Journal of Global Biosciences
ISSN 2320-1355
Volume 9, Number 3, 2020, pp. 6873-6883
Website: www.mutagens.co.in
DOI: www.mutagens.co.in/jgb/vol.09/03/090303.pdf

SCAN ME

Research Paper

RETINOPATHIES AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE UNDERGOING HEMODIALYSIS IN A TERTIARY HEALTH INSTITUTION IN NIGER DELTA, NIGERIA

Rachael Aliu[1], Alfred A. Onua[2] and Elizabeth A. Awoyesuku[2]

[1]Department of Ophthalmology,
Federal Medical Centre, Yenagoa,
Nigeria
[2] Department of Ophthalmology,
University of Port Harcourt Teaching Hospital,
Nigeria.

Abstract

Aim: To determine the prevalence and causes of retinopathies among patients with chronic kidney disease undergoing hemodialysis in the department of nephrology, University of Port Harcourt Teaching Hospital, Nigeria. Methodology: This was a hospital-based cross-sectional study. Patients with chronic Kidney Disease/Renal failure, undergoing haemodialysis in the were enrolled into the study. A detailed, dilated fundoscopy with binocular indirect ophthalmoscope (Keeler, 1205-P-2000) was used to examine the posterior segment of the consenting adult study participants between March 2013 and October 2013. Relevant socio-demographic data were obtained from the study participants via a semi-structured questionnaire. Data were recorded in Microsoft excel sheets and later analysed using SPSS version 25 (Statistical Package for Social Sciences for Windows, version 25.0; SPSS, Chicago, IL, USA). Frequency was presented in percentages. Mean and standard deviations were calculated for descriptive and comparative purposes. Statistical significance was tested using the chi-square test. P-value < 0.05 was taken as statistically significant. Results: One hundred and seventy eyes were examined. A total of 30 (35.4%) females and 55 (64.6%) males were examined giving a male to female ratio of 1.8:1. The commonest posterior segment finding was hypertensive retinopathy of different grades seen in a total of 58 (68.2%) subjects, followed by macular oedema seen in 31 (36.5%) patients. Only 3 (3.5%) of the study subjects had normal fundoscopic findings. Maculopathies (Macular oedema, Clinically Significant Macular Oedema, Age Related Macular Degeneration) accounted for a total 52.4% cases of visual impairment. Conclusion:

Hypertensive Retinopathy and Maculopathies pose significant causes of visual impairment in persons with CKD.
Key words: Chronic Kidney Disease, Retinopathies, visual impairment.

INTRODUCTION

Blindness due to proliferative retinopathy or maculopathy is approximately five times more common in diabetic patients with nephropathy compared with normoalbuminuric patients [1]. The ocular manifestations of Chronic Kidney Disease (CKD) can be an indicator of the control of the disease and posterior segment ophthalmoscopic findings can be used to monitor the effect of treatment [2]

Retinopathy is often asymptomatic in its most treatable phase and delay in diagnosis can result in significant increase in the patient's risk of visual loss [3]. The most important and vision threatening pathologies in CKD are found in the posterior segment [1].

End-stage renal disease patients in our environment frequently present late and with life threatening conditions and timely attention may usually not be given to sight threatening conditions. The World Health Organization health report shows that intrinsic diseases of the kidney and urinary tract resulted in the death of 1 million people in 2002 thereby ranking 12th on the list of major causes of death [4]. The prevalence of impaired renal function (where glomerular filtration rate (GFR) could be less than 60 mL per minute) is estimated to range between 10-20% of the adult population in most countries of the world [4].

Renal pathologies, especially glomerular disease, is more prevalent in Africa and seems to be of a more severe form than is found in Western countries [5]. This is due to the high prevalence of infection-related nephropathies and non-communicable diseases [6]. Hospital-based studies in Nigeria, estimates the prevalence of renal diseases at between 3.6 to 10.4% [7,8]. Chronic kidney disease is also said to be responsible for 8-10% of hospital admissions in a hospital-based study in Nigeria [9]. The commonest causes of CKD world-wide are hypertension and diabetes mellitus [6,10,11,12]. Age, Analgesics abuse, ingestion of herbs and use of skin bleaching or lightening soaps and creams containing hydroquinone and mercury are also known risk factors commonly seen in Nigeria [8].

