

Sonographic Findings in Posterior Segment of the Eye in Sudanese Adult Patients Examined with Cataract

Abstract

Background: cataract is remaining a health problem worldwide and is a leading cause of blindness. The majority of cases were reported in the developing countries. Ocular sonography is an important imaging method to evaluate abnormalities of the posterior segment of eyes. **Objective:** The objective of this study was to determine the ocular posterior segment abnormalities in Sudanese adult patients using ultrasound and to describe the different types of cataract and their association with age and gender. **Materials and Methods:** This was a single-center, cross-sectional study conducted in Al Walidain Eye Hospital in Khartoum State (Omdurman) from February to July 2017. Data collection sheet was designed to include a detailed history and demographic data. An ultrasound machine MEDA ultrasonic A/B scanner for ophthalmology Model ODM-2100S with probe 10 MHz was used to investigate the participants. Patients with known lesions in posterior segment and those who had a previous history of ocular surgery were removed from the study. Chi-square test was used to assess the relationship between qualitative variables. **Results:** A total of 102 known preoperative cases of cataracts were evaluated in either gender; 60 females and 42 males. The mean age was 61 ± 13.87 years. The incidence of cataract was more frequent in the age groups of 61–70 and 51–60 years than other age groups. The prevalence of significant types of cataracts was as follows: nuclear cataract 61.7%, secondary 21.57%, traumatic 12.75%, and posterior subcapsular 3.92%. Sonographic findings revealed a posterior vitreous detachment (PVD) of 19.2% of the cases, vitreous hemorrhage of 0.98%, and complicated PVD of 1.96%. All types of cataracts were strongly associated with age ($P < 0.001$). Nuclear and secondary cataracts were more common in females ($P = 0.04$). **Conclusion:** Abnormalities of posterior segment are indicative features that should be evaluated by ultrasound before ocular surgery. Age and gender were significant factors for all types of cataracts. Ocular sonography is essential before cataract surgery.

Keywords: Age, gender, nuclear, ocular sonography, cataract, posterior segment

Introduction

Cataract represents an important cause of blindness in developing countries such as Sudan and India, and many of these cases had advanced cataracts and attended lately to the clinical centers.

Cataract blindness is considered to be One of the major public health challenges of the 21st century. Cataract is considered the main cause of blindness in the world, accounting for approximately half (47.8%) of all cases of blindness.^[1] In a systematic review of population-based studies, Cataract was the principal cause of blindness in sub-Saharan Africa.^[2] It has been accounted that ninety percent of visually impaired people live in developing countries.^[3] The blindness in these countries causes disability and increased mortality, resulting in severe economic and social

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

consequences.^[4] In 2002, the WHO reported that blindness involves 37 million people worldwide.^[1] This number is predicted to reach 76 million by the year 2020 if efforts are not obtained to deal with this serious health problem.^[4] In Sudan, the incidence of cataract blindness in Makah Eye complex hospital was approximately 677.43 patients per year in 2011–2012.^[5]

High-resolution sonography is one of the most important techniques used for evaluation orbit. Visualization of orbit structures has become a routine part of the ocular examination. In particular, the vitreous body and lens are well visualized along with the other structures in orbit. This is attributed to the cystic nature of the eye and its superficial location that allow high-frequency transducer to demonstrate normal anatomy and pathology.^[6] Nowadays, ocular

How to cite this article: Gareeballah A, Gameraddin MB, Ali G, Babiker MS, Elzakil M. Sonographic findings in posterior segment of the eye in Sudanese adult patients examined with cataract. *Sudanese J Ophthalmol* 2017;9:50-4.

