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The Prevalence and Risk Factors of Post-Operative Corneal Decompensation after Cataract Extract among Patients in Khartoum Eye Hospital - Sudan June 2021 - January 2022

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ABSTRACT

➢ ***Background:***

Corneal decompensation is a medical condition characterized by opacity of the cornea. This condition arises as a result of mechanical injury caused by inadvertent contact of intraocular instruments with the cornea during surgery. Cataract extraction involves a surgical procedure to remove a clouded lens from the eye that has developed over, which can impede vision in the affected eye.

➢ ***Objectives:***

To determine the prevalence and risk factors of post-operative corneal decompensation after cataract extraction according to the type of surgical procedure

➢ ***Methodology:***

This is a Descriptive, retrospective, Cross sectional, hospital-based study, was conducted in Khartoum eye hospital, from June 2021 to January 2022. Patients who underwent cataract extraction between June 2021 - January 2022 Patients who were diagnosed with corneal decompensation were included. Data collection was conducted from medical record by using data sheet. The data will be analyzed via SPSS program (Statistical Package for The Social Sciences) and Microsoft Excel program. using chi square, t-test and correlation then be presented in the form of tables, bar charts and pie charts.

➢ ***Results:***

About patient's gender, males were 53(48.2%), females were 57(51.8%), patients from 70 – 79 years were 42(38.2%), 60 – 69 years were 33(30%), 50 – 59 years were 20(18.2%), and 40 – 49 years were 15(13.6%). About Diagnosed with symptoms of corneal Decompensation, yes 17(15.5%), No 93(84.5%), ; Extracapsular surgery was done in 55(50%) of patients, Phaco was done in 35(31.8%) of patients, and small incision cataract surgery was done in 20(18.2%) of patients, Glaucoma 7(15.5%) was the most common other contributing factors in followed by Trauma 4(36.4) and previous steroid use was 1(25%) respectively, About experience any intra-operative complications, no 108(98.2%) patients, yes 2(1.8%) patients.

➢ ***Conclusion:***

Most of patients were females, between 70-79 years old, Extracapsular surgery was the most occuring type of surgery. Extracapsular surgery had the largest percentage of corneal decompensation. There was a notable correlation (significant association) that was observed between between gender, age and corneal decompensation.

➢ ***Recommendations:***

Further research involving a larger sample size is necessary to validate the results of this study, Education programs should be developed to raise the awareness of patients.

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DEDICATION

I offer this research in dedication to my mother Amel and my father Mohammed, who have sacrificed everything to guarantee that I would have the chance to pursue a career in education, to my siblings, my colleague Hadeel, my friends who have helped me and everyone who’s path I have ever crossed with and has made me a better doctor.

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Thanks, praises & glorification to Allah who gave me life and knowledge to carry out this dissertation.

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Last but not least I would like to pay my special regards to all my friends who have succored me throughout this thesis and all your unwavering support

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ABBREVIATIONS

DSAEK	Descemet Stripping Automated Endothelial Keratoplasty
ECCE	Extracapsular Cataract Extraction
ICCE	Intracapsular Cataract Extraction
MSICS	Manual Small Incision Cataract Surgery
OVDs	Ophthalmic Viscosurgical Devices

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CHAPTER ONE
INTRODUCTION

A. Introduction

Cataract extraction, a surgical intervention, is intended to eliminate a clouded lens in the eye, which develops gradually and hampers vision. This procedure, employed in cataract operations, involves replacing the removed impaired lens with an artificial one. The natural lens of the eye maintains clarity and transparency, but over time, protein deposits accumulate, resulting in cloudiness known as cataracts. The posterior layer of the cornea comprises endothelial cells responsible for maintaining corneal clarity. While cataract surgery can sometimes cause minor damage to these cells, most corneas possess a surplus of endothelial cells, minimizing potential issues. However, in rare cases, post-surgery, compromised endothelial function may lead to corneal decompensation, resulting in impaired vision and discomfort.

Endothelial decompensation can stem from various factors that impair the endothelium, resulting in a loss of stromal clarity. These insults often arise from inherited conditions, trauma, inflammation, infections, or immune-related causes. Additionally, damage to the corneal endothelium can induce corneal edema following intraocular surgery. Fortunately, acute corneal edema typically resolves completely when the endothelium functions normally. [1]. The removal of the crystalline lens during cataract surgery disrupts the stabilizing effect of the lens-zonule barrier in the eye. Additionally, the intracapsular method of lens extraction results in a loss of stability within the vitreous cavity, a phenomenon known as vitreodonesis. This decrease in stability within the aphakic (lens-less) eye is referred to as endophthalmodonesis. [2]. Corneal decompensation following cataract surgery has also been associated with the use of talc, detergents, and irrigating solutions. [3]. Corneal complications in uveitis are relatively uncommon but are well documented, encompassing conditions such as band-shaped keratopathy and different types of keratitis. Uveitis significantly increases the risk of developing keratopathy. Chronic or recurrent uveitis often results in the accumulation of inflammatory cells on the corneal endothelium, leading to permanent loss of endothelial cells. [4].

