



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**HANAA ALY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



**HANAA ALY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

### قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



### يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



**HANAA ALY**



# Ocular Crowding Value in Egyptians with History of Acute Angle Closure Glaucoma

Thesis

Submitted for Partial Fulfillment of Master Degree  
in Ophthalmology

By

**Mohammed Ibrahim Abdelmordy Sherief**

*M.B.B.CH (Ain Shams University)*

Under supervision of

**Prof. Dr. Amr Saleh Galal Mousa**

*Professor of Ophthalmology*

*Faculty of Medicine - Ain Shams University*

**Prof. Dr. Momen Mahmoud Hamdi**

*Assistant Professor of Ophthalmology*

*Faculty of Medicine - Ain Shams University*

**Dr. Hassan Ahmed Elsayed Hassab**

*Lecturer of Ophthalmology*

*Faculty of Medicine - Ain Shams University*

Faculty of Medicine  
Ain Shams University

**2021**



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

اسبغناك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدقة الله العظيم

سورة البقرة الآية: ٣٢

# Acknowledgment

*First and foremost, I feel always indebted to **Allah**,  
the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and  
profound gratitude to **Prof. Dr. Amr Saleh Galal  
Mousa**, Professor of Ophthalmology, Faculty of  
Medicine – Ain Shams University for his keen guidance,  
kind supervision, valuable advice and continuous  
encouragement, which made possible the completion of  
this work.*

*I am also delighted to express my deepest  
gratitude and thanks to **Prof. Dr. Momen  
Mahmoud Hamdi**, Assistant Professor of  
Ophthalmology, Faculty of Medicine – Ain Shams  
University, for his kind care, continuous supervision,  
valuable instructions, constant help and great assistance  
throughout this work.*

*I am deeply thankful to **Dr. Hassan Ahmed  
Elsayed Hassab**, Lecturer of Ophthalmology,  
Faculty of Medicine – Ain Shams University, for his  
great help, active participation and guidance.*

*I would like to express my hearty thanks to all  
my family for their support till this work was completed.*

*Last but not least my sincere thanks and  
appreciation to all patients participated in this study.*

**Mohammed Ibrahim Abdelmordy Sherief**

# List of Contents

Title	Page No.
List of Tables .....	i
List of Figures .....	ii
List of Abbreviations .....	iii
Introduction .....	1
Aim of the Work .....	4
Review of Literature.....	5
Physiology of Aqueous Humour.....	5
Anterior Chamber Angle Anatomy .....	6
Angle-Closure Glaucoma .....	9
Biometry Methods.....	22
Patients and Methods .....	31
Results .....	36
Discussion .....	44
Summary.....	49
Conclusion.....	51
References .....	52
Arabic Summary .....	1

# List of Tables

Table No.	Title	Page No.
Table (1):	Medications associated with acute angle-closure crisis (AACG).....	10
Table (2):	Optical biometers and the technology used.....	26
Table (3):	Distribution of IOP, C/D ratio, and biometric parameters between participants' eyes. ....	37
Table (4):	Pairwise comparisons of significant C/D ratio and biometric parameters between participants' eyes. ....	38
Table (5):	Distribution of Ocular Crowding Value (OCV) between participants' eyes.....	39
Table (6):	Correlation between Ocular Crowding Value (OCV) and participants' age and IOP and C/D ratio. ....	40
Table (7):	Cut-off values of the Ocular Crowding Value (OCV) for predicting the AACG.....	43



# List of Figures

Fig. No.	Title	Page No.
Figure (1):	Anatomy of anterior chamber angle.....	6
Figure (2):	Anterior chamber angle.....	8
Figure (3):	(A) Extensive cupping of the optic disk typical of glaucoma, (B) Compared with a normal optic disk .....	9
Figure (4):	Acute angle-closure glaucoma .....	14
Figure (5):	Gonioscopy .....	16
Figure (6):	YAG laser PI.....	20
Figure (7):	Angle closure opening after YAG PI.....	21
Figure (8):	IOL Master 500.....	28
Figure (9):	IOL Master 700.....	29
Figure (10):	Comparison of mean age between normal and AACG participants .....	36
Figure (11):	Correlation between patient's age and eye Ocular Crowding Value .....	41
Figure (12):	Correlation between C/D ratio and Ocular Crowding Value .....	41
Figure (13):	Receiver Operating Characteristics (ROC) curve of Ocular Crowding Value for predicting AACG.....	42

