Ophthalmic Findings among Jordanian Patients with Chronic Renal Failure on Haemodialysis at Prince Ali Military Hospital in the South of Jordan

Ahmed E. Khatatbeh MD, Mohammad N. Maryan MD**, Amer T. Al Bderat MD**, Mazen Odat, MD**, Amin Al- Qudhah MD**, Mohammad Al- Hashky MD**

ABSTRACT

Objective: To characterize the ocular and peri-ocular findings in patients with chronic renal failure undergoing haemodialysis at Prince Ali Bin Al- Hussein Military Hospital.

Methods: This is a descriptive study. Data were collected from patients with chronic renal failure undergoing haemodialysis from June 2012 till January 2013. The medical files were reviewed to report medical, surgical and ophthalmic history of all candidate patients. All patients underwent full ophthalmic examination on day one of recruitment.

Results: Forty-four patients (87 eyes) were reported. Mean age was 56.9 years (56.9 ±12.5). Male to female ratio was 2:1. Aetiologies of chronic renal failure were: Hypertension (n=17, 39%), glomerulonephritis (n=13, 30%), and diabetes mellitus (n=10, 23%). Some other aetiologies were also found like: Small kidney (n=4, 9%), renal stones (n=2, 5%), polycystic kidney (n=2, 5%), familial (n=2, 5%) and analgesic nephropathy (n=1, 2%). Ocular findings were seen in 75 eyes (86%), including lid edema (n=66, 76%)), conjunctival congestion (n=54, 62%), cataract (n=47, 54%), and dry eye (n=44, 51%).

Conclusion: Ocular and peri-ocular findings were frequent in chronic renal failure patients who were undergoing hemodialysis, which urges regular ophthalmic examination to detect and treat sight threatening complications early.

Key words: Ophthalmic findings, Chronic renal failure, Hemodialysis.

JRMS September 2013; 20(3): 62-67 /DOI: 10.12816/0001043

Introduction

Chronic renal failure (CRF) is considered as one of the important health problems that affect the population. Its effect on health can be attributed to renal failure itself or the primary pathology that caused it, haemodialysis, even renal transplantation, or all of them together. It is estimated that around 10-16% of adult population in USA, Europe, Asia, and Australia are suffering from chronic renal failure.[1] In addition to health problems caused by CRF, management of the disease has financial impact on government treasury. Previous reports found diabetic nephropathy to be the most common cause of CRF, followed by hypertensive nephropathy and glomerulonephropathies.[2] The association

From the Departments of:
*Ophthalmology, King Hussein Medical Center, (KHMC), Amman-Jordan
**Internal Medicine, KHMC
Correspondence should be addressed to Dr. A. Khatatbeh, (KHMC), E-mail: drahmed_73@hotmail.com
Manuscript received February 7, 2013. Accepted April 4, 2013

between renal diseases and visual impairment was first described by Bright in 1836. Twenty-three years later, Liebreich described fundus changes in uremic patients and called it Bright's disease.[3] Many studies described the high prevalence of ocular findings in patients with CRF especially in the fundus, which was blamed to be the main culprit responsible of deterioration of vision in CRF patients. A study conducted in USA by Grunwald *et al*. [4] revealed that the prevalence of ocular fundus pathology among CRF patients to be 45%. The above mentioned entity should be differentiated from oculorenal syndromes, which is a group of inherited and non-inherited malformations and systemic diseases that has combined ocular and renal manifestations.[5] According to Jordanian Ministry of Health (MOH) statistics; 2557 Jordanian patients were reported to have CRF and scheduled for haemodialysis among all health sectors in 2011, in MOH affiliated hospitals there are 914 patients using 202 haemodialysis units and those patients underwent 123071 haemodialysis session (average 2.6 per week for each patient) in the year 2011, in Al-Karak Governorate, there are 69 patients with CRF using 14 haemodialysis units,[6] according to administrative data half of those units are located in Prince Ali Military hospital and are used by 51 patients (average 2.1 per week for each patient).