After prolonged conservative management, when visual acuity declines, a corneal transplant, typically Descemet stripping automated endothelial keratoplasty (DSAEK), may be the sole recourse to ameliorate vision impairment. DSAEK can be concurrently performed with cataract extraction and intraocular lens insertion in the presence of a visually significant cataract. While injuries may initially result in transient damage without endothelial decompensation, repeated or severe isolated injuries can lead to permanent and non-compensatory loss of endothelial cells. [5, 6].

B. Problem Statement and Justification

Postoperative corneal decompensation is significant among patients who have experienced cataract extraction in Khartoum eye Hospital. Most of the patients who have underwent cataract extraction were diagnosed with postoperative corneal decompensation. Therefore, the objective of this study is to determine the prevalence and identify the risk factors associated with post-operative corneal decompensation after cataract extract in khartoum eye hospital. Corneal decompensation can cause eye pain or discomfort in light, Pain or tenderness when the eye is touched, Hazy circles (halos) around lights and sometimes can also cause blistering of the eye .

C. Research Question

What is the prevalence and risk factors of post-operative corneal decompensation after cataract extraction?

D. Objectives

➢ *General Objective:*

- To determine the prevalence and risk factors of post-operative corneal decompensation after cataract extraction according to the type of surgical procedure.

➢ *Specific Objectives:*

- To ascertain the demographic attributes (age, sex, medications and medical procedures) of the study subjects.
- To determine the prevalence of post-operative corneal decompensation after cataract according to the type of surgical procedure performed.
- To assess different risk factors of postoperative corneal decompensation after cataract extract.

CHAPTER TWO
LITERATURE REVIEW

A. Background

Cataract surgery stands as one of the most prevalent procedures conducted globally and holds a long-standing history as one of the earliest surgical interventions. With advancements in both surgical techniques and intraocular lens technology, it has emerged as one of the most effective interventions in the field of medicine. This article explores the evolution of cataract surgery, tracing its journey from ancient methods like couching to contemporary approaches such as phacoemulsification and lens replacement.

The natural crystalline lens of the eye is a transparent structure, suspended in place by zonular fibers originating from the ciliary body. Comprising a capsule, lens epithelium, cortex, and nucleus, the lens serves vital functions such as refracting light to focus a sharp image on the retina and facilitating accommodation. Cataract, characterized by the opacification of the lens, results in visual impairment. While numerous factors can contribute to cataract formation, aging remains the primary cause, often influenced by various factors. Avoidable risk factors for cataracts include tobacco use and exposure to ultraviolet radiation. [7, 8].

As a cataract progresses to a point where it significantly affects vision, cataract surgery becomes the sole treatment option. The definition of "visually significant" has evolved over time, now commonly understood as a visual acuity of 20/40 or worse. In the early stages of cataract surgery, a "visually significant" cataract typically referred to an advanced or mature stage where vision impairment approached near blindness. However, with remarkable advancements in surgical techniques and enhanced safety protocols, the criteria for cataract surgery have shifted, now recommending cataract removal at much earlier stages of development. [9].

The earliest known method of cataract treatment dates back to the fifth century BC and is known as couching. The term "couching" originates from the French verb "coucher," meaning "to put to bed." Couching was typically performed on mature cataracts, where instead of removing the cataract from the eye, a needle was used to dislodge the mature cataract out of the visual axis. While this procedure instantly improved vision by allowing light to pass through, it left the cataract within the eye. Initially, couching was deemed successful due to immediate vision improvement. However, the retention of the cataractous lens and the absence of sterile techniques soon led to adverse effects, resulting in blindness shortly after the procedure. Unfortunately, despite advancements in modern medicine, couching continues to be practiced in some developing countries. [10, 11].

As understanding of ocular anatomy and eye disease science advanced, so did the approach to cataract surgery. While couching was prevalent until the 18th century, ancient texts suggest that around 600 BC, an Indian surgeon named Sushruta may have pioneered extracapsular cataract extraction (ECCE). In ECCE, the lens capsule is retained. The first documented cataract extraction occurred in 1747 in Paris, performed by French surgeon Jacques Daviel. This procedure, more effective than couching, boasted a success rate of approximately 50%. Daviel's technique involved creating a large corneal incision (over 10 mm), puncturing the lens capsule, expressing the nucleus, and then removing the lens cortex via curettage. Despite representing significant progress, Daviel's procedure was associated with postoperative complications, including poor wound healing, posterior capsular opacification, retained lens fragments, and infection. [12,13].

Despite the risks associated with Daviel's procedure, it remained the standard approach for cataract extraction for over a century, until the 19th century, when intracapsular cataract extraction (ICCE) gained popularity as the preferred method of cataract removal. However, advancements in operative techniques and surgical instruments led to the resurgence of extracapsular cataract extraction (ECCE) in the 1970s, supplanting ICCE due to its lower incidence of blinding complications. Today, variations of ECCE and small incision cataract surgery (SICS) are practiced worldwide. Over time, techniques for extracapsular cataract removal have evolved, resulting in overall success rates reaching as high as 90% to 95%. [14].

