments such as laser peripheral iridotomy (LPI) and glaucoma surgery, the article also looks at the use of AS-OCT in glaucoma and the measurement of both static and dynamic biometric risk factors for primary angle closure disease (PACD). Finally, we discuss other clinical applications of AS-OCT for the diagnosis and management of diseases affecting the cornea, lens, and ocular surface.



A specific type of OCT technology (AS-OCT) is intended for scientific investigation and clinical treatment of illnesses affecting anterior segment and ocular surface.[23-25] Compared to imaging the posterior region, imaging the anterior segment poses distinct obstacles. First, a deeper and wider scan is required to capture the full anterior region than is usually required for the posterior segment. Longer light wavelengths, which are often absorbed by the vitreous in posterior segment imaging, can be used since the anterior segment is more optically accessible than the posterior segment.

Additionally, by modifying the numerical aperture, transverse resolution can be enhanced. This is not as possible in the posterior segment because of the higher degree of optical aberrations that limit resolution. Given these considerations, sources with longer wavelengths are frequently chosen for anterior segment imaging because they offer greater penetration depth. [24]



Top Row (A and B):

"AS-OCT (A): Displays a fairly normal corneal structure. The layers of the cornea seem smooth and consistent. The anterior chamber angle looks open."

Slit Lamp Image (B): Depicts an eye that appears to have a central corneal opacity or scar. The cornea is not entirely clear. The light reflex is somewhat irregular.

Middle Row (C and D):

AS-OCT (C): This image illustrates a more intricate condition. There seem to be:

Iridocorneal touch (labeled): Indicating that the iris is touching the cornea.

Fibrous membrane(labeled): Signifying a layer of tissue or scar tissue on the posterior surface of the cornea,.

Slit Lamp Image (D): This image depicts an eye with considerable corneal irregularities:

The cornea is opaque and uneven.

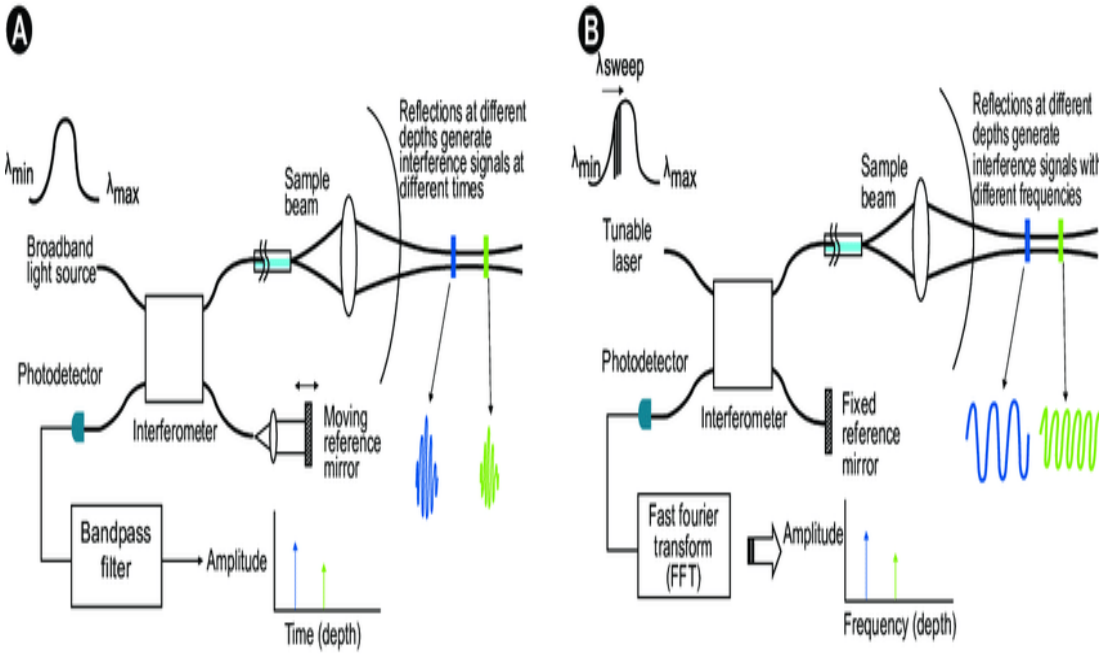
There is a prominent opacity or membrane on the inner surface of the cornea (probably corresponding to the fibrous membrane observed in the AS-OCT).

Bottom Row (E and F):

AS-OCT (E): This image probably depicts a post-operative or recovered corneal state. The layers of the cornea seem quite uniform, although there may be some slight alterations.

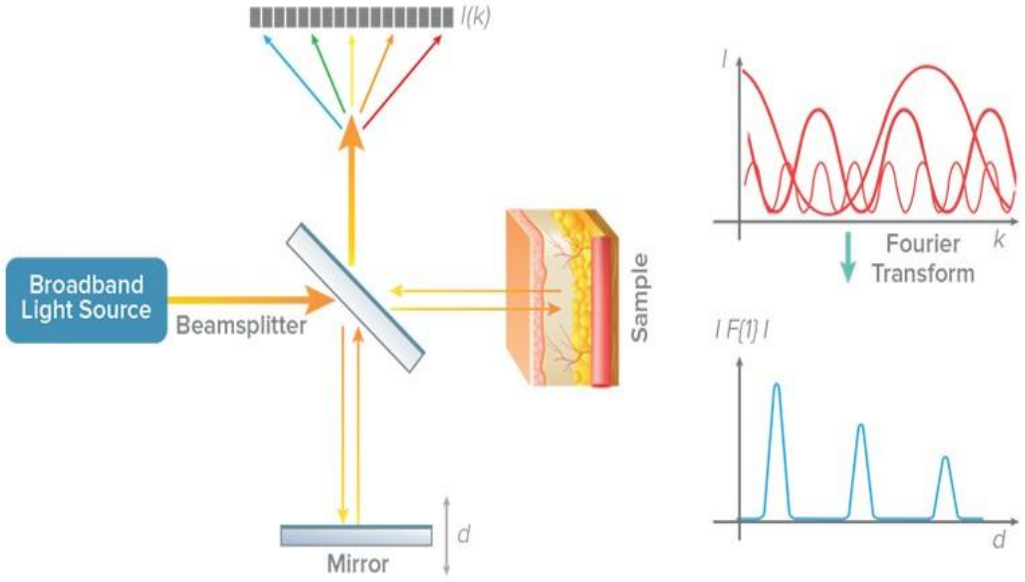
Slit Lamp Image (F): This image presents an eye with a transparent cornea, potentially following some form of intervention (surgery or treatment). There is a clearly defined structure, which might be an intraocular lens (IOL) if the patient underwent cataract surgery, or a corneal implant.

Optical coherence Tomography in the Time Domain



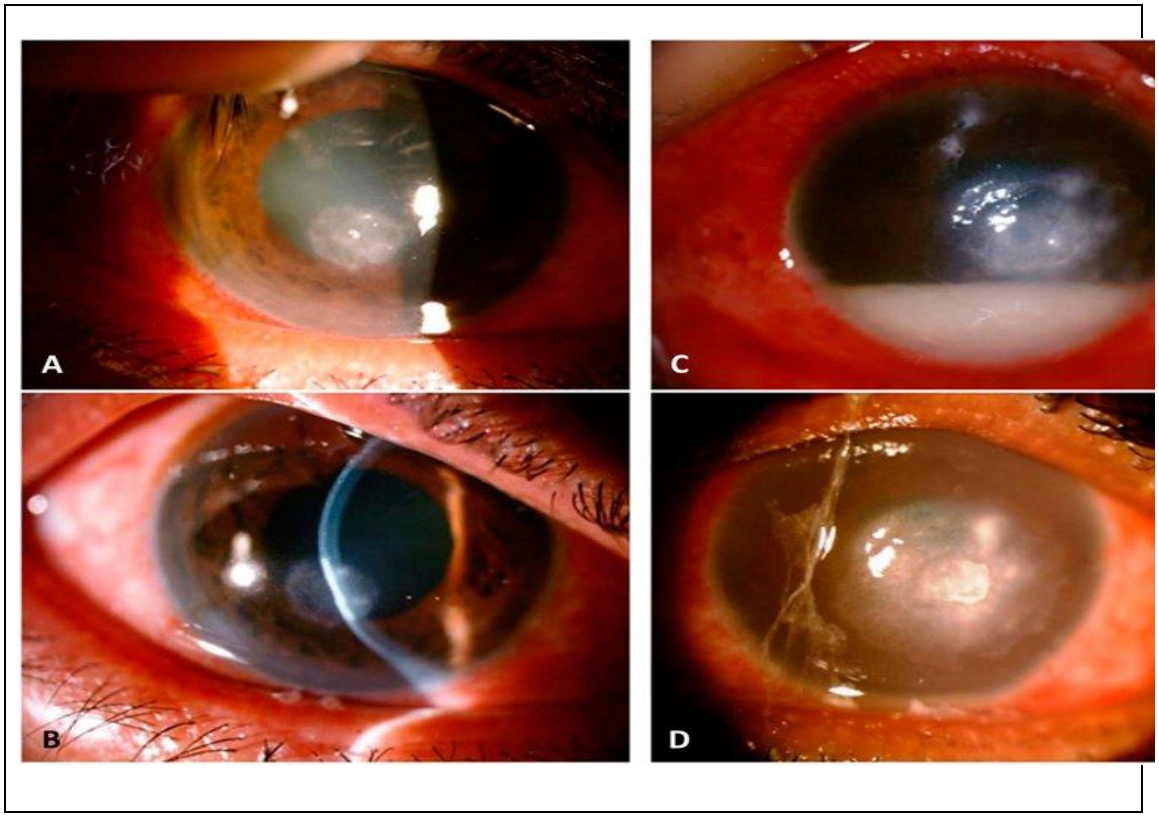
Time-domain OCT (TD-OCT) is an early OCT technique that creates two-dimensional images akin to ultrasound technology by measuring the time delay and intensity of backscattered light from different tissue depths using a low-coherence interferometer. However, TD-OCT only records one point at a time, and its depth resolution is constrained by the light source's coherence length. Compared to more sophisticated OCT technologies, TD-OCT usually uses a super luminescent diode with a relatively broad spectrum as its light source, which leads to inferior image resolution. Newer techniques that provide higher image resolution, faster acquisition speeds, and more imaging capabilities have generally supplanted TD-OCT.

Optical Coherence Tomography in the Spectral Domain:



Spectral-domain OCT (SD-OCT) is a second-generation technology that provides better picture quality, enhanced tissue penetration, and noticeably quicker recording rates. By using a spectrometer to record the backscattered light spectrum, SD-OCT allows for the simultaneous evaluation of several tissue sites.[26] The faster data acquisition speed improves resolution and makes three-dimensional tissue imaging easier. SD-OCT creates high-resolution, cross-sectional pictures of biological tissues by applying Fourier transforms. The light source that illuminates the tissue is a broadband super luminescent diode. A spectrometer, which separates the light into its distinct wavelengths, detects the reflected light. To create high-resolution images, interference patterns between reflected light and a reference beam are measured for each wavelength and then processed using Fourier transformations.[28]

Slit Lamp:



The slit lamp bio microscope is a vital diagnostic tool in ophthalmology, used to examine the anterior and posterior segments of the eye with high magnification. It consists of an observation system, illumination system, and mechanical support to provide a focused beam of light at adjustable angles and widths. This device is essential for visualizing corneal conditions, cataracts, and retinal diseases.[30]

Base: Includes adjustable tables, power switches, and rheostats for light adjustment.

Illumination Arm: Contains a light source, filters, and beam adjusters for various illumination techniques like diffuse, focal, and retro-illumination.

Viewing Arm: Provides the magnification control and eyepiece.

Clinical Significance: The slit lamp enables detailed examination of the cornea, anterior chamber, iris, and lens. It also facilitates techniques for measuring corneal thickness, assessing pupil size, and grading cataracts.

Illumination Techniques:

Diffuse Illumination: Used for a gross examination of the anterior segment.

Direct Focal Illumination: Focuses light on specific structures like the cornea or lens.

Conical Beam: Highlights aqueous flare and anterior chamber cells.

Optical Section: Used for detailed observations of the corneal layers.

- Byrd LB, et al. (2024) [32]. Corneal Ulcer. A corneal ulcer is an epithelial defect that extends into the corneal stroma, representing a potentially vision-threatening emergency. It can lead to tissue destruction, infiltration, and necrosis. Even with prompt treatment, complications such as corneal scarring, perforation, glaucoma, cataracts, synechiae, and loss of vision may arise. If left untreated, bacterial keratitis can progress to endophthalmitis, resulting in blindness. In the United States, the annual incidence of corneal ulcers is estimated to be between 30,000 and 75,000 cases, with 12.2% of corneal transplants performed due to infectious keratitis. Early recognition is crucial for effective treatment. Corneal ulcers are categorized by cause, location, and layer involvement, with both infectious (bacterial, viral, fungal, protozoal) and noninfectious (e.g., neurotrophic, vitamin A deficiency) causes. Risk factors include ocular trauma, dry eyes, contact lens use, and systemic conditions like diabetes and immunosuppression. Infective keratitis is particularly linked to improper contact lens care.
- Tawfeek MM, et al. (2023) [33]**.** Correlation Between Slit Lamp (SL) Examination and Anterior Segment Optical Coherence Tomography (AS-OCT) for The Evaluation of Central Infectious Corneal Perforation. AS-OCT is a reliable non-invasive method for assessing corneal perforation and its healing process, providing detailed information on wound healing and surrounding tissue that the slit lamp cannot detect. It has been shown to be more accurate than slit lamp examination in evaluating corneal perforations. Corneal perforations, caused by trauma, autoimmune diseases, ocular surface diseases, and microbial keratitis, pose a significant risk to ocular health and require prompt surgical intervention to prevent complications like endophthalmitis, choroidal hemorrhage, and glaucoma. AS-OCT offers ultra-high-resolution imaging

(<5 μm) and a non-invasive, in vivo cross-sectional view of the cornea, providing superior axial resolution of the ocular surface and corneal structure.