This study seeks to underline the importance of routine fundoscopy in patients with CKD to ensure prompt management of visually disabling posterior segment/retinal pathologies thus helping to prevent visual impairment and improve quality of life of the patients.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study. Consenting adult patients with chronic Kidney Disease/Renal failure, undergoing haemodialysis in the nephrology department of the University of Port Harcourt Teaching Hospital Nigeria; between March 2013 and October 2013 were enrolled into the study. Relevant socio-demographic data were obtained from the study participants via a semi-structured, self-administered questionnaire.

Detailed ocular examination of each study participant included: Visual acuity testing, measurement of intraocular pressure**,** dilatation of patients' pupils with mydriatics for binocular indirect fundoscopy and fundus photography. The intraocular pressure was measured with Perkins' hand-held tonometer (MK2-model) after instilling a local anaesthetic agent (1% tetracaine) and fluorescein dye into the inferior fornix. Three measurements were taken for each eye and the average determined and recorded. Dilatation of the pupils was achieved with tropicamide eye drop (0.5%). Fundoscopy with binocular indirect ophthalmoscope was done with Keeler's binocular indirect ophthalmoscope (Keeler, 1205-P-2000). Indirect ophthalmoscopy was carried out without scleral indentation because most of the anticipated fundal pathological findings are expected to be in the posterior segment. Fundal pictures were taken with a Carl Ziess mydriatic fundus camera (FF 450 Plus model). Two fields were taken: first centered on the optic disc (ETDRS standard field 1) and the second centered on the fovea (ETDRS standard field 2) [13]. Patients with optic nerve head signs of glaucoma had visual field testing with Humphrey's visual field analyzer, model 750.

Data were recorded in Microsoft excel sheets and later analysed using SPSS version 25 (Statistical Package for Social Sciences for Windows, version 25.0; SPSS, Chicago, IL, USA). Frequency was presented in percentages. Mean and standard deviations were calculated for descriptive and comparative purposes. Statistical significance was tested using the chi-square test. P-value < 0.05 was taken as statistically significant.

Working definitions

Hypertensive retinopathy: classification was based on the Keith, Wagener and Barker [14] classification of hypertensive retinopathy.

Grade 1- slight or modest narrowing of the retinal arterioles, with an arteriovenous ratio≥1:2.

Grade II –modest to severe narrowing of retinal arterioles (focal or generalized), with arteriovenous ratio ≥ 1:2 or arteriovenous nicking.

Grade III-bilateral soft exudates or flame shaped hemorrhages.

Grade IV- bilateral optic disc oedema

Diabetic retinopathy: classified with the ETDRS classification [15].

Definition	Criteria	Treatment
Mild NPDR	1 microaneurysm	Observe (ETDRS)
NPDR	Microaneurysm, hard exudates, haemorrhages, Cotton wool spots etc. (not meeting criteria below)	ETDRS
NPDR	Blot haemorrhages in 4 quadrants Venous bead in 2 quadrants IRMA in 1quadrant	PDR (ETDRS)
PDR	NVD or NVE (not fulfilling criteria below)	PDR (ETDRS)
High rik PDR	NVD >1/4 disc diameter NVD <1/4 disc diameter with VH NVE >1/2 disc diameter with VH	PDR (ETDRS)
Advanced PDR and VH	High risk PDR with tractional RD involving macula or with VH	Early vitrectomy for Type 1 DM (DRVS)
Macular oedema	Retinal thickening or hard exudates within 1 disc diameter from fovea	Observed at 6-monthly intervals

Clinically Significant Macular Oedema (CMO)

- Retinal thickening within 500 μm of the center of the macula.

- Exudates within 500 µm of the center of the macula, if associated with retinal thickening (which may be outside the 500 µm).
- Retinal thickening one-disc area (1500 µm) or larger, any part of which is within one-disc diameter of the center of the macula.

RESULTS

Table 1: Age and Gender Distribution of Study Subjects.