B. Intracapsular Cataract Extraction

In 1753, Samuel Sharp conducted the inaugural intracapsular cataract extraction (ICCE), wherein the lens, encompassing the lens capsule, was extracted through a sizable incision. Sharp manually removed the cataract using his thumb, a process that involved breaking the zonular fibers suspending the lens—a critical aspect of ICCE. Over time, the technique for disrupting zonules evolved from early forceps manipulation to the introduction of alpha-chymotrypsin by Joaquin Barraquer in 1957, which enzymatically dissolved the zonules. Additionally, cryoextraction emerged as a successful method for ICCE, involving the application of a frozen probe to the cataract, which adhered to the probe and could be gently evacuated from the eye. Although ICCE's success improved with advancements in anesthesia and sterilization techniques, its popularity waned rapidly with the refinement of extracapsular cataract extraction (ECCE) methods. Major drawbacks of ICCE include the complete removal of the lens and lens capsule, which eliminates the barrier separating the anterior and posterior eye structures. Without this barrier, blinding complications like corneal decompensation are more likely, as the vitreous may prolapse forward. Furthermore, ICCE necessitates larger incisions for cataract removal, resulting in slower healing and increased astigmatism. Despite these limitations, ICCE remained the primary cataract extraction approach in the United States until the 1970s, and modern ICCE techniques continue to be practiced in developing countries. [15,16].

C. Modern Cataract Extraction and Phacoemulsification

As advancements in surgical techniques, anesthesia, and equipment progressed, intracapsular cataract extraction (ICCE) fell out of favor and was replaced by extracapsular cataract extraction (ECCE) as the standard procedure for cataract removal. ECCE has demonstrated significantly superior visual outcomes compared to ICCE. The introduction of intraocular lenses (IOLs) to replace the cataractous lens has further enhanced refractive results post-surgery. Additionally, the advent of ophthalmic visco surgical devices (OVDs) in 1972 has greatly improved the safety and efficiency of cataract surgery. OVDs, gel-like substances used during the procedure, help maintain space within the eye, prevent globe deflation, and protect internal eye structures without interfering with the surgical steps.

In 1967, Charles Kelman introduced phacoemulsification, commonly referred to as "phaco," as an alternative to extracapsular cataract extraction (ECCE). With conventional ECCE, the entire lens nucleus is removed from the eye through a large incision typically around 10 mm in size. In phacoemulsification, an ultrasound-driven needle is used to emulsify and aspirate the lens through a significantly smaller incision, typically measuring 3 to 4 mm. Initially met with resistance, phacoemulsification has now become the safest and preferred method of cataract surgery. The smaller incision in phacoemulsification results in a more stable anterior chamber during surgery, shorter recovery time, and reduced surgically induced astigmatism. [17].

The contemporary phacoemulsification procedure involves several precise steps. Preoperative pupil dilation using topical medications and administration of topical anesthetic agents are standard practices. In the operating room, after sterilization with povidone-iodine and draping, the eye is exposed with a lid speculum and the surgical microscope is aligned. A small paracentesis or side-port incision is made in the cornea, through which ophthalmic viscosurgical devices (OVD) are injected to protect ocular structures and stabilize the globe for the main incision. The main incision, ranging from 1.8 mm to 2.75 mm, is crafted to promote self-sealing (known as "stitchless cataract surgery"). A continuous circular opening is created in the anterior lens capsule (capsulorrhexis) to expose the lens contents, followed by the introduction of the phacoemulsification instrument for lens emulsification and aspiration. After removing the lens contents, leaving the anterior portion of the lens capsule intact, it serves as the housing for the intraocular lens (IOL). Phacoemulsification is used to move all lens contents through an opening in the lens capsule, leaving only the lens capsule, which accommodates the IOL. [18].

Phacoemulsification techniques and technology are continuously evolving with a focus on precision. In some parts of the world, cataract surgery has transitioned into a refractive procedure, with patients expecting reduced dependence on spectacles. Skilled phaco surgeons meticulously follow the outlined steps of cataract surgery, ensuring controlled and consistent procedures that lead to predictable and reliable outcomes. However, there's always room for advancement in medicine. In 2001, femtosecond laser technology revolutionized LASIK refractive surgery, enabling the creation of more precise corneal flaps. This technology was adapted for cataract surgery in 2008, introducing laser-assisted cataract surgery. While the laser doesn't eliminate the need for phacoemulsification, it performs several steps of the procedure, such as constructing the main wound, creating incisions, and fragmenting the lens. Additionally, it's utilized for limbal relaxing incisions to correct astigmatism. Femtosecond laser technology enhances visual acuity outcomes, offering greater precision, predictability, and reproducibility compared to traditional cataract extraction. However, current data doesn't demonstrate superiority of femtosecond laser-assisted cataract surgery over manual phacoemulsification. Both methods are deemed equally safe and effective. Despite widespread adoption of femtosecond laser technology among cataract surgeons, some still question its overall benefit and cost-effectiveness.