- Bonnet C, et al. (2020) [34]. Anterior Segment Optical Coherence Tomography Imaging in Peripheral Ulcerative Keratitis: A Corneal Structural Description. Slit-lamp photographs were taken using a Canon 20D camera with a Haag-Streit flash unit, while AS-OCT was performed with the Spectralis OCT anterior segment module (Heidelberg Engineering). AS-OCT, with an axial resolution of 7 μm and a frame rate of 40, was effective in tracking disease activity in Peripheral Ulcerative Keratitis (PUK). It helped monitor corneal thickness progression, detect recurrences early, and enable timely treatment adjustments. This underscores AS-OCT's value as a non-invasive imaging tool for PUK diagnosis and management.
- Gupta N, et al. (2022) [35]. Role of AS-OCT in Managing Corneal Disorders. AS-OCT is a non-invasive imaging modality that provides accurate, high-resolution visuals of the cornea and ocular surface. Its increasing popularity is driven by technological advancements that enhance diagnostic accuracy. However, AS-OCT adoption remains limited. This review discusses its role in diagnosing corneal and ocular surface disorders in humans and animal models, with representative scan images. AS-OCT is essential for distinguishing benign lesions from malignant ocular surface squamous neoplasia (OSSN), assessing pterygium, and evaluating astigmatism risk. Further research is needed to expand its applications, especially with the development of OCTA technology
- Jin X, et al. (2022) [36]. Clinical Observation of Corneal Endothelial Plaques With Fungal and Bacterial Keratitis by Anterior Segment Optical Coherence Tomography. Early diagnosis of infectious keratitis can be facilitated by AS-OCT and IVCM, which help detect corneal endothelial plaques. The study included 24 patients with

bacterial keratitis and 28 with fungal keratitis, diagnosed through cultures, smears, or IVCM findings. IVCM revealed densely packed inflammatory cells in the endothelial layer of patients with bacterial keratitis, while AS-OCT showed unclear boundaries between the corneal endothelium and endothelial plaque in fungal keratitis cases. These diagnostic tools offered valuable insights for the early detection and differentiation of bacterial and fungal keratitis.

- Han SB, et al. (2016) [37].Applications of Anterior Segment Optical Coherence Tomography in Cornea and Ocular Surface Diseases. AS-OCT is a non-contact method for assessing the structure of the cornea, conjunctiva, sclera, anterior chamber, and surrounding anterior segment. It provides high-resolution images quickly and is valuable for research, surgery planning, postoperative monitoring, and diagnosing corneal and anterior segment diseases. It is anticipated that developments like as UHR-OCT and En face OCT will provide even more accurate perspectives, improving the capacity for diagnosis and therapy. Since its 1994 introduction and 2001 commercial release, OCT—which was created by Huang et al.—has been utilized extensively to create detailed cross-sectional images using low-coherence interferometry.
- Xiang X, et al. (Year) [38]. Ocular Adverse Reactions to Immunotherapies and Targeted Therapies in the Treatment of Cancer. While ocular side effects are typically less severe than systemic reactions, they can nonetheless have a major impact on patients' eyesight and quality of life. This is true for both targeted medicines and immunotherapies. Careful monitoring is crucial because certain negative ocular consequences can cause irreversible eye damage. Assessing ocular health and visual function is essential early in cancer treatment, paying special attention to mild symptoms like conjunctivitis and dry eye. Oncologists should work with

ophthalmologists when needed and be on the lookout for any possible ocular side effects. Additionally, the report offers fresh information on corneal ulcers linked to slit lamps and as-oct, urging more investigation into the ocular adverse effects of cancer treatments.

METHODS AND MATERIALS

SOURCE OF DATA:

"This prospective observational clinical study was conducted on a minimum of 50 patients who met the inclusion criteria in the Department of Ophthalmology, R. L. Jalappa Hospital and Research, Kolar, from May 2023 to October 2024. Ethical clearance was obtained from the Institutional Ethical Committee of Sri Devaraj Urs Medical College, and written informed consent was taken from the participants."

STUDY AND DESIGN:

"It was hospital based prospective, observational clinical study."

INCLUSION CRITERIA:

cases of corneal ulcer infection before corneal scraping.

- Corneal ulcer of size > 2 mm.

EXCLUSION CRITERIA:

a. Perforated ulcer

b. Impending perforation of ulcer

c. Total corneal ulcer

- Previous corneal surgery in the affected eye

METHOD OF COLLECTION OF DATA:

- This prospective, observational study was conducted in a hospital. The study's patients were chosen from RLJH Kolar's ophthalmology department. Based on the inclusion and exclusion criteria, a total of patients with corneal ulcer diagnoses were chosen for the study.
- A thorough history and examination of the eyes were recorded. Snellen's chart was used to measure visual acuity at a distance of six meters.
- Prior to the corneal scraping process, the corneal ulcer was first examined under a slit-lamp biomicroscope by a senior resident and a guide, and the results were recorded. ZIESS OCT (PRIMUS200) was used to measure the ulcer size after slit-lamp inspection.
- Two separate observers measured the parameters, and the final value for result interpretation was the average of the two values.
- The parameters were measured by two different people, and the average of the two values was used to interpret the results.
- The maximum vertical diameter (length), maximum horizontal diameter (breadth), depth of infiltration, and corneal thickness at the ulcer's thinnest point were the characteristics measured by anterior segment optical coherence tomography.

Sample size:

The study by Das M et al. used the Intra class correlation coefficient (r) of scar size (measurements made by two different people were least reproducible when evaluated from slit lamp examination) to estimate the sample size. The result was 0.80 (i.e., r = 0.80). By entering these numbers into the algorithm below, with a 99% confidence level and 90% power, a sample size of 50 was determined.

Sample size = N = [(Zα+Zβ)/C]2 + 3

The standard normal deviate for α = Zα = 2.58

The standard normal deviate for β = Zβ = 1.28

r = Correlation coefficient = 0.80

C = 0.5 * ln[(1+r)/(1-r)] = 1.0986

N = 50

Data visualization: Several graph forms, including bar diagrams, pie diagrams, and scatter plots, were created using Microsoft Word and Excel.

To determine the correlation between two quantitative and qualitative variables, respectively, Pearson correlation and Spearman's correlation were used.

Correlation coefficient (r)	Interpretation
0 - 0.3	Positive Weak correlation
0.3-0.6	Positive Moderate correlation
0.6-1.0	Positive Strong correlation
0 to (-0.3)	Negative Weak correlation
(-0.3) to (-0.6)	Negative Moderate Correlation
(-0.6) to – (1)	Negative Strong Correlation

- A P value of <0.05 (the probability that the result is true) was considered statistically significant, assuming all the conditions of the statistical tests were met.
- " **Statistical software** such as MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze the data. EPI Info (CDC Atlanta), Open Epi, MedCalc, and Medley's desktop were utilized to estimate sample size, odds ratio, and reference management in the study."

OBSERVATION AND RESULTS:

Table-1 : PATIENTS DISTRIBUTION BY AGE

Age	No.Patients	%
50 - 59	17	34.0
60 - 69	17	34.0
70 - 79	13	26.0
80 - 89	3	6.0
Total	50	100.0

The age distribution of the study participants is shown in this table. One important demographic factor that can affect the occurrence and course of corneal ulcers is age; older patients are frequently at a higher risk of developing ocular problems. According to the data, the largest proportion of patients—34 percent of the sample as a whole—fall within the 50–69 age range. Cases in the 70–79 age range have significantly decreased (26%), whereas the 80–89 age group has the fewest cases (6%). Knowing the age distribution is crucial because it puts potential risk factors for corneal ulcers, like concomitant diseases like diabetes and aging-related physiological changes like weakened immune systems and slowed healing, into perspective.

Graph- 1 : PATIENTS DISTRIBUTION BY AGE

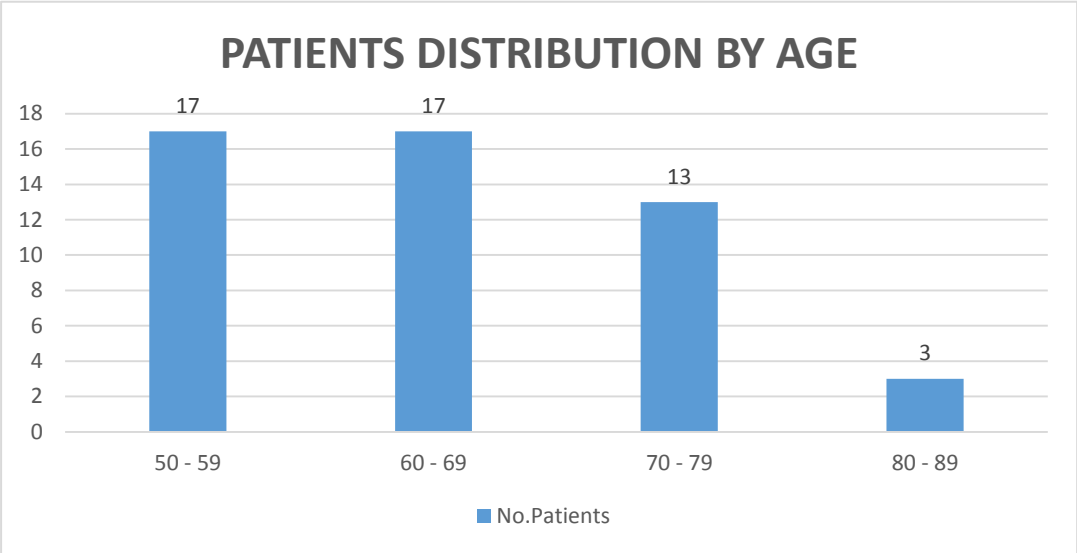


Table- 2 : PATIENTS DISTRIBUTION BY GENDER

Gender	No. of Patients	%
Female	21	42.0
Male	29	58.0
Total	50	100.0

50 patients in all, 42% of whom were female (21 patients) and 58% of whom were male (29 patients), were assessed in the present study. The disorder is more common in male patients than in female patients in this cohort, according to the gender distribution.

Graph - 2 : PATIENTS DISTRIBUTION BY GENDER

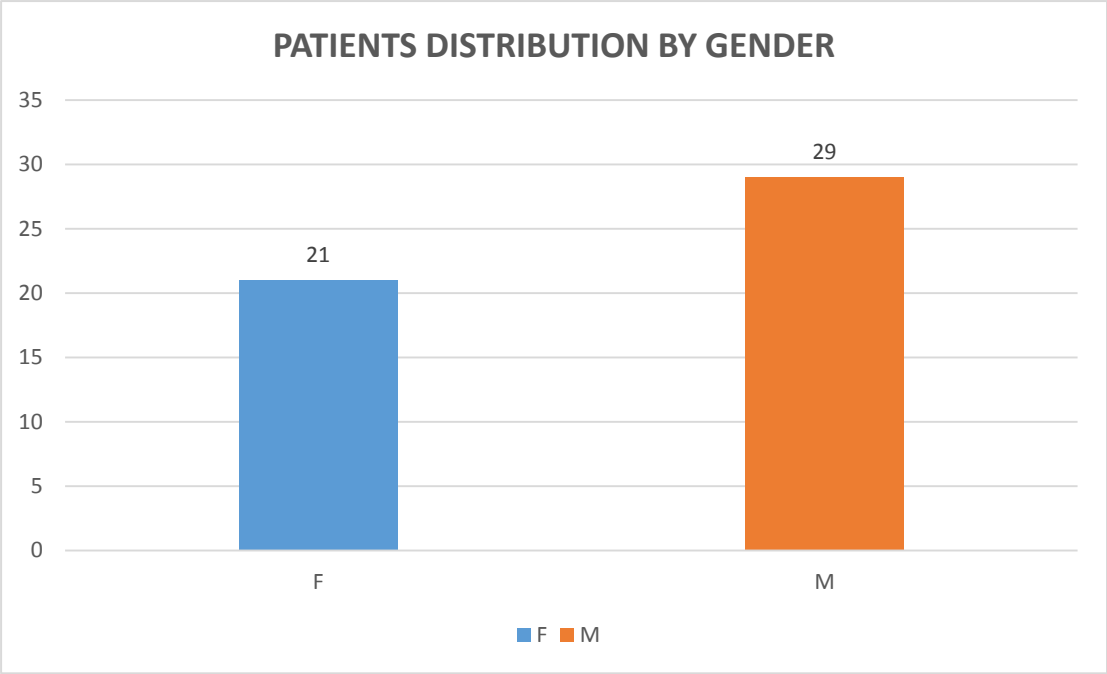


Table-3: LOGMAR VISUAL ACUITY OF PATIENTS

LogMAR	No. Patients	%
.3	15	30.0
.6	12	24.0
1.2	14	28.0
1.7	9	18.0
Total	50	100.0

The LogMAR scale was used in this investigation to evaluate the patients' visual acuity. 15% of the 50 patients had a LogMAR of 0.3, which is indicative of modest vision impairment. 28% (14 patients) had a LogMAR of 1.2, suggesting moderate vision impairment, while 24% (12 patients) had a LogMAR of 0.6. Nine patients, or the remaining 18%, had a LogMAR of 1.7, indicating more severe vision impairment.