Age Group (years)	Gender				TOTAL	(%)
	Male (n)	(%)	Female (n)	(%)		
<20	2	(2.4)	0	(0)	2	(2.4)
20-29	9	(10.6)	4	(4.7)	13	(15.3)
30-39	16	(18.8)	8	(9.4)	24	(28.2)
40-49	13	(15.3)	6	(7.1)	19	(22.4)
50-59	7	(8.2)	6	(7.1)	13	(15.3)
60-69	4	(4.7)	4	(4.7)	8	(9.4)
70-79	2	(2.3)	1	(1.2)	3	(3.5)
80 and Above	2	(2.3)	1	(1.2)	3	(3.5)
TOTAL	55	(54.6)	30	(35.4)	85	(100)
Chi square value= 0-9766			p-value= 0.9761			

A total of 55 (64.6%) males and 30 (35.4%) females were examined giving a male to female ratio of 1.8:1. The mean age was 43.5 ± 15.56 and age range 19 to 83 years. The age range 30-39 years was the highest proportion represented (n=24; 28.2%) while those under 20 years had the least representation (n=2; 2.4%). The difference in the ages of both gender in this study was not statistically significant (p=0.9761).

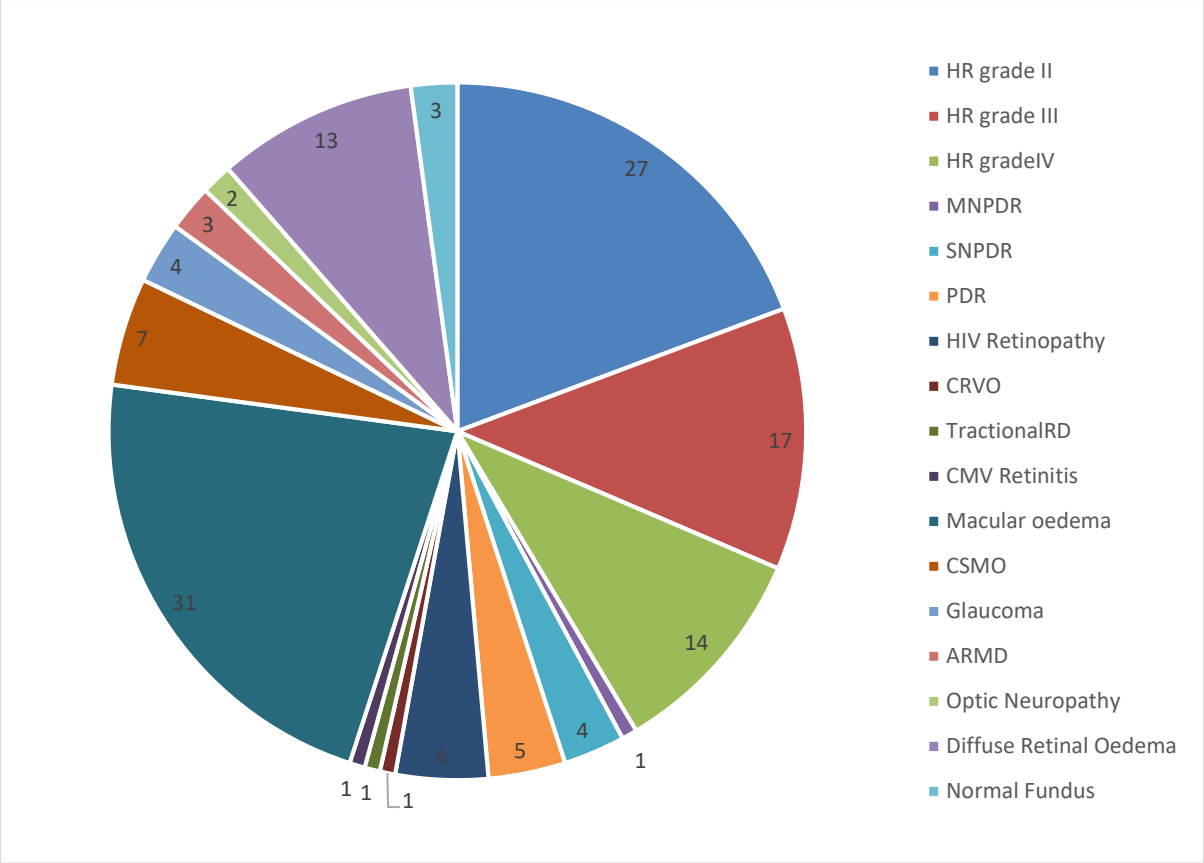

Figure 1: Ocular Posterior Segment Pathologies in the Study Population

KEY:

HR- Hypertensive Retinopathy
MNPDR- Moderate Non-proliferative Diabetic Retinopathy
SNPDR- Severe Non-proliferative Diabetic Retinopathy
PDR-Proliferative Diabetic Retinopathy
CRVO- Central Retinal Vein Occlusion
CMV –Cytomegalovirus
HIV- Human Immunodeficiency Virus
CSMO – Clinically Significant Macular Oedema
ARMD –Age-Related Macular Degeneration
RD-Retinal Detachment

The commonest posterior segment finding in this study was hypertensive retinopathy of different grades seen in a total of 58 (68.2%) subjects, followed by macular oedema seen in 31 (36.5%) patients. Only 3 (3.5%) of the study subjects had normal fundoscopic findings.