Reviewing the literature, we found no report addressing the ophthalmic findings of CRF in Jordan.

Methods

This is a descriptive study where data were collected from patients with chronic renal failure undergoing haemodialysis from June 2012 till January 2013. Files were reviewed to report medical, surgical and ophthalmic history of all candidate patients. All patients underwent full ophthalmic examination on day one of recruitment. Patients with known malignancy or oculorenal syndromes were excluded. Detailed history was obtained from each patient including age, gender, past medical and surgical history, previous ocular diseases, cause of CRF, duration and frequency of haemodialysis. Detailed ophthalmologic examination included best corrected visual acuity, Schirmer's test, eyelids, anterior segment using slit lamp biomicroscopy, intra ocular pressure measurement using Goldmann applanation tonometry, and dilated posterior segment assessment using 78 D non-contact lens. The approval of the local ethical committee was obtained as well as the patients' consent. Data were reported and statistically analysed.

Results

Forty-four patients (87 eyes) were included in this study, 29 of patients were males with a male to female ratio of 2:1 and the age of the patients ranged between 23 and 87 years (mean 56.9 ±12.5 years). Patients were undergoing haemodialysis for a period ranging from two months to 22 years (mean 4.3 ±3.4 years). The primary pathologies responsible for CRF are summarized in Table I. The majority of patients had single underlying cause responsible for CRF and seven had two combined causes.

Considerable drop of vision (6/18 or less) was seen in 37 eyes (43%) and severe loss of vision (best corrected visual acuity in the best eye is less than 6/60 according to WHO classification of blindness) was seen in four patients (legally blind). Causes of decreased visual acuity among the 37 eyes are summarized in Table II.

Seventy- five eyes (86%) showed at least one eye pathology as shown in Table III. None of the eyes had elevated intraocular pressure.

Tables IV and V represent the presence of ocular pathology in relation to the duration and the frequency of dialysis, respectively.

Discussion

Chronic renal failure is a slowly progressive deterioration of renal function that usually occurs as a result of another systemic problem and result in serious systemic problems.

This study showed that males were more frequently affected than females with a ratio of 2:1 and this ratio is similar to that found in the literature. This can be explained by the rapid deterioration of renal function in some forms of glomerulonephritis and polycystic kidney disease in males.[7]

Taking into consideration the prevalence of diabetes mellitus and hypertension in older age group and as these are the most important underlying causes of CRF [8] it was not surprising

Table I: Aetiologies of CRF

Aetiology of CRF	Number of patients	Percentage
Hypertension	17	39
Glomerulonephritis	13	30
Diabetes Mellitus	10	23
Small kidney	4	9
Renal stones	2	5
Polycystic Kidney	2	5
Familial	2	5
Analgesic nephropathy	1	2
More than one cause	7	15.6

Table II: Aetiologies of reduced vision among eyes with vision drop

Cause	Number of eyes with reduced vision n= 37	%
Band keratopathy	7	19
Lens opacity	16	43
Diabetic retinopathy	10	27
Hypertensive retinopathy	4	11
Maculopathy	6	17

Table III: Ocular findings among patients with CRF

Ocular finding	Number of eyes n=87	%
Lid edema	66	76
Blepharitis	2	2
Dryness	44	51
Conjuctival congestion	54	62
Pinguecula	24	28
Conjuctival calcification	8	9
Band keratopathy	12	14
Corneal calcification	6	7
Keratic precipitates	2	2
Posterior synechiae	1	1
Cataractous changes	47	54
Pseudophakia	11	13
Posterior capsular opacification	2	2
Hypertensive retinopathy	10	11
Diabetic retinopathy	11	13
Maculopathy	6	7
Myopic chorio-retinal degeneration	2	2