Graph-3: LOGMAR VISUAL ACUITY OF PATIENTS

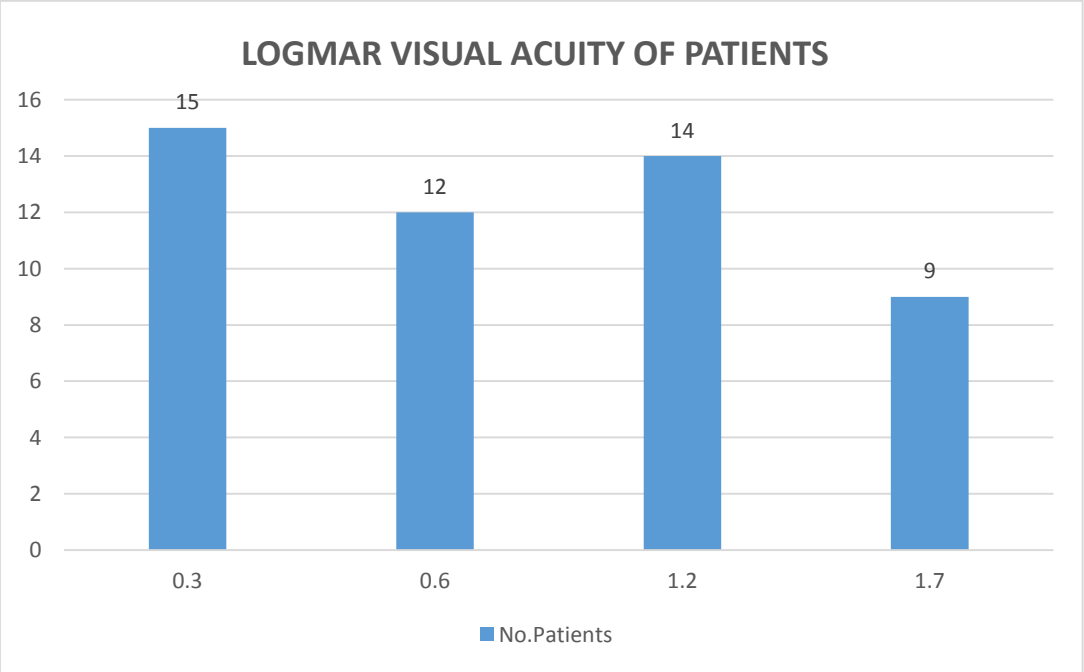


Table-4: TIME SINCE INJURY

Time ingury	No. Patients	%
5	15	30.0
10	12	24.0
15	14	28.0
20	9	18.0
Total	50	100.0

The table shows the period since injury, which is a crucial component in assessing the healing process and any side effects of *corneal ulcers*. A significant percentage of patients (30%) were injured during the last five days, indicating acute situations that would need immediate medical attention. The distribution of the remaining cohort varies: 28% of patients had injuries 15 days ago, whereas 24% had injuries 10 days ago. Additionally, 18% of patients who were injured 20 days ago are highlighted in the table. Complications include infection, scarring, and delayed healing are more likely the longer it has been since the incident. “This information is essential for comprehending the relationship between the corneal ulcer's development and the time of injury”.

Graph-4: TIME SINCE INJURY

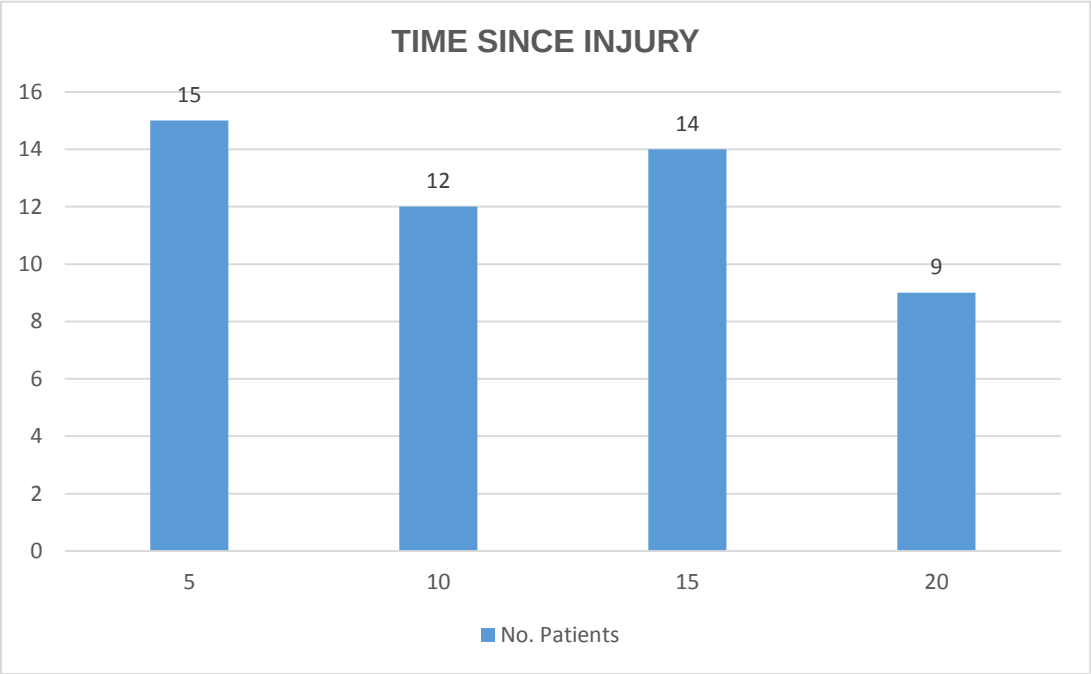


Table-5: SYSTEMIC ILLNESSES IN PATIENTS

SYSTEMIC ILLNESS	No. Patients	%
Diabetes	18	36.0
DM & HTN	1	2.0
Hypertension	15	30.0
None	16	32.0
Total	50	100.0

The participants in the current study had the following distribution of systemic illnesses: Thirty percent (15 patients) had hypertension, thirty six percent (18 patients) had diabetes, two percent (1 patient) had both diabetes and hypertension, and thirty-two percent (16 patients) had no systemic illness.

Graph-5: SYSTEMIC ILLNESSES IN PATIENTS

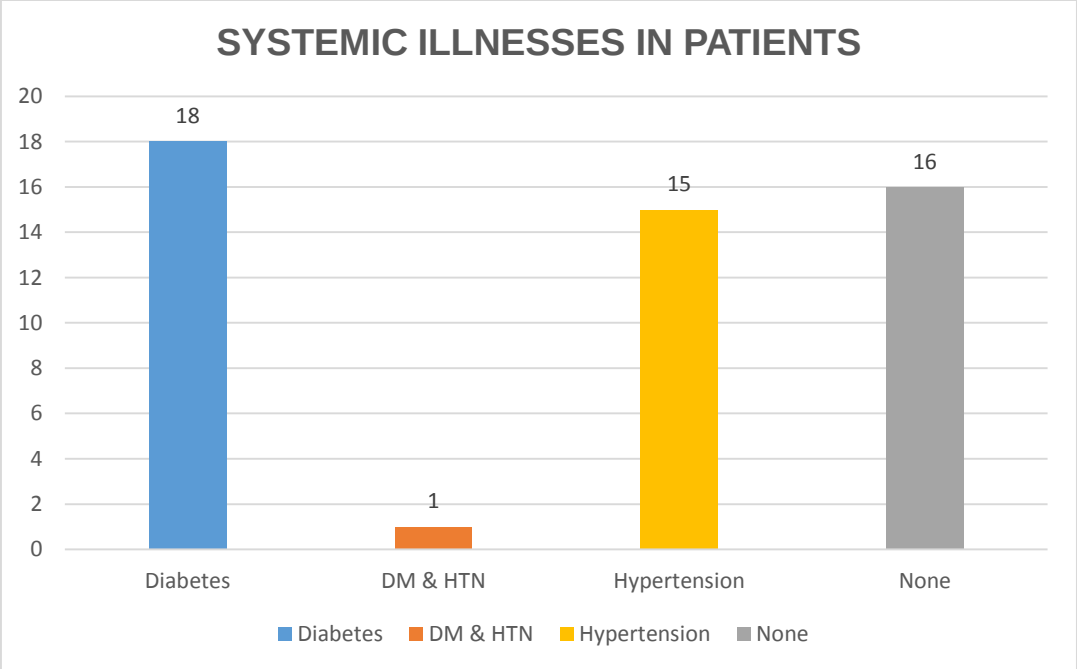


Table-6: OCCUPATION OF PATIENTS

Job	No. Patients	%
Agricultural	15	30
Laborers	12	24
Professional	9	18
Unemployed	14	28
Total	50	100

the occupational distribution of the study participants, which is crucial for understanding potential environmental and physical risk factors for corneal ulcers. Around 30% of the patients were employed in agriculture, a field frequently associated with eye injuries due to exposure to dust, debris, and physical stress. Twenty-four percent were workers, another group at higher risk for trauma. Professionals make up 18%, whereas 28% are unemployed. Occupational dangers, particularly in manual labor and agriculture, are a major cause of corneal ulcers, particularly when protective eyewear is not worn.

Graph-6: OCCUPATION OF PATIENTS

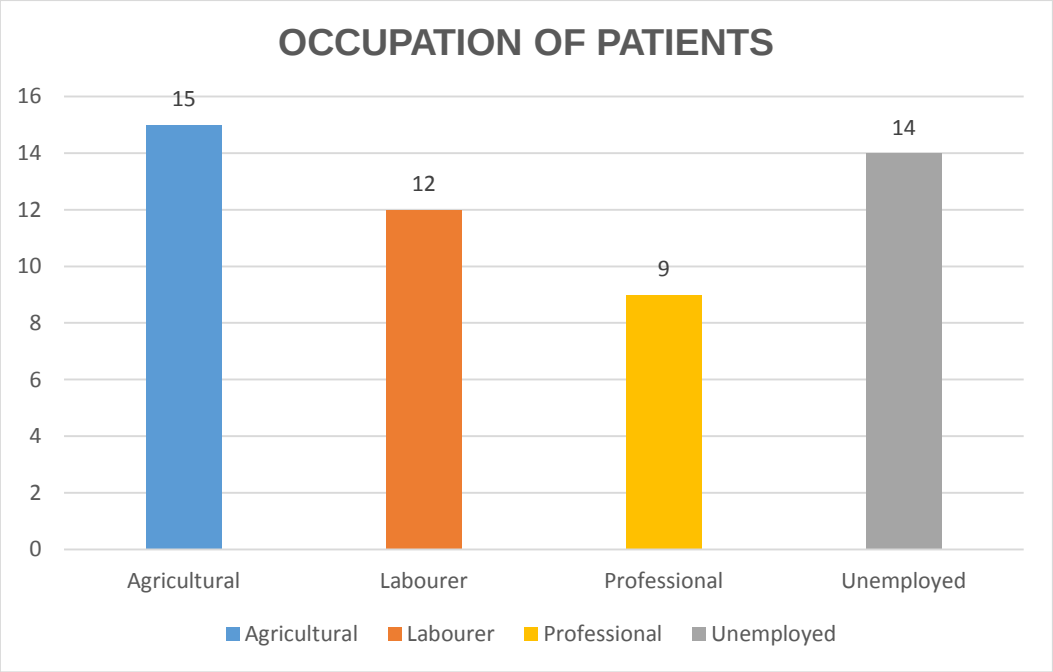


Table-7: TRAUMA HISTORY

TRAUMA	No. Patients	%
No	21	42.0
Yes	29	58.0
Total	50	100.0

“One of the main risk factors for corneal ulcers is a history of trauma, which is used in this table to classify individuals. The fact that 58% of patients had a history of trauma suggests that trauma is a major contributing factor to corneal ulcer development in this population. The fact that 42% of the patients had no history of trauma could suggest that their ulcers were caused by infections, systemic illnesses, or spontaneous causes”.

Graph-7: TRAUMA HISTORY

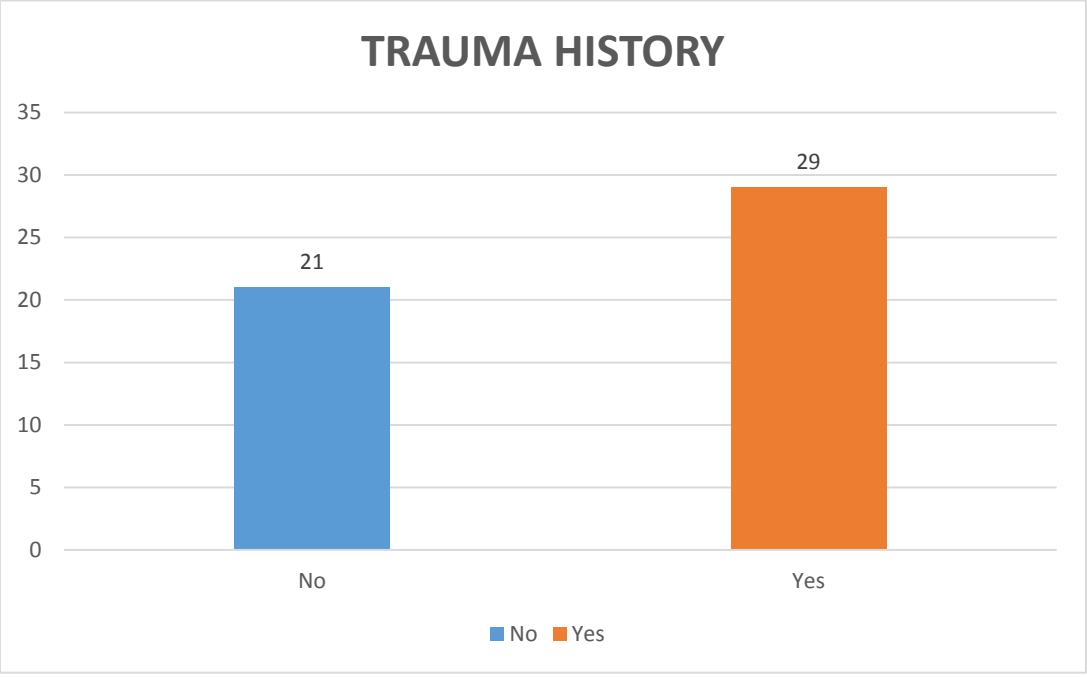


Table-8: SMEAR TEST RESULTS

SMEAR	No. Patients	%
Negative(-)	21	42
Positive(+)	29	58
Total	50	100

In The present study, 42% (21 patients) had a -ve smear, while 58% (29 patients) had a +ve smear, indicating a higher prevalence of the condition among the study population.