# List of Abbreviations

Abb.	Full term
<i>AACG</i>	<i>Acute Angle Closure Glaucoma</i>
<i>AC</i>	<i>Anterior Chamber</i>
<i>ACD</i>	<i>Anterior Chamber Depth</i>
<i>AL</i>	<i>Axial Length</i>
<i>AUC</i>	<i>Area Under the Curve</i>
<i>BCVA</i>	<i>Best Corrected Visual Acuity</i>
<i>CCT</i>	<i>Central Corneal Thickness</i>
<i>C/D</i>	<i>Cup Disc ratio</i>
<i>CI</i>	<i>Confidence Interval</i>
<i>COPD</i>	<i>Chronic Obstructive Pulmonary Disease</i>
<i>ILM</i>	<i>Internal Limiting Membrane</i>
<i>IOL</i>	<i>Intra Ocular Lens</i>
<i>IOP</i>	<i>Intra Ocular Pressure</i>
<i>ITC</i>	<i>Irido Trabecular Contact</i>
<i>LT</i>	<i>Lens Thickness</i>
<i>LPI</i>	<i>LASER Peripheral Iridotomy</i>
<i>LV</i>	<i>Lens Vault</i>
<i>NPV</i>	<i>Negative Predictive Value</i>
<i>OCT</i>	<i>Optical Coherence Tomography</i>
<i>OCV</i>	<i>Ocular Crowding Value</i>
<i>OLCR</i>	<i>Optical Low Coherence Reflectometry</i>
<i>PACG</i>	<i>Primary Angle Closure Glaucoma</i>

# List of Abbreviations (Cont...)

Abb.	Full term
<i>PCI</i>	<i>Partial Coherence Interferometry</i>
<i>PPV</i>	<i>Positive Predictive Value</i>
<i>ROC</i>	<i>Receiver Operating Characteristics</i>
<i>SD</i>	<i>Standard Deviation</i>
<i>SSRI</i>	<i>Selective Serotonin Reuptake Inhibitor</i>
<i>SNRI</i>	<i>Serotonin Norepinephrine Reuptake Inhibitor</i>
<i>TCA</i>	<i>Tri-Cyclic Antidepressants</i>
<i>US</i>	<i>Ultra-Sound</i>
<i>VA</i>	<i>Visual Acuity</i>
<i>WDT</i>	<i>Water Drinking Test</i>
<i>WTW</i>	<i>White To White distance</i>
<i>YAG</i>	<i>Yttrium Aluminum Garnet</i>

## INTRODUCTION

**G**laucoma is a leading cause of ocular morbidity and blindness worldwide (*Thylefors et al., 1995*).

Glaucoma is defined as “a group of diseases with certain features including an intraocular pressure that is high for the continued health of the eye” (*Prum et al., 2016*).

All forms of the disease have in common a characteristic potentially progressive optic neuropathy that is associated with visual field loss as damage progresses, and in which IOP is a key modifiable factor (*Bowling, 2018*).

The term angle closure refers to occlusion of the trabecular meshwork by the peripheral iris [iridotrabecular contact – (ITC)], obstructing aqueous outflow. Angle closure glaucoma can be primary, when it occurs in an anatomically predisposed eye or secondary to another ocular or systemic factor (*Bowling, 2018*).

Previous studies have stated that primary angle closure glaucoma (PACG) is responsible for nearly half the cases of glaucoma-related blindness in the world (*Quigley and Broman, 2006*).

It is typically associated with greater rapidity of progression and visual morbidity than POAG (*Bowling, 2018*).

In the Primary Angle Closure Preferred Practice Pattern® (PPP) guidelines (2016), acute angle closure glaucoma (AACG) was described as a suddenly occluded angle with symptomatic high IOP. Since approximately half of fellow eyes of acute angle-closure glaucoma patients can develop AACG within 5 years, the fellow eye is also at high risk of AACG and, it is of paramount importance to assess the risk of AACG properly (*Prum et al., 2016*).

Notably, many ways have been used for detecting a closed angle to diagnose primary angle closure disease (PACD) instead of assessing the risk of AACG. For example, gonioscopy examination is the current gold standard for the detection of PACD (*Nongpiur and Wei, 2013*).

Objective measurements of the depth of the AC are often clinically useful in glaucoma management. Indications include assessment of PAC risk, and monitoring of progression in conditions where the AC is shallower, such cilio-lenticular block. Older methods used slit lamp with or without special attachment, but an accurate and repeatable measurement can be obtained using ultrasonography or optical interferometry methods (*Bowling, 2018*).

The traditional biometric parameters such as anterior chamber depth or lens vault are not strong predictors of AACG. We speculate that the crowding condition of the eye would be a more important factor to trigger an AACG. Ocular crowding value can be calculated as follows:  $(LT+CCT-ACD)/AL$ ; LT: lens thickness, CCT: central corneal thickness, ACD: ant. Chamber depth and AL: axial length of the globe (*Wei et al., 2018*).



## AIM OF THE WORK

The aim of the work is to identify the risk of AACG through evaluation of ocular biometric parameters of Egyptians with history of AACG and comparison with their uninvolved fellow eyes and another group of healthy eyes, using AL Scan optical biometer.