D. Intraocular Lenses

The remarkable success achieved in cataract surgery owes much to the development of intraocular lenses (IOLs). In 1949, Sir Harold Ridley accomplished the first implantation of an IOL. Prior to the advent of IOLs, patients undergoing cataract surgery were left aphakic, lacking a lens in their eyes. This necessitated the use of high-powered hyperopic spectacles postoperatively to refract light and focus images on the retina. Consequently, patients who had cataract surgery to address vision loss often found their vision remaining poor without corrective lenses. Ridley's pivotal realization came after observing that World War II pilots, wounded with pieces of shattered airplane windshields in their eyes, tolerated the presence of these materials. This led him to develop an IOL made of polymethyl methacrylate (PMMA), commonly known as acrylic glass. Initially, Ridley's innovation faced skepticism and encountered significant postoperative complications, including glaucoma, uveitis, and dislocation of the implanted lens. [20].

Since Ridley's pioneering work, significant advancements have been made in intraocular lens (IOL) technology and design. The primary objective of IOL implantation is to achieve optimal outcomes while minimizing adverse complications. IOLs can be implanted in various locations, including the anterior chamber, attached to the iris, positioned in the ciliary sulcus (the space between the anterior lens capsule and iris), or within the capsular bag. During the initial phases of IOL implantation, intracapsular cataract extraction (ICCE) was the prevailing method, involving the removal of the entire lens, including the lens capsule. Consequently, IOL placement was limited to the anterior chamber or fixation to the iris. However, early IOL models were associated with significant safety concerns. For instance, anterior chamber IOLs were prone to spinning within the chamber, leading to corneal endothelial damage. Similarly, iris-fixated lenses often resulted in pupillary distortion and uveitis-glaucoma-hyphema (UGH) syndrome.

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With the decline in popularity of intracapsular cataract extraction (ICCE), intraocular lenses (IOLs) underwent redesign to facilitate posterior chamber implantation. Steven Shearing, an American ophthalmologist, is recognized for revolutionizing IOL design in the modern era. During the 1970s, he introduced a lens capable of self-centering behind the iris, mimicking the natural lens position. As cataract surgical techniques advanced, the capsular bag emerged as a more structurally stable location for IOL placement. The advent of foldable lenses in 1980 marked a significant milestone, allowing for improved surgical outcomes. These foldable IOLs, crafted from flexible materials like acrylic or silicone, could be inserted through smaller incisions. Since the 1970s, notable strides have been made in IOL technology, design, and materials. In 1992, the development of the first toric IOL enabled correction of astigmatism. Subsequent enhancements in toric IOL models have yielded outstanding results, offering patients increased independence from spectacle correction. [21].

➢ *Related Studies:*

In a retrospective study conducted at the University of Manchester, UK, by Shiao W. Wong, Fiona Carley, and Nicholas P. Jones in 2019, the aim was to investigate the prevalence, etiology, management, and visual outcomes of corneal decompensation related to uveitis. The study utilized data from the Manchester Uveitis Clinic (MUC), which prospectively records information on patients. Clinical records of identified patients were retrospectively reviewed, including demographic details, uveitis cause and duration, preceding intraocular surgeries, corneal decompensation patterns, frequency and types of corneal transplantation, and visual outcomes. Between March 1991 and May 2018, a total of 25 patients (0.6%) with corneal decompensation were identified, with 9 patients (0.2%) affected bilaterally, accounting for a total of 34 eyes. The mean duration between uveitis diagnosis and decompensation onset was 23 months (ranging from 0 to 117 months). Forty-one percent of patients had associated glaucoma, and 50% of eyes had undergone intraocular surgery prior to decompensation. Among eyes with no history of elevated intraocular pressure or intraocular surgery, keratouveitis (presumed autoimmune or tuberculous) was the most prevalent cause of corneal decompensation. [22].

In a recent retrospective study conducted by A. Konowal, J. C. Morrison, S. V. L. Brown, D. L. Cooke, L. J. Maguire, D. V. Verdier, F. T. Fraunfelder, R. F. Dennis, and R. J. Epstein in 1999, the aim was to characterize irreversible corneal decompensation resulting from topical dorzolamide hydrochloride therapy in nine patients with corneal endothelial compromise. The study involved analyzing patients' charts retrospectively. The findings revealed that nine eyes of nine patients developed corneal decompensation shortly after initiating topical dorzolamide treatment, and this condition did not resolve upon discontinuation of the drug. The onset of corneal decompensation occurred within 3 to 20 weeks of therapy initiation. All nine patients had previously undergone intraocular surgery, with eight of them having undergone cataract surgery (three aphakic and three with posterior chamber intraocular lenses), while two patients had anterior chamber intraocular lenses. Additionally, four patients had prior penetrating keratoplasties, each accompanied by reported complications of corneal allograft rejection episodes that were successfully managed. Two patients had asymptomatic Fuchs endothelial dystrophy. Subsequently, seven patients underwent successful penetrating keratoplasties. [23].