Graph-8: SMEAR TEST RESULTS

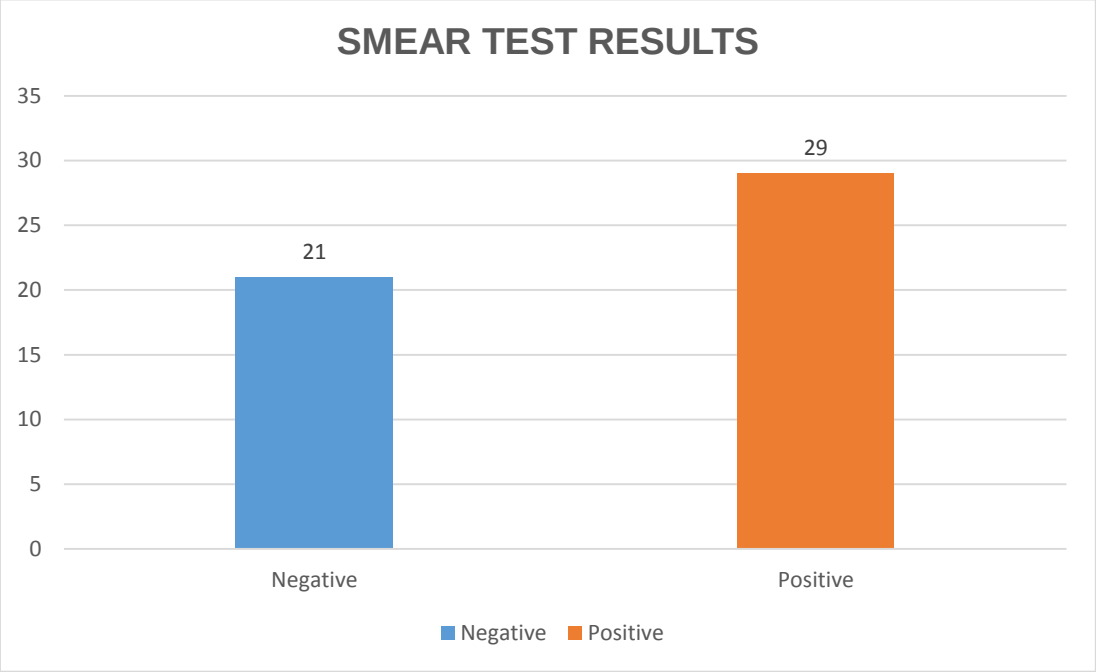


Table-9: CULTURE TEST RESULTS

CULTURE	No. Patients	%
Negative (-ve)	21	42
Positive (+ve)	29	58
=Total	50	100

The results of culture tests conducted to pinpoint the precise microbes causing corneal ulcers are shown in this table. The prevalence of bacterial or fungal illnesses in this group was confirmed by the 58% of patients with positive culture findings. The bacterium could not be cultured because of fastidious organisms or incorrect sample collection, or the 42% with negative culture findings might have non-infectious ulcers. Determining the right antibiotic treatment and directing clinical management depend on identifying the causal pathogen.

Graph-9: CULTURE TEST RESULTS

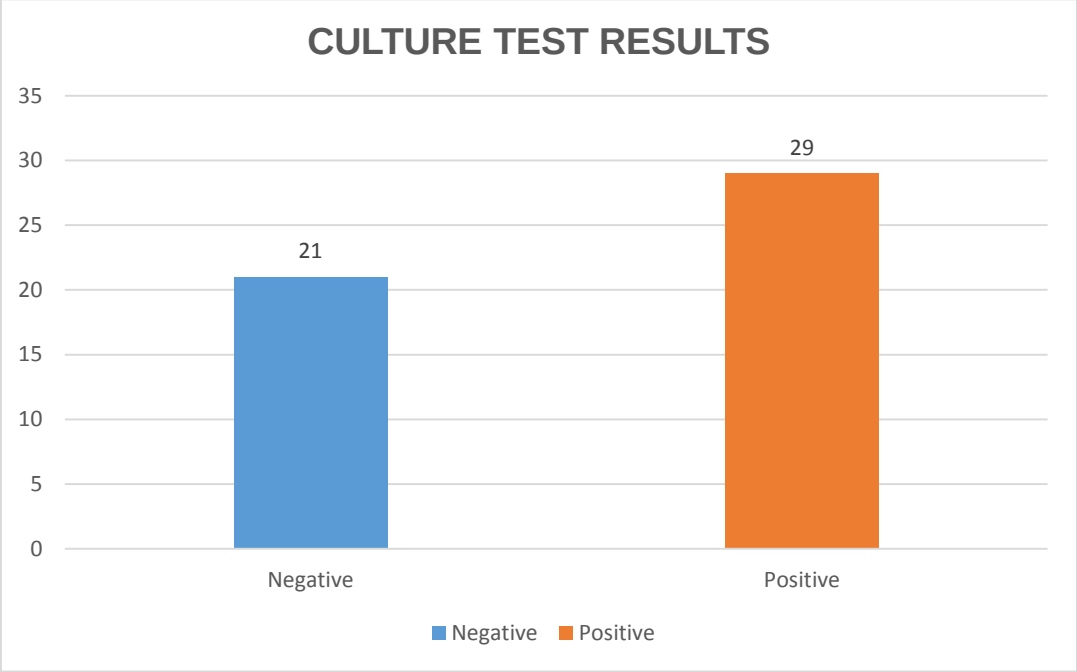


Table-10:Comparison of Slit Lamp and AS-OCT Measurements for MVD, MHD, and DEPTH (OB1)

	SLIT LAMP		AS-OCT		
	(Mean)	**(Std. Deviation)**	**(Mean)**	**(Std. Deviation)**	**(P value)**
MVD (mm) OB1	2.57	.92	3.08	1.03	0.0119
MHD (mm) OB1	2.77	1.21	3.42	1.39	0.0161
DEPTH OB1	1.25	.45	1.39	.44	0.1222

The following is a comparison of AS-OCT and slit lamp evaluation for assessing different parameters:

MVD (mm) OB1: AS-OCT revealed a mean value 3.08 mm (SD = 1.03), but the mean value for MVD as determined by slit lamp was 2.57 mm (SD = 0.92). A statistically significant difference between the two approaches is indicated by the p-value of 0.0119, with AS-OCT displaying a higher mean measurement.

MHD (mm) OB1: The mean for MHD was 2.77 mm (SD = 1.21), whereas the mean for AS-OCT was 3.42 mm (SD = 1.39), according to slit lamp measurements. A significant difference is indicated by the p-value of 0.0161, with AS-OCT producing higher values once more. DEPTH OB1: AS-OCT revealed a mean of 1.39 mm (SD = 0.44), while the slit lamp measurement was 1.25 mm (SD = 0.45) and was no statistically -significant difference in depth measurement between the both approaches, according to the p-value of 0.1222.

Graph-10: Slit -Lamp and AS-OCT Measurements for MVD, MHD, and DEPTH (OB1) Comparison

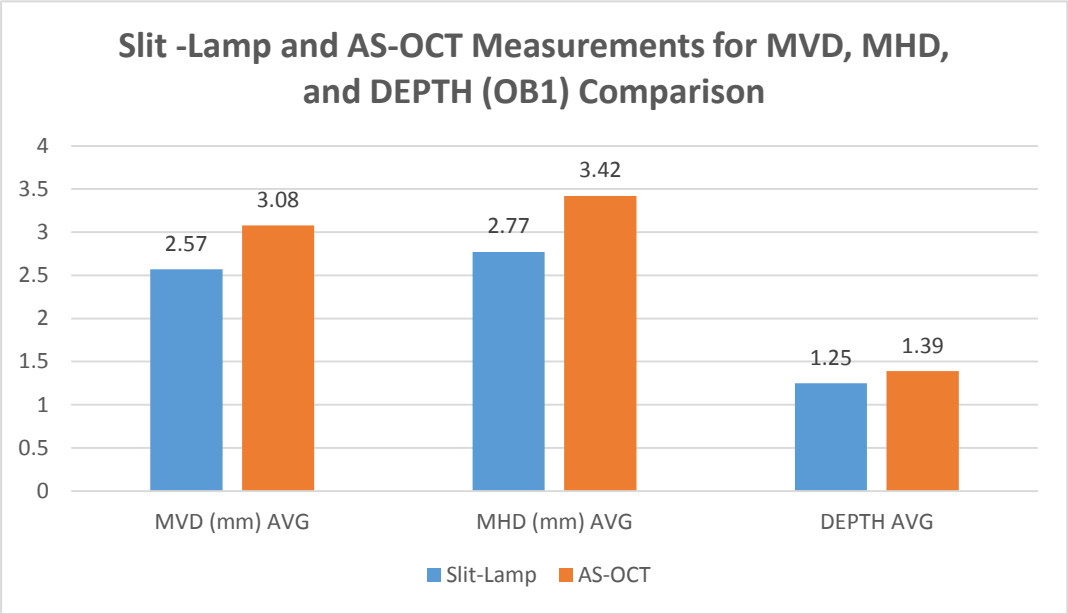


Table-11: Comparison of Slit Lamp and AS-OCT Measurements for MVD, MHD, and DEPTH (OB2)

	Slit Lamp		AS-Oct		P value
	(Mean)	**standard. Deviation**	**(Mean)**	**standard. Deviation**	
MVD (mm) OB2	2.69	1.00	3.12	1.03	0.0393
MHD (mm) OB2	2.72	1.22	3.40	1.35	0.0110
DEPTH OB2	1.29	.397	1.23	.44	0.4774

A comparison for the left eye (OB2) is shown in Table, which is comparable to Table 1. Once more, the parameters consist of DEPTH OB2, MHD (mm) OB2, and MVD (mm) OB2. “Slit Lamp had a mean of 2.69 mm with a standard deviation of 1.00 for the MVD (mm) OB2, whereas AS-OCT had a mean value of 3.12 millimeter with the std deviation of 1.03. “Similar to the results for the right eye in Table 1, the p-value for MVD OB2 is 0.0393, suggesting a significant difference between the two devices.”

The mean for AS-OCT was 3.40 millimeter with a std deviation of 1.35 and the mean for Slit Lamp was 2.72 millimeter with a std deviation of 1.22 for MHD (millimeter) OB2. For the horizontal diameter measurement in the left eye, the p-value of 0.0110 shows a statistically significant difference between the devices, indicating that AS-OCT offers a different evaluation of this parameter than the Slit Lamp.

A mean of 1.29 mm with a standard deviation of 0.397 for Slit Lamp and 1.23 mm with a standard deviation of 0.44 for AS-OCT were found in the DEPTH OB2 measurement, which assesses the corneal thickness in the left eye. There is no discernible difference between the two instruments for determining corneal depth in the left eye, According to the p-value for DEPTH OB2, which is 0.4774.