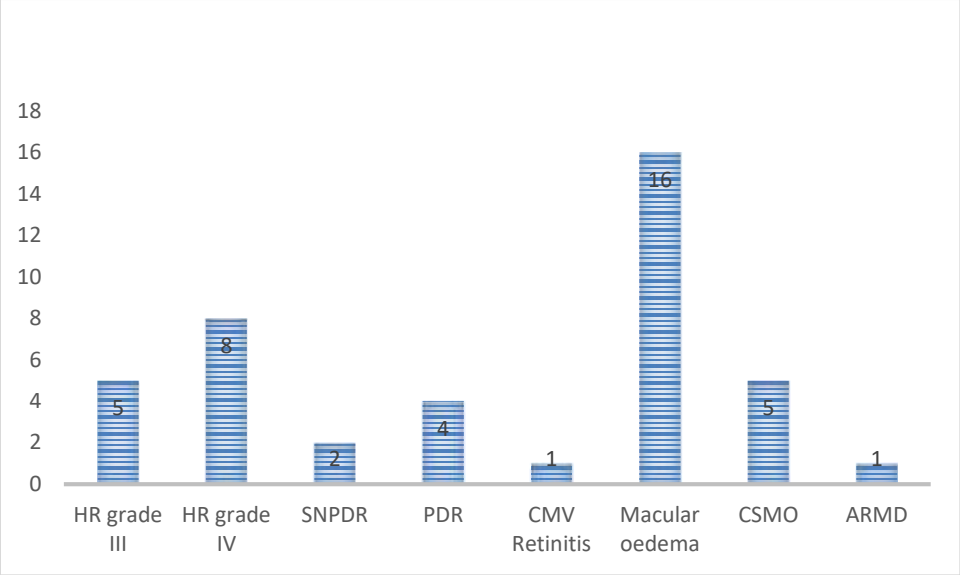

Figure 2: Causes of visual impairment in the study population

Maculopathies (Macular oedema, CSMO, ARMD) were the commonest cause of visual impairment in the study population, accounting for a total of 22 (52.4%) cases of visual impairment while Hypertensive Retinopathy grades III and IV collectively accounts for 30.9% of visual impairment.

DISCUSSION

One hundred and seventy eyes were examined in this study. Fifty-five subjects were males. Male to female ratio was 1.8:1. The mean age was 43.5 ± 15.56 and age range was 19 to 83 years. The age range 30-39 years was the highest proportion represented (n=24; 28.2%) while those under 20 years had the least representation (n=2; 2.4%). The difference in the ages of both gender in this study was not statistically significant (p=0.9761) (Table 1). The demographic characteristics of our study is similar to findings by Alasia et al in a study carried out in Port Harcourt [12]. Also, some studies carried out in Nigeria and other developing countries corroborates with our findings [16,17,18,19]. However, in the study of Karras et al in France, the mean age of subjects with CKD was 59.8±14.5 years [20]. This difference could be that the onset of CKD in more industrialized countries in an older age because of the more advanced health care facilities. The reasons for the male preponderance are unknown but in Sub-Saharan Africa, families value male more than female members and may therefore spending more money on them for medical treatment [17]. However, it could be due to faster

rate of deterioration of kidney function in males with some forms of glomerulonephritis and polycystic kidney disease [21].

The commonest fundal finding was hypertensive retinopathy which was seen in 68.2% of the study population (Figure 1). It was also responsible for 30.9% of cases of visual impairment. This is similar to findings in Canada and Nepal [2,22]. However, lower prevalence of 25% and 28.5% had been reported in USA and China [23,24]. The differences observed could be due to patients from the latter studies being recruited from all stages of CKD.

Diabetic retinopathy of various grades of severity, accounted for 11.8% of posterior segment pathologies in the subject population. This is similar to the findings by Vrabec et al, Kian-Ersi et al and Ahmed et al [22,25,26].