**Awadia
Gareeballah,
Moawia Bushra
Gameraddin¹,
Gadia Ali²,
Mahmoud S
Babiker³,
Maisa Elzakil²**

Department of Diagnostic Radiologic Technology, Faculty of Applied Medical Sciences, Taibah University, Al-madinah Al-Munawarah, King Saudi Arabia, ²Department of Diagnostic Radiology, Faculty of Radiological Sciences and Medical Imaging, Alzaiem Al-Azhari University, Khartoum, Sudan, Departments of ¹Diagnostic Radiologic Technology and ³Diagnostic Radiologic Technology, Faculty of Applied Sciences, Taibah University, Al-Madinah Al-Munawarah, Kingdom of Saudi Arabia

Address for correspondence:

*Dr. Moawia Bushra
Gameraddin, Department
of Diagnostic Radiologic
Technology, Faculty of Applied
Sciences, Taibah University,
Al-Madinah Al-Munawarah,
Kingdom of Saudi Arabia.
E-mail: m.bushra@yahoo.com*

Access this article online

Website: www.sjophthal.net

DOI:
10.4103/sjophthal.sjophthal_22_17

Quick Response Code:



sonography has become an important diagnostic imaging method that has increased the ability to detect and differentiate many ocular and orbital diseases. It is safe, rapid, and nonionizing that enables it to provide valuable diagnostic information of various ophthalmic diseases not obtainable by any other imaging methods. However, ultrasound is capable of detecting various pathologies preoperatively; this enables the ophthalmologist and surgeon to plan surgery and take measures to combat various predictable complications.^[7,8]

In previous studies, there were statistical inconsistencies regarding the prevalence of diseases of the posterior segment of the eye in cataract patients. Significant difference was observed regarding findings associated with cataract across different communities. Shen *et al.* reported the prevalence of vitreous detachment (VD) in Chinese to be 2.7% in a large cohort study.^[9] In an epidemiological study performed by Sawsan and Samira in 2001 at Khartoum, the incidence of vitreous hemorrhage (VH) was reported to be 51.7 due to diabetes mellitus.^[10] However, to our knowledge, only rare studies demonstrated the sonographic findings which associate with cataracts.

The present study aims to characterize abnormalities associated with cataracts using ultrasonography in Sudanese adults attending AL Walden eye Hospital (Omdurman) and to find a correlation between age and gender with the sonographic findings. However, the present study will highlight the importance of ocular sonographic evaluation in preoperative adult cataract patients. This is useful for ophthalmologists to establish a strategy for diagnosis and treatment for cataract patients and patient counseling.

Materials and Methods

This was a single-center, prospective cross-sectional study for assessment of cataract by ultrasonography and to detect the posterior segment abnormalities of eyes in cataract patients using ultrasound in such preoperative cases. The study was conducted from February to July 2017 in Al Walidain Eye Hospital (Omdurman, Sudan). A total of 102 Sudanese adult preoperative cataract patients (males and females) participated in the study. Exclusion criteria included patients with a history of posterior segment abnormality and those who had a previous history of ocular surgery. Children were also excluded from the study. Data collection sheet was designed to collect demographic data (age, previous surgery, etc.) Clinical history was written from patient's records. The study was approved by the ethical committee of Al-Rebate National University. Informed written consent was obtained from every patient to participate in the study.

Sonographic procedure

The patients were scanned using MEDA ultrasonic A/B scanner for ophthalmology Model ODM-2100S with probe

of 10 MHz. The method used is directly interviewing the patients when they present to the ultrasound department for ocular ultrasonography. The patient was sitting, flexed his neck, and slightly rotated his head to the opposite side, to prevent gel pouring. The ultrasonic linear probe of 7.5–10 MHz with small footprint transducers was selected and placed over the globe of the eye with a closed lid after application of the gel. The anteroposterior, longitudinal, and transverse views of B-scan along with A-scan were taken. Images were interpreted by an expert sonologist and ophthalmologist.

Statistical analysis

The data collected during the study were stored in a compact disk in a personal computer. The statistical program, SPSS Inc. Version 16.0. Chicago, USA, was utilized to interpret the data. Data were presented as percentage and frequency. Chi-square test was used to evaluate the association between age and gender with sonographic findings of the posterior segment of the eye. $P < 0.05$ was considered statistically significant.