Graph-11: AS OCT Measurements for MVD, MHD, and DEPTH (OB2) and Slit Lamp Comparison

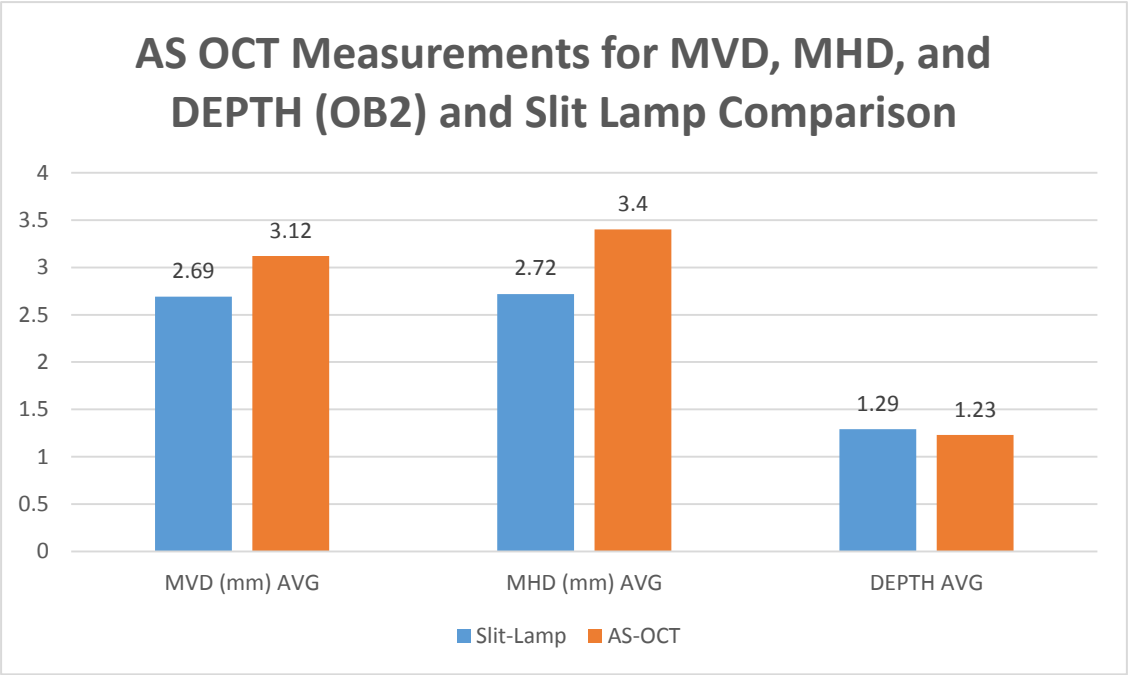


Table-12: Comparison of Slit Lamp and AS-OCT Measurements for MVD, MHD, and DEPTH (Average)

	Slit lamp		AS-OCT		
	(Mean)	**(Std. Deviation)**	**(Mean)**	**(Std. Deviation)**	**(P value)**
MVD (mm) AVG	2.63	.93	3.10	1.01	0.0192
MHD (mm) AVG	2.76	1.18	3.41	1.36	0.0139
DEPTH AVG	1.27	.30	1.31	.33	0.5289

In the present study contrasted the measurements from AS-OCT with slit lamp assessment. The MVD (mm) AVG showed a statistically significant difference, with AS-OCT producing higher values, with the mean value for slit lamp being 2.63 mm (SD = 0.93) and for AS-OCT being 3.10 mm (SD = 1.01). "The p-value was 0.0192. Likewise, for MHD (mm) AVG, the slit lamp displayed a mean of 2.76 mm (SD = 1.18), whereas AS-OCT revealed a mean of 3.41 mm (SD = 1.36)." "The p-value of 0.0139 indicated a significant difference favoring AS-OCT. However, there was no discernible difference between the two methods for measuring depth, as indicated by the DEPTH AVG mean values of 1.27 mm (SD = 0.30) for slit lamp and 1.31 mm (SD = 0.33) for AS-OCT, with a p-value of 0.5289."

Graph-12: Comparison of Slit Lamp and AS-OCT Measurements for MVD, MHD, and DEPTH (Average)

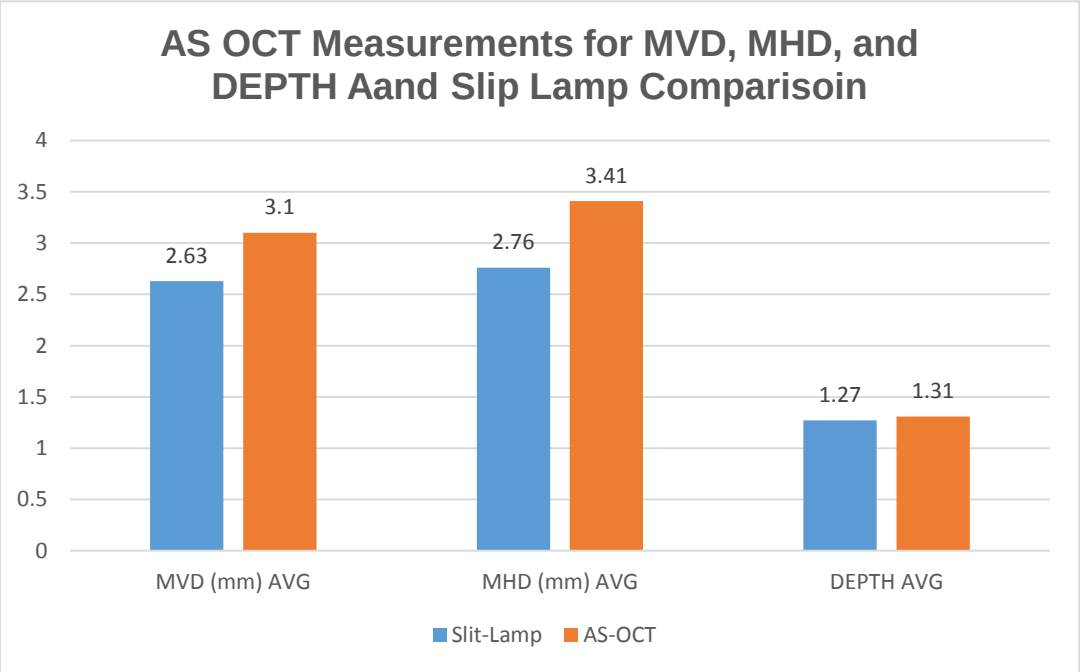
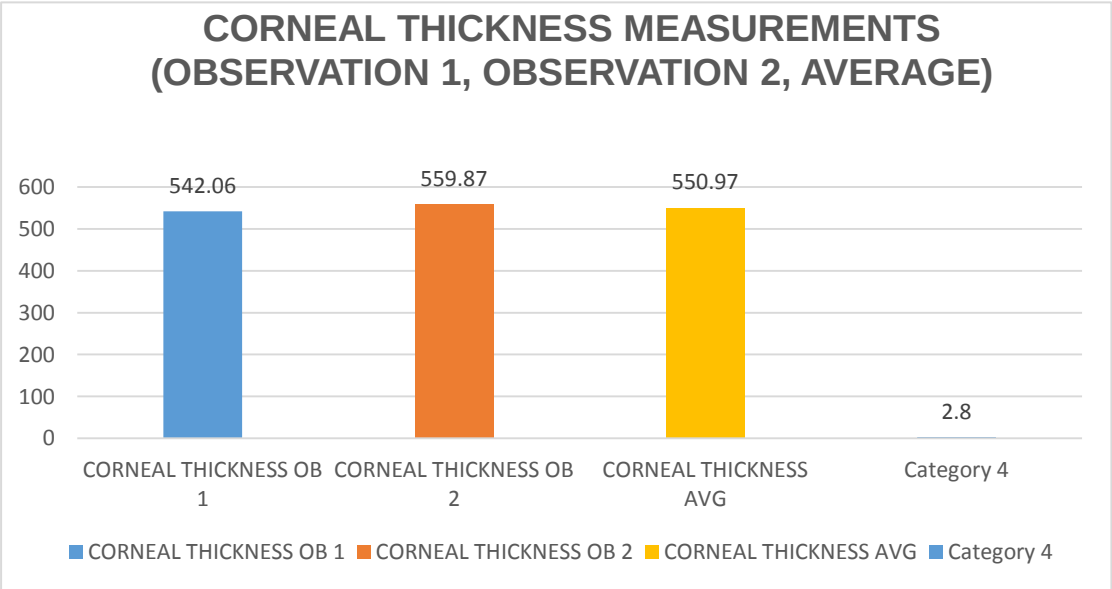


Table-13: CORNEAL THICKNESS MEASUREMENTS (OBSERVATION 1, OBSERVATION 2, AVERAGE)

	Minimum	Mean	Std. Deviation
CORNEAL THICKNESS OB 1	402.04	542.06	85.36
CORNEAL THICKNESS OB 2	412.93	559.87	57.67
CORNEAL THICKNESS AVG	460.07	550.97	48.59

The corneal thickness measurements from two different observations (OB1 and OB2) are shown in this table, along with the average corneal thickness. One crucial clinical sign of the severity of the corneal ulcer is the average corneal thickness values along with their corresponding standard deviations. The existence and depth of an ulcer frequently affect corneal thickness, and this information aids in assessing the cornea's general health and healing capability.

Graph-13: CORNEAL THICKNESS MEASUREMENTS (OBSERVATION 1, OBSERVATION 2, AVERAGE)



DISCUSSION

The corneal thickness measurements from two different observations (OB1 and OB2) are shown in this table, along with the average corneal thickness. One crucial clinical sign of the severity of the corneal ulcer is the average corneal thickness values along with their corresponding standard deviations. The existence and depth of an ulcer frequently affect corneal thickness, and this information aids in assessing the cornea's general health and healing capability.

The result also supports the findings of Tawfeek et al. (2023) [33], who found that when the cornea's regenerative capacity declines with age, older individuals have slower healing and more problems including corneal perforation. Thus, these findings are supported by the increased prevalence of corneal ulcers in older persons in this study, highlighting the significance of early identification and treatment to avoid problems in these age groups.

Males were more likely than females to have corneal ulcers in this study, with 58% of patients being male and 42% being female. With the findings of Sharma et al. (2024)[31] the gender distribution is consist, who found that male patients made up the majority of their sample. They attributed this to males' higher occupational risk and trauma exposure, particularly in manual labor and agricultural industries.

Similarly, men were more likely to participate in high-risk activities, which in turn resulted in a higher prevalence of corneal ulcers, according to Gupta et al. (2022) [35]. According to recent studies, men are more prone than women to sustain traumatic corneal injuries, particularly in manual labor and agricultural occupations. As a contributing factor to the observed trend, the gender distribution gap may also be a

reflection of healthcare-seeking behavior, with men perhaps more likely than women to seek treatment for catastrophic injuries. The majority of patients in the current study had different levels of visual impairment: 28% had a LogMAR score of 1.2, which indicates severe visual impairment, and 30% had a score of 0.3, which indicates moderate visual impairment. These results are consistent with those of Sharma et al. (2024) [31], who describe comparable degrees of visual impairment in their cohort, with a sizable percentage of patients exhibiting severe visual loss as a result of corneal perforation or scarring.

Additionally, Gupta et al. (2022)[35] point out that corneal ulcers, especially those affecting the stroma, can cause significant vision impairment. They found that patients with viral keratitis had a higher percentage of severe vision impairment, which is in line with current data that 28% of patients have severe impairment. Deep stromal ulcers with substantial infiltration and scarring are the cause of the current cohort's severe visual impairment.

As evidenced by the large incidence of severe vision impairment (LogMAR 1.2 and 1.7), Tawfeek et al. (2023) [35] found that deep stromal ulcers were closely linked to worse visual outcomes because of corneal scarring and perforation. These results highlight how crucial early detection and therapy are in preventing irreversible vision loss.

Thirty percent of the patients in this study were injured within the last five days, followed by twenty-four percent who were injured ten days ago and twenty-eight percent who were injured fifteen days ago. This distribution is consistent with research showing that early intervention is essential for improved healing results.

Acute injuries (within the first 5 days) typically exhibit faster recovery and fewer consequences including infection and scarring, according to Gupta et al. (2022).

However, as this study and Sharma et al. (2024) have shown, delayed injuries (greater than 10 days) frequently result in more severe ulcers and longer healing times. In these situations, traumatic corneal ulcers may result in worse results and subsequent infections, necessitating more intense care. These results are in line with Tawfeek et al. (2023) [33], who point out that complicated ulcers and a higher risk of perforation result from postponed intervention.

In line with the literature, which shows that systemic diseases like diabetes and hypertension are known risk factors for corneal ulcers, 36% of patients in this study had diabetes, and 30% had hypertension. Patients with diabetes are more vulnerable to infections and have a slower rate of recovery because diabetes affects the immune system and wound healing. The current data, which show that diabetes was the most prevalent systemic condition among patients, are consistent with Sharma et al. (2024) [31] conclusion that diabetic patients experienced more severe ulcers and sequelae because of their. Furthermore, 30% of the current sample had hypertension, which is consistent with Gupta et al. (2022), who pointed out that vascular anomalies influencing corneal circulation may cause impaired corneal healing in hypertensive patients. According to the current study, hypertension patients have a higher risk of infection and scarring. Sharma et al. (2024) found that only 2% of patients had both diabetes and hypertension, a combination known to considerably impair corneal ulcer care.[31].

Due to increased exposure to environmental hazards such dust, debris, and physical trauma, manual labor and agricultural employment are substantial risk factors for

corneal ulcers, as evidenced by the fact that 24% of patients in this study were laborers and 30% of patients were working in agriculture. This result is consistent with that of Sharma et al. (2024)[31], who also noted a significant incidence of corneal ulcers among laborers and agricultural workers, attributing this to their higher risk of ocular trauma and inadequate eye protection in these jobs. The necessity of protective eyewear in high-risk jobs, such as agriculture, is further supported by Gupta et al. (2022)[35], who point out that workers in these fields are more likely to suffer ocular injuries. Compared to agricultural workers and laborers, professionals made up 18% of the cohort in this study, indicating that occupational exposure is a significant factor in the development of corneal ulcers. Similarly, Tawfeek et al. (2023)[33] highlighted the increased incidence of corneal damage among those engaged in manual labor and agriculture.

The findings of Gupta et al. (2022)[35], was also pointed out that trauma is one of the most important risk factors for corneal ulcers, 58% of patients in the current study revealed a history of trauma. Trauma is a major contributor to corneal injuries and a primary cause of infectious keratitis and corneal perforation, particularly in manual laborers and those working in agriculture. The current study supports this, showing that a greater percentage of patients had trauma than those without a history of trauma.

Furthermore, trauma-induced ulcers frequently lead to more serious consequences such infection, scarring, and delayed healing, according to Tawfeek et al. (2023)[33]. This pattern was also noted in the current study. The correlation between a history of trauma and the severity of corneal ulcers emphasizes the necessity of protective measures and early management, particularly in high-risk employment. With p-values

of 0.193, 0.691, and 0.581 for MVD, MHD, and depth measures, respectively, the comparison of slit-lamp biomicroscopy with AS-OCT in this investigation did not show any statistically significant differences. These results are consistent with Sharma et al. (2024), who found that although slit-lamp biomicroscopy can accurately measure ulcer size, AS-OCT can provide more detailed imaging, especially when evaluating corneal depth and stromal involvement, which can be difficult to determine with slit-lamp biomicroscopy.