Age-related macular degeneration (ARMD) was seen in 3.5% of the study population. Other studies reported prevalence ranging between 7-44% [22,26,27]. The Prevalence of ARMD has been shown to be higher in white population than in the blacks [28]. Persons with moderate chronic kidney disease were trice more likely to develop Age-related Macular Degeneration than normal countrerparts [29].

Prevalence of macular oedema in this study was 44.7%. It was mostly observed in association with diabetic retinopathy and HIV positive patients. Diffuse retinal oedema accounted for 15.3% of our fundal findings in the study subjects. Diffuse retinal oedema has been suggested to coexist with severe diabetic nephropathy in diabetic patients [30].

Tractional retinal detachment was detected in 1 patient (1.2% of study subjects). It was secondary to proliferative diabetic retinopathy. Similarly, Bajracharya et al in their study reported a prevalence of 0.4% of retinal detachment among patients with CKD [2]. Some other researchers had also reported cases of retinal detachment in patients with CKD [23,31].

In this study, 42% of the subjects had visual impairment in either one eye or in both eyes. Macular oedema from diabetic retinopathy is the leading cause of visual impairment in this study being accountable for 35.6% of the cases (Figure 2). Only a few studies assessed visual impairment in association with posterior segment changes [2,26]. Other studies reported maculopathy but not macular oedema specifically and

may have included it with figures for diabetic retinopathy. Maculopathy (Macular oedema, CSMO, ARMD) accounts for a total of 22 (52.4%) cases of visual impairment. Other researchers reported lower prevalence of maculopathy among patients with CKD [2,26]. The higher prevalence in this study could be due to a high prevalence of hypertensive patients in the study population as hypertension has been shown to worsen diabetic retinopathy [27]. Hypertensive retinopathy stages III and IV were responsible for about a third of cases of visual impairment in this study.

Diabetic retinopathy accounted for 14.3% of patients with visual impairment. This is higher than findings by other researchers [2,22,26]. More studies may be needed to unravel the reason (s) for this observed difference.

CONCLUSION

Hypertensive Retinopathy and Maculopathies pose significant causes of visual impairment in persons with CKD. Routine eye examinations for all patients with CKD is therefore necessary for early diagnosis and treatment of blinding posterior segment conditions.

CONSENT AND ETHICAL APPROVAL

As per university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Evans RD, Rosner M. Ocular abnormalities associated with advanced kidney disease and hemodialysis*. Seminars in Dialysis, 2000; 18(3): 252-257.*
2. Bajracharya L, Shah DN, Raut KB, Koirala S. Ocular evaluation in patients with chronic renal failure-a hospital-based study. *Nepal Med Coll J 2008; 10 (4): 209-214.*
3. Leys AM. *Duane's Ophthalmology on CD-ROM. 2006 Edition. Lippincott, Williams and Wilkin, 2005. Volume 5, Chapter 31: The eye and renal diseases.*
4. WHO. The World Health Report 2003: shaping the future. *WHO 2003*
5. Moeller S, Gioberge S, Brown G: ESRD patients in 2001: Global overview of patients, treatment modalities and development trends. *Nephrol Dial Transplant 2002; 17: 2071–2076.*

6. Sumaili EK, Cohen EP, Zinga CV, Krzesinki JM, Pakasa NM, Nseka NM. High prevalence of undiagnosed chronic kidney disease among at-risk population in Kinshasa, the Democratic Republic of Congo. *Nephrol Dial Transpl. 2009; 24(1): 117-122.*

7. Lysaght MJ. Maintenance dialysis population dynamics: Current trends and long-term implications*. J Am Soc Nephrol 2002; 13(1): 37–40.*

8. Campbell RC, Ruggeneti P, Remuzzi G: Halting the progression of chronic nephropathy. *J Am Soc Nephrol 2002; 13(3): 190–195.*

9. Naicker S. End-stage renal disease in sub-Saharan and South Africa. *Kidney Int Suppl 2003; 83; 119-122.*

10. Phuong-Thu T Pham, Phuong-Chi T Pham, Alan H Wilkinson and Susie Q Lew. Renal abnormalities in sickle cell disease. *Kidney International. 2000; 57: 1–8.*

11. Chadban S, Briganti E, Kerr P. Prevalence of kidney damage in Australian adults: The AusDiab Kidney Study. *J Am Soc Nephrol 2003; 14(7): 131–138.*