Results

A total of 102 patients with cataract were examined. The mean age was 61 ± 13.87 years; 60 females and 42 males [Figure 1]. The age was categorized into six groups [Table 1]. It was observed that most of the patients were in the age groups of 61–70 years and 51–60 years. Of this total number of patients, 68.6% had no previous history, 10.8% had a history of trauma, 9.8% had diabetes mellitus, and 6.9% had hypertension [Table 2]. Cataracts had been categorized using morphological and etiological classifications such as nuclear and subcapsular cataracts (morphology) and secondary and traumatic cataracts (etiology) as shown in Table 3.

Table 4 summarizes the ultrasonographic ocular examinations; it revealed that 77.5% of the patients did not

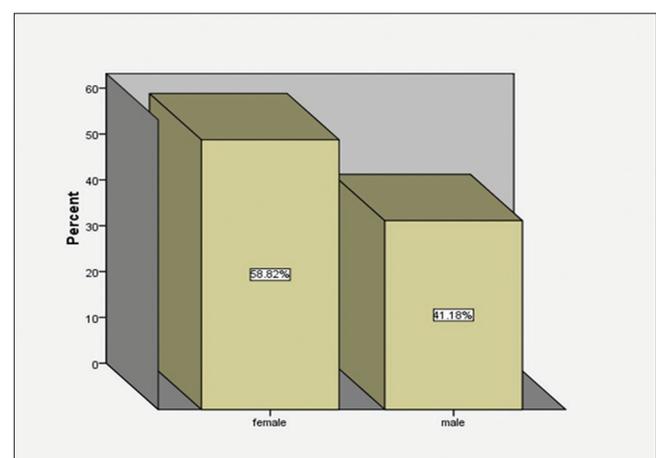


Figure 1: Frequency distribution of gender

present with any abnormalities in the eye contents, 19.6% had posterior VD (PVD), 0.98% had VD and edema, 0.98% had VH, and 0.98% had VD and staphyloma. Cataracts in all patients appeared as an ovoid echogenic mass on sonography.

It was observed that gender is a significant factor influencing the incidence of cataracts ($P = 0.04$). Nuclear and secondary cataracts were more common in females than males [Table 4]. Age is a significant factor affecting the incidence of various types of cataracts ($P = 0.001$). The age groups 16–70 years and 51–60 years had the high frequency of cataract [Table 5]. Table 6 shows distribution of types of cataract and age of participants. A statistically significant correlation existed between the types of cataracts and gender ($P = 0.04$). Figures 2 and 3 were ocular sonograms demonstrating cataract with vitreous changes.

Discussion

Ultrasonography has greatly advanced in the last 30 years; it has enabled us to study the disorders of the posterior segment of the eye even through opaque media such as dense cataract. It can detect lesions in the anterior segment and most commonly used to assess the abnormalities in the posterior segment of the eye.^[11] Ultrasonographic ocular evaluation is often used in cataract patients performed by the sonographers and ophthalmologists in Walidain Eye Hospital and is routinely used in these cases.

The sonographic ocular investigations in this study demonstrated that PVD was the most common finding (19.6%). This finding agrees with previous literature, particularly reports related to the prevalence of the various abnormalities assessed with ultrasound. According to Corrêa *et al.*, PVD was the most common finding (26.1%), which is consistent with the current finding.^[12] Carrero^[13] reported the prevalence of PVD to be 26.1%, which is close to our finding. It was contradictory to the finding of Mendes *et al.*, who studied sonographic findings in patients with cataract and reported vitreous opacities to be the most common abnormality, 12.1%.^[14] PVD is attributed to fluid in the vitreous cavity which passes through holes or tears directly in the retina and separates the retina from the underlying pigmented retinal epithelium.^[15] Regarding VH, the incidence was 0.98% in this study. This finding agreed with that of Manzoor and Khalida who reported VH to be 1.91% in nontraumatic cataract patients.^[16] A previous study reported that VH was present in 2.5% of the cases, which is closer to our finding.^[17] However, VH was less frequent, and it was not a common abnormality in cataract patients.