In a 1995 epidemiologic and clinical investigation conducted by Paul Courtright, Susan Lewallen, Simon P. Holland, and Theodore M. Wendt at a nonprofit hospital in Asia, the authors aimed to explore the occurrence of postoperative corneal edema. The study involved a comprehensive review of clinical charts, interviews with involved personnel, examinations and interviews with patients who underwent surgery, and laboratory simulations of the disinfection procedure used. The surgical procedures were performed on 111 patients over a 5-day period, comprising 61 men (55%) and 48 women (43.2%). A significant proportion of patients (88%) were over 50 years old. Pre-operative visual acuity was documented for 44 patients (40%), revealing that 23% were blind, 48% were visually disabled, and 30% were not visually disabled. Half of the patients had pre-operative visual acuity in the surgical eye of less than 3/60, while the other half had a visual acuity of 3/60 to 6/24. Intraocular pressure was recorded for 49 patients, and A-scan and keratometry findings were obtained for all patients. Among the patients, 41 (37%) did not have clear records of the operating surgeon, while the remainder were divided between surgeon 1 and surgeon 2. Patients with clear corneas and good visual acuity (>6/60) were classified as control subjects, while those with cloudy corneas and visual acuity less than 6/60 were categorized as patients. [24].

In 2013, a study conducted by Muriël Doors, Tos Berendschot, Wouter Touwslager, Carroll A. Webers, and Rudy Nuijts aimed to compare corneal thickness and volume changes and identify risk factors for postoperative corneal decompensation. The research took place at the Maastricht University Medical Center in Maastricht, the Netherlands. This prospective randomized clinical trial enrolled a total of 52 eyes from 48 patients between November 2008 and May 2010. All patients diagnosed with Fuchs endothelial dystrophy (FED) planning to undergo cataract surgery due to visually significant cataracts were included. Patients with a history of previous corneal or intraocular surgery, those requiring combined surgical procedures (e.g., triple procedure), or those with other visually significant ocular diseases were excluded. The results revealed that preoperative central corneal thickness (CCT) was the sole significant predictor of postoperative corneal decompensation ($P < .001$). A preoperative CCT of 620 μm corresponded to an odds ratio of 1, indicating no increased risk of corneal decompensation. With each 10-μm increase in preoperative CCT, the odds of developing corneal decompensation increased by 1.7 times. [25].

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CHAPTER THREE
METHODOLOGY

A. Study Design:

Descriptive, retrospective, Cross sectional, hospital-based study.

B. Study Area:

Study area is Khartoum eye hospital. It is one of the biggest ophthalmic hospitals situated in Sudan, it is located in Nile street, Khartoum.

C. Study Population:

Study Population: patients attending Khartoum eye hospital who have undergone cataract extraction surgery from June 2021 to January 2022.

➢ *Inclusion Criteria:*

- Above 40 years of age
- Patients who underwent cataract extraction between June 2021 - January 2022
- Patients who were diagnosed with corneal decompensation.

➢ *Exclusion Criteria:*

- Bellow 40 years of age
- Patients who underwent cataract extraction outside the study period
- Patients who have not undergone cataract surgery.

D. Sampling

➢ *Sample Size:*

The sample size was determined using an online calculator, using solvin's finite population equation formula after access to the database.

$$\mathbf{n = N / (1 + Ne^2)}$$

n = corrected sample size

N = Total population size

e = Margin of error (MoE), e = 0.05

The sample size was 110, collected from the database from June 2021 to January 2022.

➢ *Sample Technique:*

Convenient sampling technique.

E. Data collection Plan and Analysis:

Data collection was conducted from medical record by using data sheet. The analysis of the data was conducted utilizing SPSS (Statistical Package for the Social Sciences) and Microsoft Excel. Using chi square, crosstabulation and correlation then be presented in the form of tables, bar charts and pie charts.

F. Ethical Considerations:

The ethical consideration was acquired from the research technical and ethical committee at the Faculty of Medicine. It was also sought from khartoum eye teaching hospital. Informed consent was obtained from participants.

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CHAPTER FOUR
RESULTS

About patient's gender, males were 53(48.2%), females were 57(51.8%) [Table 1].

Regarding the age, patients from 70 – 79 years were 42(38.2%), 60 – 69 years were 33(30%), and 50 – 59 years were 20(18.2%), and 40 – 49 years were 15(13.6%). [Table 1].

About Diagnosed with symptoms of corneal Decompensation, yes 17(15.5%), No 93(84.5%) [Table 1].

About Type of cataract surgery; Extracapsular surgery was done in 55(50%) of patients, Phaco was done in 35(31.8%) of patients, and small incision cataract surgery was done in 20(18.2%) of patients [Table 1].

Table 2 demonstrated that the Association between the type of cataract extract and corneal decompensation was not significant (p-value = 0.275). ($p > 0.05$)

Table 3 represented the Association between age and Corneal decompensation, the p-value was significant (p-value = 0.001). ($p < 0.05$)

Table 4 showed the Association between gender and Corneal decompensation, the p-value was significant (p-value = 0.044). ($p < 0.05$)

Glaucoma 7(63.3%) was the most common other contributing factors in followed by Trauma 4(36.4%) and previous steroid use 1(25%) respectively [Table 5].

Table 5 displayed that the association between contributing factors and corneal decompensation was highly significant (p-value = 0.000). ($p < 0.05$).