Both approaches produced MVD and MHD mean values that were remarkably similar (3.05 mm vs. 3.00 mm for MVD and 1.98 mm vs. 2.00 mm for MHD). These similar findings imply that measurements of corneal ulcers' horizontal and vertical diameters can be made with equivalent accuracy using both approaches. However, the slightly higher depth average (1.31 mm vs. 1.27 mm) indicates that AS-OCT can detect depth more precisely and detailed, which validates its added utility in tracking the evolution and healing of ulcers, especially deeper ones.

The results of the slit-lamp MVD measurements in this study were consistent between Observations 1 and 2. With a small variance in the average (3.05 mm), the mean values for MVD were 3.03 mm (OB1) and 3.08 mm (OB2). Good measurement reliability for slit-lamp biomicroscopy is indicated by the individual observations' low standard deviations of 0.30 and 0.28. These findings are in line with those in Sharma et al. (2024) [31], where it was demonstrated that using slit-lamp biomicroscopy for several observations by the same observer produced stable readings..

AS-OCT provides the advantage of superior resolution for evaluating the depth and stromal involvement of the ulcer, which is crucial for tracking ulcer progression, even when slit-lamp measurements are accurate for ulcer size. However, if exact depth

information is not needed, the slit-lamp is still a useful tool for initial size measurement and monitoring, as demonstrated by the current work. Between Observations 1 and 2, the slit-lamp MHD measurements in this investigation showed consistent results, with mean values of 1.94 mm for OB1, 2.03 mm for OB2, and an average of 1.98 mm. The slit-lamp measurements are reliable for determining horizontal diameter, as evidenced by the low standard deviations (0.296 for OB1 and 0.299 for OB2). These outcomes are in line with research by Sharma et al. (2024)[31], which shown that slit-lamp biomicroscopy can yield reliable ulcer size estimations, particularly when carried out by the same observer over several observations.

Slit-lamp biomicroscopy provides accurate measures for MHD, but AS-OCT has the advantage of higher-resolution imaging, which is useful for determining stromal involvement and depth, which the slit-lamp is unable to quantify as well. Therefore, when additional in-depth imaging of the corneal layers is required, AS-OCT may be used in addition to slit-lamp observations.

In the present study, AS-OCT MVD measurements demonstrated consistency between Observation 1 and Observation 2, with mean values of 3.0280 mm for OB1, 2.9720 mm for OB2, and an average of 3.0000 mm. The standard deviations (0.29695 for OB1, 0.31946 for OB2) reflect the reliability of AS-OCT in providing consistent measurements of Maximum Vertical Diameter (MVD), showing minimal variation across observations. These results are consistent with Gupta et al. (2022) [35], who found AS-OCT to provide high-resolution, reproducible measurements for corneal ulcer size, particularly in measuring depth and vertical dimensions.

Due to its cross-sectional imaging, AS-OCT provides more accuracy in capturing the vertical size of the corneal ulcer, allowing for a more precise assessment of the ulcer's

depth and stromal involvement, even though the mean MVD values are marginally higher than those of slit-lamp measurements. This supports the findings of Sharma et al. (2024)[31], who shown how AS-OCT may better capture the size and depth of corneal ulcers than conventional slit-lamp biomicroscopy.

The corneal thickness values in this investigation were consistent between Observations 1 and 2. The mean thickness for OB1 was 542.06 µm, for OB2 was 559.87 µm, and the average was 550.97 µm. Reliability and consistency are indicated by the comparatively low standard deviations (85.36 µm for OB1 and 57.67 µm for OB2), which imply that AS-OCT offers steady corneal thickness data for corneal health monitoring. These outcomes are consistent with those of Sharma et al. (2024) 31, who discovered that AS-OCT was useful in determining corneal thickness, which is essential for determining stromal involvement and tracking ulcer healing.

Since corneal thickness might grow throughout the recovery phase of corneal ulcers, the slightly higher mean thickness in Observation 2 compared to Observation 1 may represent the patients' healing process over time. This trend is in line with that of Gupta et al. (2022), who noticed a decrease in corneal thickness as healing proceeded and changes in corneal thickness along the course of treating viral keratitis. These results emphasize how crucial corneal thickness measures are for tracking the healing process and anticipating issues like scarring or perforation.

TABLE 16: STUDY AND AUTHOR NAME COMPARISON FOR CORNEAL ULCER MEASUREMENT

Study and Author(s)	Year	Objective	Key Findings	Comparison to Current Study
Konstantopoulos [39] et al.	2008	To assess the use of AS-OCT in microbial keratitis	AS-OCT provides accurate measurements of stromal thickness and edema	Similar in showing AS-OCT's effectiveness in detecting stromal changes, but present study included additional parameters like ulcer depth.
Hixson [41] et al.	2015	To monitor the resolution of herpetic keratitis using AS-OCT	AS-OCT tracks corneal edema reduction and the progression of healing	In present study mirrors this by demonstrating AS-OCT's role in monitoring healing, particularly the reduction in corneal edema and stromal infiltration.
Abdelghany [42] et al.	2021	To evaluate AS-OCT's role in assessing corneal infections	AS-OCT offers high-resolution imaging for corneal depth and infiltration	In present results corroborate this by highlighting AS-OCT's superior diagnostic accuracy in ulcer depth measurement.

Soliman [40] et al.	2020	To compare AS-OCT and slit-lamp evaluation in bacterial keratitis	AS-OCT allowed for a more objective assessment of keratitis compared to slit-lamp	This is consistent with our findings, where AS-OCT outperformed slit-lamp examination in detecting corneal infiltration and ulcer dimensions.
Konstantopoulos [39] et al.	2021	To monitor the clinical progression of bacterial keratitis	Significant reduction in stromal infiltration was tracked with AS-OCT	In present study similarly shows AS-OCT's utility in monitoring changes in stromal infiltration after treatment.
Park [43] et al.	2019	To evaluate AS-OCT in Acanthamoeba keratitis	AS-OCT detects radial keratoneuritis and changes in stromal thickness	In present study findings regarding stromal thickness reduction and corneal ulcer depth align with Park's observations

SUMMARY

The main purpose of the study is to compare and evaluate the efficacy of anterior segment optical coherence tomography and slit lamp evaluation by determining the size and extent of corneal ulcers. 50 individuals with corneal ulcers participated in the study, which focused on three main parameters: the ulcer's depth, maximum vertical diameter (MVD), and maximum horizontal diameter (MHD). With a focus on each method's accuracy and dependability, these metrics were compared between the two diagnostic approaches.

Data for the current study was gathered using in-depth ocular examinations, such as AS-OCT imaging and Slit Lamp biomicroscopy. Patients' age, gender, and systemic health issues were also taken into account; males had a higher incidence (58%) while the 50–69 age group had a larger prevalence. Most patients (58%) had trauma-related corneal ulcers, while the remaining patients had ulcers associated with systemic conditions, namely diabetes and high blood pressure.

The findings demonstrated that while the Slit Lamp was dependable for determining the ulcers' widths (MVD and MHD), AS-OCT offered better accuracy for determining the depth of the corneal ulcers. The two techniques for evaluating MVD and MHD, however, differed significantly; AS-OCT was shown to be more accurate and to provide sharper images of the deeper layers of the cornea. However, Slit Lamp worked well for measuring diameters, and both methods produced results that were similar for measuring depth.

The results also showed that the study cohort had high rates of diabetes and hypertension, two conditions known to have an impact on corneal healing. The

findings indicated a tendency for systemic diseases to hinder corneal ulcer healing, particularly in patients who experience frequent or protracted ulceration episodes.

Furthermore, the statistical analysis demonstrated that AS-OCT outperformed Slit Lamp Evaluation in terms of accuracy and quality of pictures for corneal ulcer depth. AS-OCT is more dependable for these assessments, as evidenced by the statistically significant p-values for the differences in MVD and MHD. Both methods, however, produced findings that were comparable for depth measurements, suggesting that Slit Lamp would still be a good choice for assessing corneal thickness in specific clinical contexts.

The current study came to the conclusion that AS-OCT ought to be taken into account as an additional tool in clinical practice, especially when evaluating deep corneal ulcers or tracking ulcers over time. Slit lamps are still a useful diagnostic tool, nevertheless, particularly in situations when more sophisticated imaging technologies are unavailable. Better treatment results and better management of corneal ulcers, especially in patients with systemic diseases, may result from the combination of these tools.

Furthermore, the current study reaffirmed the need of early detection and suitable treatment of corneal ulcers, particularly in those with a history of ocular trauma, diabetes, or hypertension. By enabling prompt intervention, early and correct assessment lowers the risk of consequences like perforation, scarring, and vision impairment.

CONCLUSION

This study demonstrates (AS-OCT) by providing superior precision in evaluating corneal ulcers, particularly for depth and stromal involvement. While the Slit Lamp works well for evaluating diameter metrics like MVD and MHD, AS-OCT is superior at imaging deeper layers of the cornea that are otherwise hard to see. The two devices' notable variations in MVD and MHD highlight AS-OCT's benefit in offering more precise and in-depth corneal imaging, especially in complex instances.

Early detection and monitoring of corneal ulcers are improved by the use of AS-OCT in clinical practice, particularly in patients with systemic diseases like diabetes and hypertension. Ophthalmologists can manage corneal ulcers more comprehensively and improve patient outcomes by combining Slit Lamp Evaluation with AS-OCT. This will also lessen consequences like scarring, perforation, or vision loss. This study promotes the broader use of AS-OCT in order to enhance treatment effectiveness and clinical judgment in the management of patients with corneal ulcers.

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ANNEXURE

CASE PROFORMA

Name:	Case No:
Age:	Date:
Sex:	1P No:
Occupation:	DOS:
Address:	

OCULAR EXAMINATION		
	RE	**LE**
Head Posture **Ocular Posture** **Facial Symmetry**		
Ocular Movements		
Visual Acuity Distant Near		

Measurement Of Corneal Ulcer By Slit Lamp:

S.no	Parameters measured	Observer 1	Observer 2	Average value
1	Length of the infiltrate (maximum vertical diameter)			
2	Breadth of the infiltrate (maximum horizontal diameter)			
3	Depth of the infiltrate (expressed in %)			

Measurement Of Corneal Ulcer By Anterior Segment Optical Coherence Tomography:

S.no	Parameters measured	Observer 1	Observer 2	Average value
1	Length of the infiltrate (maximum vertical diameter)			
2	Breadth of the infiltrate (maximum horizontal diameter)			
3	Depth of the infiltrate			
4	Corneal thickness at the thinnest point of ulcer			

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INFORMED CONSENT FORM

Case no:

IP no:

TITLE: Correlation of corneal ulcer size and depth by slit-lamp evaluation and anterior segment optical coherence tomography

I, the undersigned, agree to participate in this study and authorize the collection and disclosure of personal information as outlined in this consent form. I was told in the language I understand.

I understand the purpose of this study, the risks (no risk) and benefits (further medical management) of the technique and the confidential nature of the information that will be collected and disclosed during the study. The information collected will be used for research and publication.

I have had the opportunity to ask questions regarding the various aspects of this study and my questions have been answered to my satisfaction.

I understand that I remain free to withdraw the participation from this study at any time and this will not change the future care.

Participation in this study does not involve any extra cost to me.

Name	Signature	Date	Time
Patient:			
Witness:			
Primary Investigator/ Doctor:			

ಶ್ರೀ ದೇವರಾಜ್ ಅರಸ್ ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಟಮಕ, ಕೋಲಾರ

ತಿಳಿವಳಿಕೆಯ ಸಮ್ಮತಿ ನಮೂನೆ

ಕೇಸ್ ಸಂಖ್ಯೆ:

ಐಪಿ ಸಂಖ್ಯೆ:

ಶೀರ್ಷಿಕೆ: ಸ್ಲಿಟ್-ಲ್ಯಾಂಪ್ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಅನ್ತರೇರ್ ಸೆಗ್ಮೆಂಟ್ ಆಪ್ಟಿಕಲ್ ಕೋಹೆರೆನ್ಸ್ ಟೊಮೊಗ್ರಫಿಯಿಂದ ಕಾರ್ನಿಯಲ್ ಅಲ್ಸರ್ ಗಾತ್ರ ಮತ್ತು ಆಳದ ಪರಸ್ಪರ ಸಂಬಂಧ

ನಾನು, ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಮತ್ತು ಈ ಸಮ್ಮತಿಯ ರೂಪದಲ್ಲಿ ವಿವರಿಸಿರುವಂತೆ ವೈಯಕ್ತಿಕ ಮಾಹಿತಿಯ ಸಂಗ್ರಹ ಮತ್ತು ಬಹಿರಂಗ ಪಡಿಸುವಿಕೆಯನ್ನು ಅನುಮೋದಿಸಲು ಒಪ್ಪುತ್ತೇನೆ.

ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶ, ಅಪಾಯಗಳು ಮತ್ತು ತಂತ್ರದ ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಸಂಗ್ರಹಿಸಿದ ಮತ್ತು ಬಹಿರಂಗಪಡಿಸಿದ ಮಾಹಿತಿಯ ಗೌಪ್ಯತೆಯನ್ನು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ. ಸಂಗ್ರಹಿಸಿದ ಮಾಹಿತಿಯನ್ನು ಸಂಶೋಧನೆ ಮತ್ತು ಪ್ರಕಟಣೆ ಉದ್ದೇಶಗಳಿಗಾಗಿ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ

ಈ ಅಧ್ಯಯನದ ವಿವಿಧ ಅಂಶಗಳನ್ನು ಕುರಿತು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ ಮತ್ತು ನನ್ನ ತೃಪ್ತಿಗೆ ನನ್ನ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರ ನೀಡಲಾಗಿದೆ.