Cataracts were categorized using morphological and etiological classifications. It was observed that all types of cataracts increased with advancing age. The study revealed that nuclear cataract was more frequent than other types of cataracts. This finding was consistent with several

Table 1: Frequency distribution of age groups

Age group (years)	Frequency (%)
20-40	9 (8.8)
41-50	11 (10.8)
51-60	27 (26.5)
61-70	38 (37.3)
71-80	13 (12.7)
81-95	4 (3.9)
Total	102 (100.0)

Table 2: Frequency distribution of clinical history of the patients

History	Frequency (%)
HT	7 (6.9)
DM	10 (9.8)
DM and HT	2 (2.0)
Trauma	11 (10.8)
Trauma and smoking	2 (2.0)
No history	70 (68.6)
Total	102 (100.0)

DM: Diabetes mellitus, HT: Hypertension

Table 3: Frequency distribution of cataract types among the patients

Type of cataract	Frequency (%)
Secondary	22 (21.57)
Nuclear	63 (61.76)
Traumatic	13 (12.75)
Posterior subcapsular cataracts	4 (3.92)
Total	102 (100.0)

Table 4: Frequency distribution of sonographic findings associated with cataracts

Sonographic findings	Frequency (%)
Normal structures	79 (77.5)
PVD	20 (19.6)
Vitreous hemorrhage	1 (0.98)
PVD and edema	1 (0.98)
PVD and staphyloma	1 (0.98)
Total	102 (100.0)

PVD: Posterior vitreous detachment

Table 5: Gender of participants and type of cataract

Age groups (years)	Type of cataract				Total	P
	Secondary	Nuclear	Traumatic	Posterior		
20-40	0	2	7	0	9	0.001
41-50	3	6	2	0	11	
51-60	6	16	3	2	27	
61-70	10	26	2	0	38	
71-80	3	9	0	1	13	
81-95	0	4	0	0	4	
Total	22	63	14	3	102	

Table 6: Distribution of types of cataract and age of participants

Gender	Type of cataract					Total	P
	Secondary	Nuclear	Traumatic	Posterior	Develop cataract		
Female	15	40	3	1	1	60	0.04
Male	7	23	10	2	0	42	
Total	22	63	13	3	1	102	

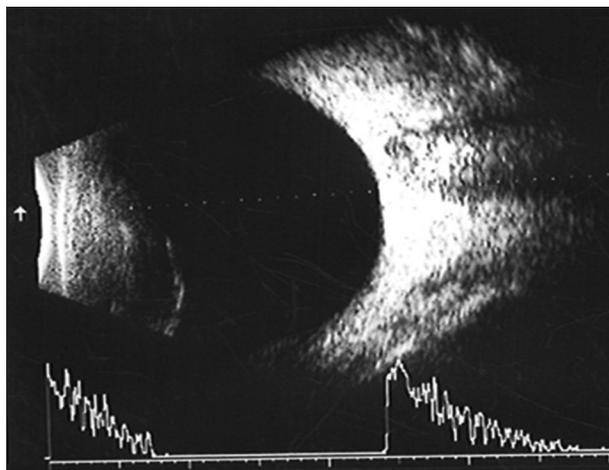


Figure 2: Sonogram of the right eye of a 70-year-old female demonstrating cataract with normal posterior segment