Table 1: Frequency, Distribution and Percentage for Research Variables

		Frequency	Percent
GENDER	Female	57	51.8
	Male	53	48.2
	Total	110	100.0
AGE	40 - 49	15	13.6
	50 - 59	20	18.2
	60 - 69	33	30.0
	70 - 79	42	38.2
UNDERGONE CATARACT SURGERY	yes	110	100.0
DIAGNOSED WITH SYMPTOMS OF CORNEAL DECOMPENSATION	yes	17	15.5
	no	93	84.5
TYPE OF CATARACT SURGERY	small incision cataract surgery	20	18.2
	Extracapsular surgery	55	50.0
	Phaco	35	31.8
OTHER CONTRIBUTING FACTORS	Infection	17	15.5
	Glaucoma	11	10.0
	trauma	11	10.0
	previous steroid use	4	3.6
	Non	67	60.9
EXPERIENCED ANY INTRA-OPERATIVE COMPLICATIONS	yes	2	1.8
	no	108	98.2

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Table 2: Percentage of those who had Corneal Decompensation According to Each Type of Cataract Extraction

Diagnosed with symptoms of corneal Decompensation * Type of cataract surgery Crosstabulation					
		Type of cataract surgery			P value
		small incision cataract surgery	Extra capsular surgery	Phaco	
Diagnosed with symptoms of corneal Decompensation	yes	1	11	5	0.275
		5.9%	64.7%	29.4%	
	no	19	44	30	
		20.4%	47.3%	32.3%	

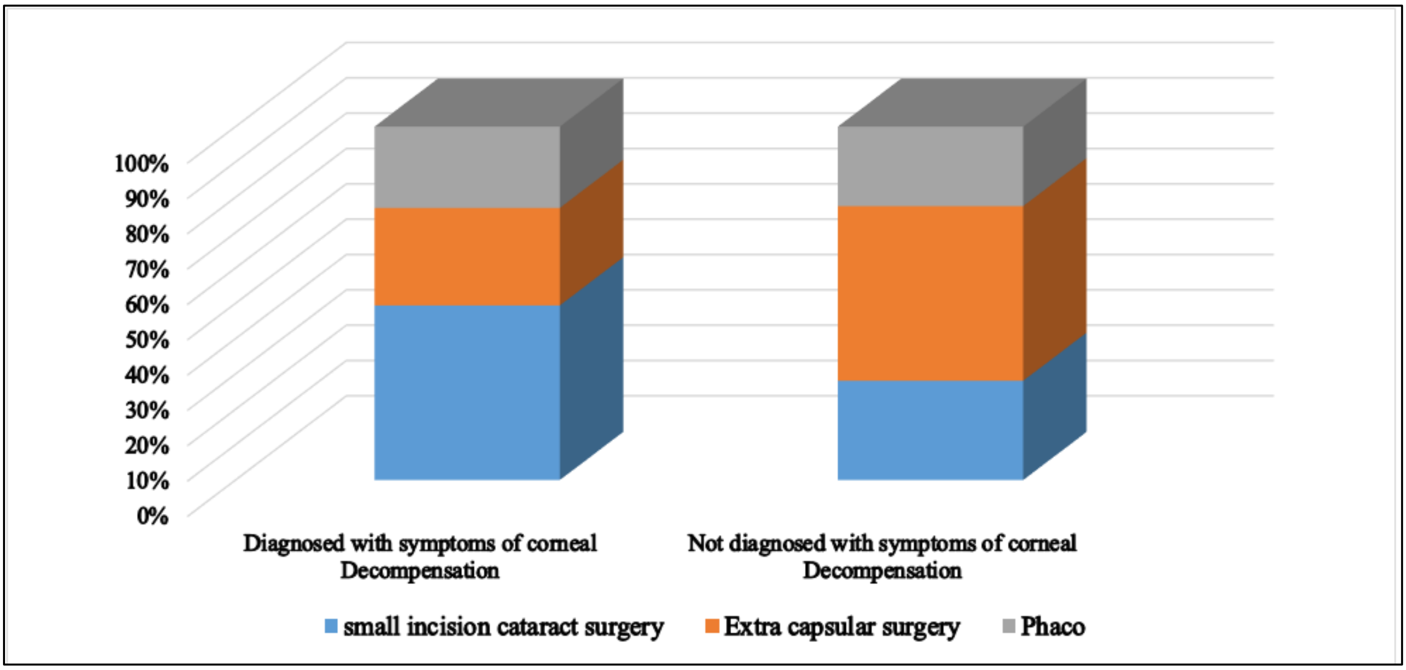

Fig 1: Distribution of Patients who had Corneal Decompensation According to Each Type of Cataract Extraction

Table 3. Chi Square for Age and Corneal Decompensation

		DIAGNOSED WITH SYMPTOMS OF CORNEAL DECOMPENSATION		P value
		Yes	No	
AGE	40 - 49	7	8	0.001
		46.7%	53.3%	
	50 - 59	5	15	
		25.0%	75.0%	
	60 - 69	2	31	
		6.1%	93.9%	
	70 - 79	3	39	
		7.1%	92.9%	