Table IV: Presence of ocular pathology in relation to duration of dialysis

Duration (months)	n & % eyes	n & % of eyes with reduced vision	n & % of eyes with anterior segment pathology	n & % of eyes with posterior segment pathology
0-36	51(58.6)	17(33)	42(82)	10(20)
37-72	12(13.8)	5(42)	10(84)	3(25)
73-108	12(13.8)	7(58)	11(92)	4(33)
>108	12(13.8)	8(75)	11(92)	7(58)

Table V: Presence of ocular pathology in relation to frequency of dialysis

Frequency of dialysis per week	n & % of eyes	n & % of eyes with reduced vision	n & % of eyes with anterior segment pathology	n & % of eyes with posterior segment pathology
2	39 (45)	16(43)	34(87)	10(26)
3	48 (55)	21(44)	40(83)	14(29)

that the mean age of patients was 56.9 years. Most of CRF in our study was caused by hypertension, glomerulonephritis and diabetes mellitus with hypertension being the most common predisposing factor, those results are similar to those found in many studies all over the world,[9] however the second common cause was glomerulonephritis rather than diabetes mellitus, this support the idea that there is a geographical variation in the prevalence and aetiology of CRF that could be attributed to race and ethnicity, genetic predisposition, difference in prevalence of diabetes, obesity, and smoking.[10] Another explanation could be the longer life expectancy of diabetic patients in developed countries.

In this series, 37 eyes (43%) showed reduced vision, which is higher than that of a report in Nepal,[11] 23.4% of chronic renal disease patients not undergoing haemodialysis, which may explain the difference. The commonest pathology reducing vision in this series was cataract, followed by diabetic retinopathy, band keratopathy and hypertensive retinopathy respectively. The explanation why diabetes was responsible for drop of vision more than hypertension despite hypertension prevalence among patients is that most of the diabetic retinopathies found in our patients were in advanced stages unlike hypertensive retinopathies which were present mostly in early stages.

We reported a high incidence of ocular pathology among CRF patients on dialysis (86% of eyes). All patients with duration of dialysis more than 6 years had ocular pathology, and as the duration of haemodialysis increased the number of patients with ocular pathology or reduced vision increased, suggesting a linear relationship. This conforms to the results of Kian-Ersi *et al.*[12] No relation was found between the frequency of dialysis sessions and the incidence of ocular pathology and reduced vision. Lid edema was the most common pathology in this series (76%). Oedema occurs as a result of limitation in the kidneys' ability to excrete sodium into the urine, which will increase the hydrostatic pressure in the capillaries forcing the fluids to accumulate in the interstitial space. The 2nd common ocular pathology was conjunctival congestion (62%). Causes of conjunctival congestion are associated hyperparathyroidism and elevated serum calcium concentration which deposits in conjunctiva causing severe irritation and redness.[5,13] Dryness was present in this series (51%). Some studies discussed this issue.[11,13] Some explanations have been put forward. First, deposition of calcium in conjunctiva and cornea was widely suggested as aetiology due to its high association with eye dryness.[14] In this series all patients with conjunctival and corneal calcifications and band keratopathy had dryness, and it tended to be more severe than dryness in eyes without calcifications. Dursun *et al.*[15] found a considerable decrease in goblet cell density in the conjunctiva of CRF patients. Goblet cells are the primary source for synthesis of mucin layer of the tear film. William *et al.*[16] suggested that dryness is more prevalent in cataract patients, which may be a third explanation for the high incidence of dryness as the incidence of cataract was high as well (43%). Pinguecula was seen in 28% of patients. This pathology is close to that found in other studies,[11] although it was present in a significant percentage, many studies showed no harmful complication of this lesion on regular follow up apart from recurrent inflammations.[2,17] Conjunctival and corneal calcifications were present in a significant percentage of patients (9% and 7% respectively) and those calcifications mostly present within the palpebral aperture most probably due to loss of corneal and conjunctival CO_2 in these areas that results in an increase in the pH which leads to precipitation and deposition of calcium in the exposed conjunctival and cornea from the elevated serum calcium. Corneal calcification usually occurs in the periphery of the cornea but with time it extends to the centre interrupting the visual access, and called namely band keratopathy.[5] This ocular pathology was responsible for 19% of reduction of vision.