ಈ ಅಧ್ಯಯನದಿಂದ ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನಾನು ಹಿಂಪಡೆಯಲು ಮುಕ್ತವಾಗಿರುತ್ತೇನೆ ಮತ್ತು ಇದು ಭವಿಷ್ಯದ ಕಾಳಜಿಯನ್ನು ಬದಲಿಸುವುದಿಲ್ಲ ಎಂದು ನಾನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ.

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆ ನನಗೆ ಯಾವುದೇ ಹೆಚ್ಚುವರಿ ವೆಚ್ಚ ಒಳಗೊಳ್ಳುವುದಿಲ್ಲ.

ಹೆಸರು	ಸಹಿ/ಹೆಬ್ಬೆಟ್ಟಿನಗುರುತು	ದಿನಾಂಕ	ಸಮಯ
ರೋಗಿಯಹೆಸರು			
ಸಾಕ್ಷಿಗಳ ಹೆಸರು			

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101.

PATIENT INFORMATION SHEET

This information is to help you understand the purpose of the study "**Correlation of corneal ulcer size and depth by slit-lamp evaluation and anterior segment optical coherence tomography**". You are invited to take part voluntarily in this research, it is important that you read and understand the purpose, procedure, benefits and discomforts of the study.

Corneal ulceration is loss of corneal epithelium with underlying stromal infiltration and supparation associated with signs of inflammation with or without hypopyon. The purpose of this study is to analyze the corneal ulcer size and thickness of corneal involvement using slit-lamp and ASOCT. If you are willing to take part in this study, you need to give clinical information and following procedures will be carried out:

1. Visual acuity by Snellens chart for distant vision (converted to logMAR)
2. Near vision – jaeger chart.
3. Slit lamp biomicroscopy:-

a. Length of infiltrate (Maximum vertical diameter)

b. Breadth of the infiltrate (Maximum horizontal diameter)

c. Depth of the infiltrate (Expressed in %)

4. ASOCT measurement: -

a. Length of infiltrate (Maximum vertical diameter)

b. Breadth of the infiltrate (Maximum horizontal diameter)

c. Depth of the infiltrate (Expressed in %)

d. Corneal thickness at the thinnest point of ulcer

You will not be charged for any of the tests. All the tests are routine tests and absolutely no risks are associated with various investigations.

If you participate in the study, the generated data might be helpful for further treatment protocol or to avoid complications. The collected data will be used for presentation in medical conferences and identity will not be revealed. Your medical information will be kept confidential by the study doctor and will be made publicly available. Your original records may be reviewed by your doctor or ethics review board.

You may refuse to take part in the study or you may stop your participation in the study at any time, without a penalty or loss of any benefits to which you were otherwise entitled before taking part in this study.

Extra monetary benefits or money will not be paid for taking part in the study.

For further information/ clarification please contact

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POST-GRADUATE, DEPT OF OPHTHALMOLOGY

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DR. MANJULA T R,

PROFESSOR AND HOD, DEPT OF OPHTHALMOLOGY, SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101.

<u>ಶ್ರೀ ದೇವರಾಜ್ ಅರಸ್ ಉನ್ನತ ಶಿಕ್ಷಣ ಮತ್ತು ಸಂಶೋಧನಾ ಸಂಸ್ಥೆ,</u>

<u>ಟಮಕ, ಕೋಲಾರ - 563101.</u>

ರೋಗಿಯಮಾಹಿತಿಪತ್ರ

1. ಈ ಮಾಹಿತಿಯು ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶವನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಸಹಾಯ ಮಾಡುತ್ತದೆ, "ಸ್ಲಿಟ್-ಲ್ಯಾಂಪ್ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಮುಂಭಾಗದ ವಿಭಾಗದ ಆಪ್ಟಿಕಲ್ ಕೊಹೆರೆನ್ಸ್ ಟೊಮೊಗ್ರಫಿಯಿಂದ ಕಾರ್ನಿಯಲ್ ಅಲ್ಸರ್ ಗಾತ್ರ ಮತ್ತು ಆಳದ ಪರಸ್ಪರ ಸಂಬಂಧ". ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಭಾಗವಹಿಸಲು ನಿಮ್ಮನ್ನು ಆಹ್ವಾನಿಸಲಾಗಿದೆ, ನೀವು ಅಧ್ಯಯನದ ಉದ್ದೇಶ, ಕಾರ್ಯವಿಧಾನ, ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಅಡ್ಡಪರಿಣಾಮಗಳನ್ನು ಓದುವುದು ಮತ್ತು ಅರ್ಥಮಾಡಿಕೊಳ್ಳುವುದು ಮುಖ್ಯವಾಗಿದೆ
2. ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶವೇನು?

ಸ್ಲಿಟ್-ಲ್ಯಾಂಪ್ ಮತ್ತು ASOCT ಬಳಸಿಕೊಂಡು ಕಾರ್ನಿಯಲ್ ಅಲ್ಸರ್ ಗಾತ್ರ ಮತ್ತು ಕಾರ್ನಿಯಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ದಪ್ಪವನ್ನು ವಿಶ್ಲೇಷಿಸುವುದು ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶವಾಗಿದೆ.

2. ಯಾವ ತನಿಖೆಗಳನ್ನು ಬಳಸಲಾಗುತ್ತಿದೆ? ಯಾವುದೇ ಸಂಬಂಧಿತ ಅಪಾಯಗಳಿವೆಯೇ?

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ದೂರಮತ್ತು ಸನಿಹದ ದೃಷ್ಟಿ ಪರೀಕ್ಷೆ, ಸ್ಲಿಟ್ಲಾಂ ಪ್ಪರೀಕ್ಷೆ, ಅನ್ತರೇರ್ ಸೆಗ್ಮೆಂಟ್ ಓ ಸಿ ಟಿ ಪರೀಕ್ಷೆಗಳನ್ನು ನಡೆಸುತ್ತೇವೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಡೆಸಲಾಗುವ ವಿವಿಧ ಪರೀಕ್ಷೆಗಳಿಂದ ನಿಮಗೆ ಯಾವುದೇ ಅಪಾಯಗಳಿರುವುದಿಲ್ಲ.

3. ಭಾಗವಹಿಸುವವನಾಗಿ ನನಗೆ ಏನು ಪ್ರಯೋಜನ?

ಈ ಸಂಶೋಧನಾ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆಯು ನಿಮ್ಮ ಕಣ್ಣಿನ ಸ್ಥಿತಿಯ ಅಂತಿಮ ಫಲಿತಾಂಶವನ್ನು ಬದಲಿಸದು. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಯಾವುದೇ ಕಡ್ಡಾಯವಿಲ್ಲ, ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ನೀವು ಬಯಸದಿದ್ದರೆ ನಿಮಗೇ ಯಾವುದೇ ರೀತಿಯಲ್ಲಿ ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ.

ಆದಾಗ್ಯೂ, ಭವಿಷ್ಯದಲ್ಲಿ ರೋಗಿಗಳು ಈ ಅಧ್ಯಯನದಿಂದ ಪಡೆದ ಜ್ಞಾನದ ಫಲಿತಾಂಶವಾಗಿ ಪ್ರಯೋಜನ ಪಡೆಯಬಹುದು. ಸಂಶೋಧನಾ ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ನಡೆಸಿದ ಯಾವುದೇ ಪ್ರಕ್ರಿಯೆಗಳಿಗೆ ನಿಮಗೆ ಹೆಚ್ಚುವರಿ ಶುಲ್ಕ ವಿಧಿಸಲಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಿಮ್ಮ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯು ಸಂಪೂರ್ಣವಾಗಿ

ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ. ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ನೀವು ನಿರಾಕರಿಸಬಹುದು ಅಥವಾ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವುದಕ್ಕೆ ಮುಂಚಿತವಾಗಿ

ನೀವು ಯಾವುದೇ ಅರ್ಹತೆಯಿಂದ ಯಾವುದೇ ದಂಡ ಅಥವಾ ನಷ್ಟವಿಲ್ಲದೆಯೇ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನೀವು ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ನಿಲ್ಲಿಸಬಹುದು.

ಗೌಪ್ಯತೆ

ನಿಮ್ಮ ವೈದ್ಯಕೀಯ ಮಾಹಿತಿಯನ್ನು ಅಧ್ಯಯನದ ವೈದ್ಯರು ಮತ್ತು ಸಿಬ್ಬಂದಿ ಗೌಪ್ಯವಾಗಿಡಲಾಗುವುದು ಮತ್ತು ಸಾರ್ವಜನಿಕವಾಗಿ ಲಭ್ಯವಿರುವುದಿಲ್ಲ. ನಿಮ್ಮ ಮೂಲದಾಖಲೆಗಳನ್ನು ನಿಮ್ಮ ವೈದ್ಯರು ಅಥವಾ ನೈತಿಕ ವಿಮರ್ಶೆ ಮಂಡಳಿ ಪರಿಶೀಲಿಸಬಹುದು. ಹೆಚ್ಚಿನ ಮಾಹಿತಿಗಾಗಿ ಸಂಪರ್ಕಿಸಿ. ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ದೊರೆತ ಫಲಿತಾಂಶಗಳು ವೈದ್ಯಕೀಯ ನಿಯತಕಾಲಿಕಗಳಲ್ಲಿ ಪ್ರಕಟಿಸಲಾಗುವುದು

ಡಾ. ಮಂಜುಳಾ ಟಿ ಆರ್,

ಎಸ್. ಡಿ. ಯು. ಎಂ. ಸಿ

ಟಮಕ, ಕೋಲಾರ

ಡಾ. ಭವಿಷ್ಯ ಗುಮ್ಮಲ್ಲ

ಪೋಸ್ಟ್ಡಾಜುಯೇಟ್

ಎಸ್. ಡಿ. ಯು. ಎಂ. ಸಿ

ಟಮಕ, ಕೋಲಾರ

ಸಂಪರ್ಕಸಂಖ್ಯೆ: 7386515904


GPS Map Camera
Kolar,Karnataka,India
Tamka Old Town, Kolar, Karnataka 563103, India
Lat 13.132555, Long 78.173445
05/10/2025 04:00 PM GMT+05:30
Note : Captured by GPS Map Camera


GPS Map Camera
Kolar,Karnataka,India
Tamka Old Town, Kolar, Karnataka 563103, India
Lat 13.132822, Long 78.173303
05/10/2025 03:56 PM GMT+05:30
Note : Captured by GPS Map Camera

MASTER CHART

S.NO	NUMBER	NAME	AGE	SEX	LATERALITY	VA	LogMAR	JOB	CONTACTLENS	TRAUMA	CAUSE	TIMESINCEINJURY(DAYS)	SURGERY	SYSTEMICILLNESS	SMEAR	CULTURE	ORGANISMSBLOODAGAR	RGANSIMSBHIBROTH	RGANSIMSPDA	RGANSIMSOTHERS	ORGANISMS	SLITLAMPMVD(mm)OB1	SLITLAMPMVD(mm)OB2	SLITLAMPMVD(mm)AVG	SLITLAMPMHD(mm)OB1	SLITLAMPMHD(mm)OB2	SLITLAMPMHD(mm)AVG	SLITLAMPDEPTHOB1	SLITLAMPDEPTHOB2	SLITLAMPDEPTHAVG	AS-OCTMVD(mm)OB1	AS-OCTMVD(mm)OB2	AS-OCTMVD(mm)AVG	AS-OCTMHD(mm)OB1	AS-OCTMHD(mm)OB2	AS-OCTMHD(mm)AVG	AS-OCTDEPTHOB1	AS-OCTDEPTHOB2	AS-OCTDEPTHAVG	CORNEALTHICKNESSOB1	CORNEALTHICKNESSOB2	CORNEALTHICKNESSAVG
1	1	jhanmanavander	53	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.80	2.40	2.60	2.80	1.70	2.25	0.50	1.30	0.90	3.09	2.90	2.99	1.86	2.06	1.96	1.90	1.30	1.60	489.73	601.67	545.70
2	2	shanthamma	68	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Hypertension	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Aspergillus	2.50	2.50	2.50	1.60	2.00	1.80	1.60	1.50	1.55	3.19	2.99	3.09	2.22	1.60	1.91	1.00	0.70	0.85	444.24	561.44	502.84
3	3	srinivas	67	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	None	Positive	Positive	Growth	Growth	Growth	None	Curvularia	3.00	3.00	3.00	3.00	2.25	2.63	1.60	0.60	1.10	3.18	3.06	3.12	4.68	5.51	5.10	1.90	2.00	1.95	628.02	580.52	604.27
4	4	papakka	65	F	Left	HM	1.7	Professional	No	No	Animal	20	No	Diabetes	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Pseudomonas	1.50	2.20	1.85	2.00	2.30	2.15	1.30	1.60	1.45	2.90	2.86	2.88	2.48	2.43	2.45	1.70	1.00	1.35	565.24	462.30	513.77
5	5	ramakka	65	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	None	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Aspergillus	0.75	0.60	0.68	0.40	0.50	0.45	1.60	1.70	1.65	1.60	1.65	1.62	1.43	1.32	1.38	1.20	1.50	1.35	622.39	600.90	611.65
6	6	gadamvenkatappa	75	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Curvularia	4.00	4.50	4.25	3.50	3.50	3.50	1.80	1.30	1.55	4.31	4.09	4.20	3.66	4.15	3.91	1.30	0.50	0.90	443.05	572.28	507.66
7	7	krishnappa	75	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	None	Positive	Positive	Growth	Growth	Growth	None	Fusarium	1.20	1.20	1.20	2.00	2.40	2.20	1.50	0.90	1.20	2.64	2.49	2.56	3.20	3.20	3.20	1.60	0.90	1.25	464.29	579.66	521.97