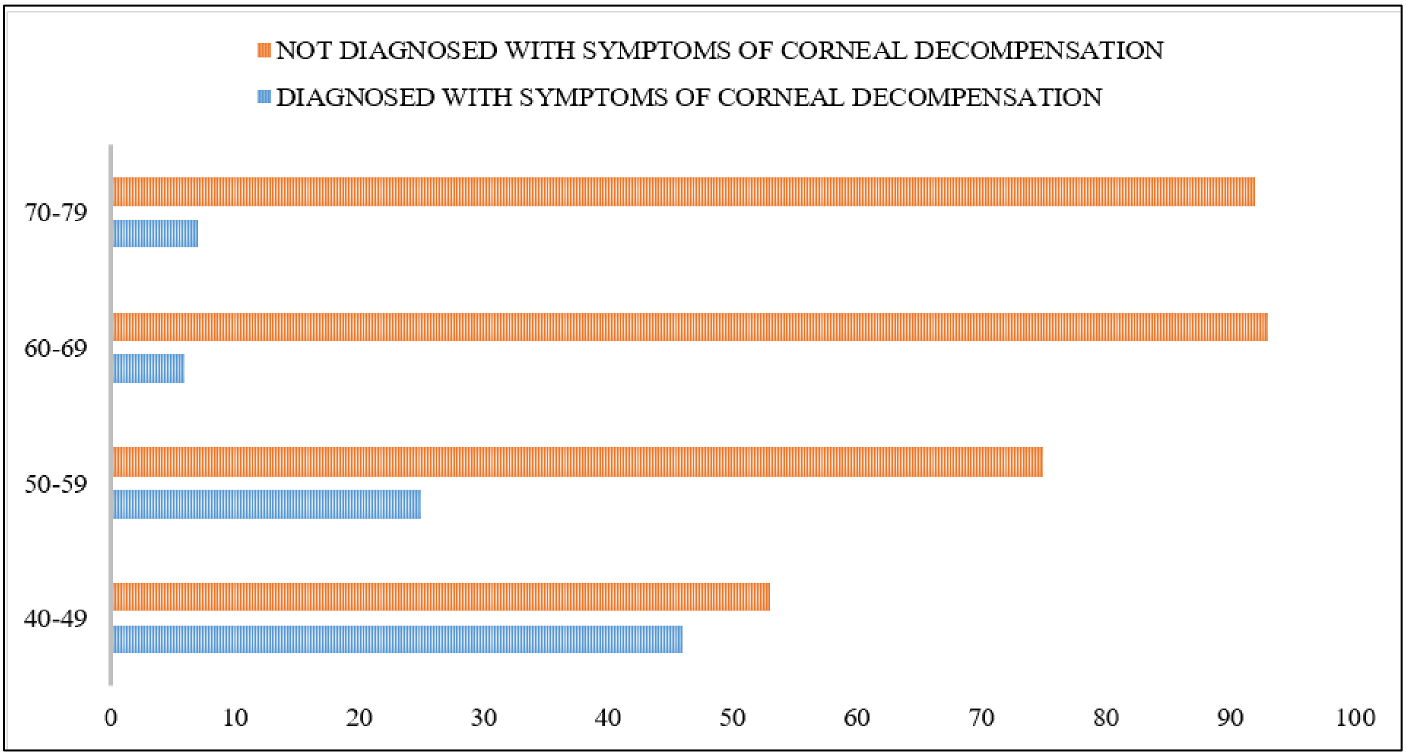

Fig 2: Distribution of Patients with Symptoms of Corneal Decompensation According to Age Groups

Table 4: Chi Square for Gender and Corneal Decompensation

		DIAGNOSED WITH SYMPTOMS OF CORNEAL DECOMPENSATION		P value
		Yes	**No**	
GENDER	Female	5	52	0.044
		8.8%	91.2%	
	Male	12	41	
		22.6%	77.4%	

Table 5: Chi Square of Other Risk Factors with Corneal Decompensation

		DIAGNOSED WITH SYMPTOMS OF CORNEAL DECOMPENSATION		P value
		Yes	**No**	
OTHER CONTRIBUTING FACTORS	Infection	3	14	0.001
		17.6%	82.4%	
	Glaucoma	7	4	
		63.6%	36.4%	
	Trauma	4	7	
		36.4%	63.6%	
	Previous steroid use	1	3	
		25.0%	75.0%	
	Non	2	65	
		3.0%	97.0%	

CHAPTER FIVE
DISCUSSION

Postoperative corneal decompensation is significant among patients who have experienced cataract extraction in Khartoum eye Hospital. A significant number of patients who have undergone cataract extraction have been diagnosed with postoperative corneal decompensation. Therefore, this study aims to determine the prevalence and identify the risk factors of post-operative corneal decompensation after cataract extract in khartoum eye hospital. Corneal decompensation can cause pain in the eye or discomfort in light, Pain or tenderness when you touch the eye, Hazy circles (halos) around lights and sometimes can also cause blistering of the eye.

This study was Descriptive, retrospective, Cross sectional, hospital-based study, was conducted in Khartoum eye hospital, patients attending khartoum eye hospital who have undergone cataract extraction surgery from June 2021 to January 2022 were included.