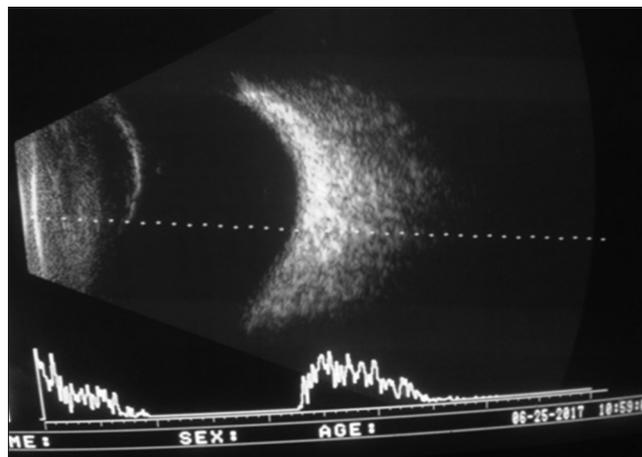


Figure 3: Sonogram of a 52-year-old male demonstrating cataract with vitreous changes

published studies. Congdon *et al.* studied the prevalence of different types of cataracts in an African population and reported that the prevalence of nuclear cataract was more common than other types (15.6%).^[18] This result was closer to our finding. It was observed that nuclear cataract was the most common in females. It was observed that secondary cataract is the second frequent type follows nuclear cataract. Similar to this result, Eballé *et al.* studied the epidemiology of secondary cataract and reported that the incidence was lower than that reported in previous studies.^[19] The prevalence of cataract types was significantly different from region to region according to metabolic disorders, age, and ethnic diversity.

The results of the present study demonstrated that 36.4% and 26.5% of the patients presented in the age groups of 61–70 and 51–60 years, respectively. It was observed that age was statistically correlated with the type of cataracts ($P = 0.001$). This finding is similar to other published studies. Haug and Bhisitkul studied “risk factors for retinal detachment following cataract surgery” and reported that younger age is associated with higher risk of retinal detachment.^[20] These findings supported that age is an important risk factor for all types of eye cataracts. In this study, diabetes mellitus and hypertension constituted approximately 20% of the presented cases. Both diabetes mellitus and hypertension were regarded risk factors for cataracts. Richter *et al.* studied the risk factors of various types of cataracts and reported that older age, history of diabetes, and higher systolic blood pressure were risk factors for lens opacities.^[21] This supported the fact that

age, diabetes mellitus, and hypertension were independent risk factors for cataracts.

The current study found that gender is another factor associated with types of cataracts in Sudanese patients. It was observed that females were significantly more frequent to nuclear and secondary cataracts than males ($P = 0.04$). This finding is consistent with published studies. Richter *et al.* evaluated the risk factors of various types of cataracts and reported that female gender is one of the independent risk factors for mixed lens opacities.^[21] Olafsdottir *et al.* studied the prevalence of cataract with and without diabetes mellitus and reported that nuclear cataract is more frequent in women.^[22] These findings supported our finding that gender is a significant risk factor for nuclear and secondary cataracts.

Limitation of the study

The study faced some limitations. The sample size was not large enough and there were no available referent studies demonstrating the prevalence and sonographic findings of posterior segment of the eye associated with cataract in Sudanese adults. Further studies with suitable sample size would be recommended to confirm the initial results.

Conclusion

Abnormalities of the posterior segment are important ocular disorders that should be evaluated before ocular surgery. Age and gender were significant risk factors for all types of cataracts. Ocular sonographic evaluation is an important presurgical step in patients with cataracts or other