12. Alasia DD, Emem-Chioma P, Wokoma FS. A Single-Center 7-Year Experience with End-Stage Renal Disease Care in Nigeria—A Surrogate for the Poor State of ESRD Care in Nigeria and Other Sub-Saharan African Countries: Advocacy for a Global Fund for ESRD Care Program in Sub-Saharan African Countries. *Int J Nephrol 2012; 10(6); 1-7.*

13. Early Treatment Diabetic Retinopathy Study Research Group: Early photocoagulation for diabetic retinopathy: *ETDRS report 9.Ophthalmology 1991; (98): 766–785.*

14. Tenth revision of the International Classification of diseases. *WHO, 1994.*

15. Walsh JB. Hypertensive retinopathy; Description, classification and prognosis. *Ophthalmology 1981; 89: 1127-1131.*

16. Alebiosu CO, Ayodele O, Adigun A, Olutoyin AI. Chronic renal failure at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria*. Afr Health Sci. 2006; 6(3); 132-138.*

17. Bamgboye EL. Hemodialysis: Management problems in developing countries, with Nigeria as a surrogate. *Kidney Int. 2003; 63(83): 93*.

18. Arogundade FA, Sanusi AA, Hassan MO, Akinsola A. The pattern, clinical characteristics and outcome of ESRD in Ile-Ife, Nigeria: Is there a change in trend? *African Health Sciences 2011; 11(4): 594-601.*

19. Kunitoshi I. Women live longer than men. Can this phenomenon be explained by chronic kidney disease (CKD)? Gender differences in the prevalence and incidence of CKD are discussed. *Kidney Int. 2008; (74): 415–417.*
20. Weatherall DJ, Ledingham JGG, Warrell DA. The epidemiology of chronic kidney disease. *Kidney Int 2005; 67: 14–18.*
21. Kanski JJ, Bowling B. *Clinical Ophthalmology: A systematic approach. 5th Edition. Elsevier Saunders 2004. Page 194.*
22. Vrabec R, Vatavuk Z, Pavlovic D. Ocular findings in patients with chronic renal failure undergoing hemodialysis. *Coll. Antropol. 2005; 29(1): 95-98.*
23. Deva R, Alias MA, Colville D, Tow FK, Ooi QL, Chew S et al. Vision-Threatening Retinal Abnormalities in Chronic Kidney Disease Stages 3 to 5. *CJASN 2011; 6 (8); 1866-1871.*
24. Ahmed E. Khatatbeh MD, Mohammad N. Maryan MD, Amer T. Al Bderat MD et al. Ophthalmic findings among Jordanian patients with Chronic Renal Failure on Haemodialysis at Prince Ali Military Hospital in the South of Jordan. *JRMS September 2013; 20(3): 62-67.*
25. Gao B, Zhu L, Pan Y, Yang S, Zhang L, Wang H. Ocular fundus pathology and Chronic kidney disease in a Chinese population. *BMC Nephrol 2011; 17(12): 62.*
26. Wong TY, Coresh J, Klein R, Muntner P, Couper DJ, Sharrett AR. Retinal microvascular abnormalities and renal dysfunction: The atherosclerosis risk in communities' study. *J Am Soc Nephrol 2004; 15: 2469-2476.*
27. Grunwald JE, Alexander J, Maguire M, Whittock R, Parker C, Mcwilliams K et al. Prevalence of ocular fundus pathology in patients with chronic kidney disease. *Clin Am Soc Nephrol 2010; 10: 2215-2223.*
28. Klein R, Klein BE, Knudtson MD, Wong TY, Cotch MF Liu K et al. Prevalence of age-related macular degeneration in 4 racial/ethnic groups in the multiethnic study of atherosclerosis. *Ophthalmology 2006; 113(3): 373-380.*
29. Liew G, Mitchel P, Wong T.Y, Iyengar S.K and Wang J.J. Chronic kidney disease increases the risk of age-related macular degeneration. *J Am Soc Nephrol. 2008; 19(4): 806-811.*
30. Update of CSN clinical practice guideline. *JASN 2006; 17: S1-S27.*
31. Kian-Ersi F, Taheri S, Akhlaghi MR. Ocular Disorders in Renal Transplant Patients. *Saudi J Kid Dis Transpl. 2008; 19(5): 751-755.*