Most of patients in the current study were females; in addition, most of patients were between 70-79 years. Only 15.5% (17) of patents were diagnosed with symptoms of corneal Decompensation.

On the other hand, Extracapsular surgery, Phaco, and small incision cataract surgery were the most common Type of cataract surgery. In addition, infection, trauma, and Glaucoma were the most common Other contributing factors. Moreover, only 1.8% (2) of patients experienced intra-operative complications. This was dis agree with the findings of **Shiao et al [22],** discovered that 17 eyes (50%) had undergone intraocular surgery prior to experiencing decompensation. Among the eyes with no history of raised intraocular pressure or intraocular surgery, keratouveitis (presumed autoimmune or tuberculous) was identified as the leading cause of corneal decompensation. Fourteen eyes (41%) required corneal grafting, with five requiring repeat grafting., while **A. Konowal et al [23],** reported that all nine patients had previously undergone intraocular surgery. Of these, eight had undergone cataract surgery, with three being aphakic and three having posterior chamber intraocular lenses. Two patients had anterior chamber intraocular lenses. Additionally, four patients had undergone penetrating keratoplasties, each complicated by episodes of corneal allograft rejection, which were successfully treated. Two patients had asymptomatic Fuchs endothelial dystrophy. Subsequently, seven patients underwent successful penetrating keratoplasties.

The gender and age were significantly associated with corneal decompensation (p-value>0.05). males being higher at a percentage of 22.6% compared to 8.8% of females (P-value was found to be 0.044). As for the age, the age group with the most patients was 70-79 (P-value = 0.001).

In a 1995 epidemiologic and clinical investigation conducted by Paul Courtright, Susan Lewallen, Simon P. Holland, and Theodore M. Wendt at a nonprofit hospital in Asia, the researchers utilized a methodology comprising a review of clinical charts, interviews with involved personnel, examinations and interviews with patients who underwent surgery, and a laboratory simulation of the disinfection procedure used. The study focused on the development of post-operative corneal edema, involving 111 patients who underwent surgery over a five-day period. The patient demographics revealed that 61 (55%) were men and 48 (43.2%) were women, with 88% of patients being older than 50 years of age. Pre-operative visual acuity data was available for 44 patients (40%), with 23% categorized as blind, 48% as visually disabled, and 30% as not visually disabled. Half of the patients had a preoperative visual acuity (in the surgical eye) of less than 3/60, while the other half had a visual acuity of 3/60 to 6/24. Intraocular pressure was recorded for 49 patients, and A-scan and keratometry findings were recorded for all patients. Patients with clear corneas and good visual acuity (>6/60) were classified as control subjects, while those with cloudy corneas and visual acuity of less than 6/60 were classified as patients. [24].

Moreover, a significant association was observed among other contributing factors such as infection, glaucoma, trauma, and previous steroid use, with a P-value of 0.001. Among the participants, glaucoma emerged as the most prominent contributing factor before cataract extraction, with 63.6% of glaucoma patients experiencing corneal decompensation post-operatively following cataract surgery.

In 2013, Muriël Doors, Tos Berendschot, Wouter Touwslager, Carroll A. Webers, Rudy Nuijts, conducted a study aiming to compare corneal thickness and volume changes, as well as identify risk factors for postoperative corneal decompensation. This prospective randomized clinical trial took place at the Maastricht University Medical Center in the Netherlands from November 2008 to May 2010. A total of 52 eyes from 48 patients were included. Patients diagnosed with Fuchs endothelial dystrophy (FED) planning to undergo cataract surgery due to visually significant cataracts were eligible for the study. Exclusion criteria included a history of previous corneal or intraocular surgery, need for a combined surgical procedure (e.g., triple procedure), or other visually significant ocular diseases. The results revealed that preoperative central corneal thickness (CCT) was the only significant predictor of postoperative corneal decompensation (P < .001). [25].

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CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

A. Conclusion:

Most of the patients were females, between 70-79 years old. There was a significant association between gender, age and corneal decompensation. The most common type of surgery done Was extracapsular surgery also with the most occurrence of corneal decompensation. There was a high significant association between contributing risk factors and corneal decompensation. Infection was the most common other contributing factor.

B. Recommendations:

- Further research with a larger sample size is necessary to corroborate the findings of this study.
- Education programs should be developed to raise the awareness of patients.

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APPENDIX

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➢ *Gender*

- Male
- Female

➢ *Age*

➢ *Undergone cataract surgery*

- Yes
- No

➢ *Date of Operation*

➢ *Diagnosed with Symptoms of Corneal Decompensation*

- Yes
- No

➢ *Type of Cataract Surgery:*

- Extracapsular Surgery
- Intacapsular Cataract Surgery ICCE
- Phaco
- Small Incision Cataract Surgery

➢ *Had Glucauma*

- Yes
- No

➢ *Infection*

- Yes
- No

➢ *History of Trauma*

- Yes
- No

➢ *Previous History of Steroid Medication*

- Yes
- No

➢ *Operative Complications*

- Yes
- No