opacities. Most importantly, the ultrasound also provided useful information for determining ocular surgery since the posterior segment disorders had been identified.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, *et al.* Global data on visual impairment in the year 2002. *Bull World Health Organ* 2004;82:844-51.
2. Bastawrous A, Dean WH, Sherwin JC. Blindness and visual impairment due to age-related cataract in sub-Saharan Africa: a systematic review of recent population-based studies. *Br J Ophthalmol* 2013;97:1237-43.
3. World Health Organization. 10 Facts about Blindness and Visual Impairment; 2014. Available from: <http://www.who.int/features/factfiles/blindness/en/>. [Last accessed on 2017 Oct 01].
4. Frick KD, Foster A. The magnitude and cost of global blindness: An increasing problem that can be alleviated. *Am J Ophthalmol* 2003;135:471-6.
5. Gadia H, Awadia G. Assessment of Cataract using Sonography. Master Thesis. Alerbat National University; 2017. p. 1-2. Available from: http://www.repository.ribat.edu.sd/public/uploads/upload/repository/national%20ribat%20university%20Xrey_2625992512.pdf. [Last accessed on 2017 Oct 29].
6. Bedi DG, Gombos DS, Ng CS, Singh S. Sonography of the eye. *AJR Am J Roentgenol* 2006;187:1061-72.
7. Agrawal R, Ahirwal S. A study of the role of B-scan ultrasound in posterior segment pathology of an eye. *Int J Med Res Rev* 2015;3:970-3.
8. Sharma OP. Orbital sonography with its clinicosurgical correlation. *Indian J Radiol Imaging* 2005;15:537-54.
9. Shen Z, Duan X, Wang F, Wang N, Peng Y, Liu DT, *et al.* Prevalence and risk factors of posterior vitreous detachment in a Chinese adult population: The Handan eye study. *BMC Ophthalmol* 2013;13:33.
10. Sawsan E, Samira M. Causes of Vitreous Hemorrhage among Sudanese Patients. The University of Khartoum. Clinical MD Thesis in Ophthalmic Surgery and Medicine; 2003. p. 7-8 Available from: <http://www.khartoumspace.uofk.edu/bitstream/handle/123456789/7528/Causes%20of%20vitreous%20haemorrhage.pdf?sequence=1>. [Last accessed on 2017 Nov 01].
11. Qureshi MA, Laghari K. Role of B-scan ultrasonography in pre-operative cataract patients. *Int J Health Sci (Qassim)* 2010;4:31-7.
12. Corrêa ZM, Goldhardt R, Marcon AS, Marcon IM. Ultrasound findings in patients with dense cataracts. *Arq Bras Oftalmol* 2002;65:609-13.
13. Carrero JL. Incomplete posterior vitreous detachment: Prevalence and clinical relevance. *Am J Ophthalmol* 2012;153:497-503.
14. Mendes MH, Betinjane AJ, Cavalcante Ade S, Cheng CT, Kara-José N. Ultrasonographic findings in patients examined in cataract detection-and-treatment campaigns: A retrospective study. *Clinics (Sao Paulo)* 2009;64:637-40.
15. Wilkinson CP. Interventions for asymptomatic retinal breaks and lattice degeneration for preventing retinal detachment. *Cochrane Database Syst Rev* 2014;14:CD003170.
16. Manzoor A, Khalida L. Role of B-Scan ultrasonography in pre-operative cataract patients. *Int J Health Sci Qassim Univ* 2010;4:31-6.
17. Salman A, Parmar P, Vanila CG, Thomas PA, Jesudasan CA. Is ultrasonography essential before surgery in eyes with advanced cataracts? *J Postgrad Med* 2006;52:19-22.
18. Congdon N, West SK, Buhrmann RR, Kouzis A, Muñoz B, Mkocha H, *et al.* Prevalence of the different types of age-related cataract in an African population. *Invest Ophthalmol Vis Sci* 2001;42:2478-82.
19. Eballé AO, Ellong A, Ella GP, Dohvoma VA, Bella AL, Mvogo CE, *et al.* Secondary cataract: An epidemiologic and clinical survey at the Yaoundé gynaeco-obstetric and paediatric hospital. *Clin Ophthalmol* 2011;5:847-51.
20. Haug SJ, Bhisitkul RB. Risk factors for retinal detachment following cataract surgery. *Curr Opin Ophthalmol* 2012;23:7-11.
21. Richter GM, Torres M, Choudhury F, Azen SP, Varma R; Los Angeles Latino Eye Study Group, *et al.* Risk factors for cortical, nuclear, posterior subcapsular, and mixed lens opacities: The Los Angeles Latino eye study. *Ophthalmology* 2012;119:547-54.
22. Olafsdottir E, Andersson DK, Stefánsson E. The prevalence of cataract in a population with and without type 2 diabetes mellitus. *Acta Ophthalmol* 2012;90:334-40.