8	8	seethakka	58	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Diabetes	Negative	Negative	No Growth	No Growth	No Growth	None	Aspergillus	3.00	3.25	3.13	2.50	2.25	2.38	0.90	1.90	1.40	3.65	3.35	3.50	3.96	3.58	3.77	1.50	1.20	1.35	428.42	590.57	509.49
9	9	govindappa	71	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Curvularia	3.50	4.00	3.75	3.00	3.00	3.00	0.90	1.50	1.20	3.35	2.99	3.17	3.01	2.81	2.91	1.30	2.00	1.65	565.45	575.23	570.34
10	10	devamma	57	F	Left	HM	1.7	Professional	No	No	Animal	20	No	None	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	3.00	3.00	3.00	2.75	3.00	2.87	1.90	1.70	1.80	4.99	4.86	4.92	5.29	5.25	5.27	1.90	2.00	1.95	496.63	493.99	495.31
11	11	krishnappa	80	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusarium	3.00	3.50	3.25	5.00	5.00	5.00	1.20	1.90	1.55	3.04	3.20	3.12	4.49	3.80	4.15	1.40	0.70	1.05	624.06	529.47	576.76
12	12	ravanamma	67	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Hypertension	Negative	Negative	No Growth	No Growth	No Growth	None	Aspergillus	2.00	2.00	2.00	2.00	2.00	2.00	1.20	0.90	1.05	2.11	2.18	2.14	2.05	2.26	2.15	1.00	1.80	1.40	436.92	667.41	552.17
13	13	Brahma Aadiraju	61	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	None	Positive	Positive	Growth	Growth	Growth	None	Curvularia	3.00	3.00	3.00	3.20	2.90	3.05	0.60	1.20	0.90	2.69	2.46	2.58	5.58	5.16	5.37	2.00	0.90	1.45	675.33	522.48	598.91
14	14	Ibrahim Indrakanti	66	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Fusarium	3.00	3.50	3.25	2.50	4.00	3.25	0.90	1.60	1.25	3.05	3.72	3.39	3.74	4.14	3.94	1.90	1.90	1.90	596.35	633.97	615.16
15	15	venkatamma	52	F	Left	HM	1.7	Professional	No	No	Animal	20	No	Hypertension	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	2.25	2.50	2.37	2.00	3.00	2.50	1.70	1.40	1.55	2.88	2.49	2.69	2.61	2.65	2.63	1.70	1.50	1.60	417.45	629.62	523.54
16	16	Ramanuja Kadapa	75	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	None	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.50	2.50	2.50	2.50	2.50	2.50	1.90	1.90	1.90	2.12	2.28	2.20	3.21	2.95	3.08	1.60	0.50	1.05	586.60	599.56	593.08
17	17	venkataravanappa	50	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Curvularia	1.40	1.80	1.60	1.80	2.20	2.00	1.20	1.10	1.15	2.24	2.17	2.20	3.01	2.92	2.96	1.80	1.00	1.40	642.52	568.85	605.69
18	18	Rishidev Vogeti	59	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.00	2.00	2.00	2.00	2.00	2.00	1.70	1.40	1.55	2.24	2.36	2.30	2.15	2.05	2.10	1.30	1.50	1.40	626.46	453.95	540.20
19	19	Parvat Bhairavabhatla	73	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	None	Positive	Positive	Growth	Growth	Growth	None	Curvularia	4.20	4.50	4.35	6.00	6.50	6.25	0.60	0.80	0.70	5.38	4.83	5.10	6.39	5.47	5.93	1.80	1.90	1.85	500.59	681.27	590.93
20	20	munivenkatam	80	F	Left	HM	1.7	Professio	No	No	Animal	20	No	Diabetes	Negat	Negati	No Grow	No Growth	No Grow	None	Pseudomo	2.7	3.5	3.1	2.5	2.5	2.5	1.90	0.70	1.30	3.1	2.9	3.0	3.0	2.9	3.0	1.80	1.50	1.65	474.63	663.76	569.19

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21	21	Prasuna Yamujala	79	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.00	2.00	2.00	2.50	2.00	2.25	1.90	1.10	1.50	2.33	2.27	2.25	2.23	2.18	2.20	0.80	0.60	0.70	404.57	515.58	460.07
22	22	shakunthala	68	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	None	Negative	Negative	No Growth	No Growth	No Growth	None	Aspergillus	1.90	1.40	1.65	1.80	1.80	1.80	1.00	1.80	1.40	3.00	3.26	3.13	4.11	4.38	4.24	0.50	0.90	0.70	568.62	577.67	573.14
23	23	Panav Vedantham	54	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Curvularia	4.00	4.00	4.00	4.75	5.00	4.88	0.80	1.00	0.90	4.34	3.90	4.12	4.47	4.60	4.54	1.20	1.80	1.50	584.52	565.50	575.01
24	24	rajeshwari	50	F	Left	HM	1.7	Professional	No	No	Animal	20	No	Hypertension	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	1.50	1.75	1.63	1.75	1.50	1.63	0.60	1.50	1.05	2.33	4.52	3.42	1.32	1.69	1.50	1.50	1.00	1.25	404.27	548.91	476.59
25	25	Fanibhushan Modekurthi	55	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	None	Positive	Positive	Growth	Growth	Growth	None	Fusarium	4.00	4.00	4.00	5.00	4.00	4.50	1.00	1.60	1.30	4.09	3.95	4.02	5.06	5.26	5.16	1.80	1.70	1.75	521.54	524.40	522.97
26	26	suvrna	73	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Diabetes	Negative	Negative	No Growth	No Growth	No Growth	None	Aspergillus	1.00	3.00	2.00	1.50	3.00	2.25	1.80	1.30	1.55	1.14	1.23	1.19	2.53	2.44	2.48	1.30	0.70	1.00	402.04	554.56	478.30
27	27	yadamma	54	F	Left	HM	1.7	Professional	No	No	Animal	20	No	None	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	1.50	1.50	1.50	2.00	1.75	2.87	0.80	0.90	0.85	1.84	1.87	1.85	1.96	1.93	1.95	0.90	1.10	1.00	547.91	417.07	482.49
28	28	subbaraju	68	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusarium	1.80	1.50	1.65	2.10	2.00	2.05	0.80	0.80	0.80	2.78	3.01	2.89	2.62	2.58	2.60	1.90	1.40	1.65	620.03	556.65	588.34
29	29	Parmesh Gundugurthi	63	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.00	2.00	2.00	2.00	2.00	2.00	1.70	0.90	1.30	1.67	1.52	1.60	1.70	1.54	1.62	1.40	0.80	1.10	632.68	566.81	599.75
30	30	nagamani	67	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	None	Negative	Negative	No Growth	No Growth	No Growth	None	Aspergillus	4.00	4.50	4.25	4.00	4.00	4.00	1.00	0.60	0.80	3.26	3.41	3.34	3.59	3.60	3.59	1.20	1.30	1.25	533.27	412.93	473.10
31	31	Vidhaata Chaganti	64	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	None	Positive	Positive	Growth	Growth	Growth	None	Fusarium	2.00	3.00	2.50	3.50	3.50	3.50	1.20	1.70	1.45	3.80	4.40	4.10	4.49	4.77	4.63	1.80	0.80	1.30	648.64	573.30	610.97
32	32	sarada	61	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Diabetes	Negativ	Negative	No Growth	No Growth	No Growth	None	Aspergillus	4.00	3.00	3.50	2.00	2.50	2.25	0.70	1.70	1.20	2.59	2.55	2.57	3.04	3.05	3.05	1.90	1.70	1.80	565.34	543.39	554.37

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33	33	veerayya	76	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Curvularia	30.00	30.00	30.00	30.50	30.00	30.25	1.70	1.30	1.50	40.00	37.87	39.93	36.68	42.27	39.98	1.60	1.10	1.35	441.14	511.80	476.47
34	34	venkatagovindu	80	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusariium	22.25	22.50	22.38	22.75	22.50	22.63	0.80	1.00	0.90	33.07	33.78	33.43	33.11	44.10	33.61	0.60	1.40	1.00	614.56	560.78	587.67
35	35	sarala	54	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Hypertension	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Aspergillus	11.50	11.50	11.50	11.50	11.50	11.50	1.40	1.60	1.50	11.67	11.55	11.61	22.11	11.60	11.85	1.30	1.60	1.45	634.17	602.47	618.32
36	36	subbamma	53	F	Left	HM	1.7	Professional	No	No	Animal	20	No	Diabetes	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Pseudomonas	17.75	20.00	18.88	22.50	22.00	22.25	1.20	1.20	1.20	24.49	22.57	22.53	24.41	22.38	24.40	1.30	1.20	1.25	610.73	624.33	617.53
37	37	rajukumar	59	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Curvularia	33.00	33.50	33.25	44.00	44.00	44.00	1.00	0.80	0.90	22.60	33.10	22.85	55.01	44.34	44.68	1.50	1.70	1.60	474.57	580.82	527.70
38	38	bopatlarani	59	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Diabetes	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Aspergillus	11.25	11.00	11.13	11.25	11.00	11.13	1.40	0.50	0.95	11.52	11.55	11.54	11.63	11.67	11.65	0.60	1.20	0.90	443.48	508.17	475.83
39	39	venkataratnam	75	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Curvularia	33.50	33.00	33.25	44.50	33.00	33.75	1.80	0.90	1.35	44.59	44.33	44.46	55.63	55.33	55.48	2.00	0.60	1.30	545.36	611.05	578.21
40	40	seema	60	F	Left	6/24	0.6	Labourer	No	No	Stone	10	No	Hypertension	Negative	Negative	NoGrowth	NoGrowth	NoGrowth	None	Aspergillus	30.00	33.25	33.13	22.50	22.50	22.50	0.90	1.40	1.15	33.43	44.28	33.85	22.89	33.12	33.00	0.90	1.90	1.40	652.67	491.29	571.98
41	41	gopal raju	71	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	None	Positive	Positive	Growth	Growth	Growth	None	Curvularia	44.00	44.00	44.00	55.25	55.00	55.13	0.80	1.60	1.20	44.63	44.62	44.62	66.76	55.04	55.90	2.00	0.90	1.45	589.19	513.31	551.25
42	42	galijanardhan	55	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Fusariium	21.10	11.80	11.95	22.20	11.80	22.00	2.00	1.80	1.90	33.66	33.07	33.37	33.41	33.14	33.27	1.90	1.50	1.70	656.84	525.66	591.25
43	43	shaiksheksha	51	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Curvularia	22.00	22.80	22.40	44.00	33.50	33.75	0.50	1.70	1.10	44.77	44.51	44.64	44.61	44.59	44.60	1.70	1.10	1.40	452.39	517.26	484.82
44	44	kondappa	67	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	None	Positive	Positive	Growth	Growth	Growth	None	Fusariium	22.50	22.50	22.50	33.00	33.00	33.00	1.90	1.60	1.75	33.46	33.42	33.44	44.08	44.86	44.47	0.90	1.70	1.30	593.61	568.34	580.98
45	45	saraswath	72	F	Left	6/	0.6	Labour	No	No	Ston	10	No	Diabet	Neg	Neg	NoGr	NoGro	NoGr	None	Aspergi	2.	2.	2.	2.	2.	2.	1.8	1.1	1.4	2.	2.	2.	2.	2.	2.	1.2	1.0	1.1	476.	606.	541.

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46	46	kondareddy	76	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	Hypertension	Positive	Positive	Growth	Growth	Growth	None	Curvularia	4.00	5.00	4.50	5.00	5.50	5.25	0.70	1.00	0.85	5.49	5.65	5.57	5.94	6.01	5.97	0.60	1.50	1.05	419.76	513.43	466.59
47	47	veera subbamma	68	F	Left	HM	1.7	Professional	No	No	Animal	20	No	None	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	3.00	3.20	3.10	3.00	3.30	3.15	1.20	1.70	1.45	3.42	3.40	3.41	3.73	3.72	3.72	0.90	0.90	0.90	648.31	556.09	602.20
48	48	nagaruna	61	M	Right	6/12	0.3	Agricultural	No	Yes	Dust	5	No	Diabetes	Positive	Positive	Growth	Growth	Growth	None	Fusariium	3.00	2.50	2.75	2.00	2.00	2.00	1.20	0.90	1.05	3.13	3.21	3.17	4.92	5.34	5.34	1.30	0.60	0.95	449.46	637.56	543.51
49	49	subbarayudu	70	M	Right	1/60	1.2	Unemployed	No	Yes	Vegetable	15	No	None	Positive	Positive	Growth	Growth	Growth	None	Curvularia	3.50	3.00	3.25	2.50	2.00	2.10	1.40	1.90	1.65	3.97	3.93	3.95	2.78	2.89	2.83	0.50	1.00	0.75	634.03	559.91	596.97
50	50	neelima	54	F	Left	HM	1.7	Professional	No	No	Animal	20	No	DM&HTN	Negative	Negative	No Growth	No Growth	No Growth	None	Pseudomonas	2.00	1.30	1.65	0.50	0.25	0.37	1.20	1.10	1.15	1.34	1.05	1.19	0.72	0.62	0.67	1.00	0.80	0.90	604.70	579.52	592.11