Cataract was the most common cause of reduced vision (43%) as 54% of the eyes had catarctous changes and 13% were pseudophakic. This pathology is higher than in the general population. David *et al* [18] found that prevalence of cataract and pseudophakia / aphakia among adults above the age of 40 years in the United States to be 17.2% and 5.1%, respectively. This

supports the assumption that CRF increases the risk of developing cataract. This may be explained by severe uremia[19] in addition to increased levels of oxidized glutathione in CRF patients which exposes the lens to oxidative stress.[20] The higher incidence of diabetes may be another explanation. Posterior segment pathologies were the most serious because of their sight- threatening capability and the high possibility of irreversible damage to the visual system. Twenty-four eyes (28%) had at least one pathology in the fundus. The most common posterior segment abnormality was diabetic retinopathy (13%), eight eyes of which (67%) were in the form of proliferative diabetic retinopathy, while two eyes (17%) were moderate non- proliferative diabetic retinopathy, and the remaining two eyes (17%) were mild non-proliferative diabetic retinopathy. Five eyes did not show diabetic retinopathy; this means that 12 eyes out of 17 eyes (70%) of diabetic patients with CRF had diabetic retinopathy, a high percentage in comparison to previous reports in the literature.[21] This may be explained by the poor control of blood sugar in Jordanian diabetics which was described in previous studies.[22] Hypertensive retinopathy was found in 11% of eyes and 4% had reduced vision related to diabetic retinopathy, while the remaining had changes of early grades that did not interfere with vision. Maculopathy was found in 7% of eyes. The strong relationship between nephropathy and development of proliferative diabetic retinopathy and maculapathy was shown before.[23-26] This report demonstrated that ocular pathologies were frequent in patients with CRF on dialysis, some of which are serious and pose a threat to vision. Despite these facts, 55% of patients did not have full and detailed ocular examination. This implies lack of knowledge among patients of CRF. Therefore an effort should be adopted to increase the awareness of patients. And a protocol should be put forward by ophthalmologists and nephrologists suggesting routine ocular examination of CRF patients on haemodialysis. Potential limitations of this report include lack of fundus photography, as well as inaccurate or completely lacking medical records.

Conclusion

Ocular and peri-ocular pathologies are frequent in chronic renal failure patients who undergo hemodialysis. This urges the need for regular ophthalmic examination to detect and treat sight threatening complications as soon as these are detected.

References

1. **Matsushita K, van der Velde M, Astor BC, *et al.*** Association of estimated glomerular filtration rate and albuminuria with all-cause and cardiovascular mortality in general population cohorts: a collaborative meta-analysis. *Lancet* 2010; 375(9731):2073-2081.
2. **Romano V, Zoran V, Drasko P, *et al.*** Ocular Findings in Patients with Chronic Renal failure undergoing haemodialysis. Coll *Andropov* 2005; 29(1): 95–98.
3. **Liebreich R.** Ophthalmoskopischer Befund bei Morbus Brightii. *Graefes Arch Clin Exp Ophthalmol* 1859; 5:265.
4. **Grunwald JE, Alexander J, Maguire M, *et al.*** Prevalence of ocular fundus pathology in patients with chronic kidney disease. *Clin J Am Soc Nephrol* 2010; 5(5):867-873.
5. **Leys AM.** The eye and renal diseases. Duane's ophthalmology. Vol 5; Chapter 31, Lippincott Williams & Wilkins. USA 2006. Ministry of health. Annnual statistical book. 2011; 109-113.
6. **Weatherall DJ, Ledingham JGG, Warrell DA.** Oxford text book of medicine Vol III. 3rd ed. Oxford –New York-Tokyo: Oxford Univ Press 1996; 3294-5. Atkins RC. The epidemiology of chronic kidney disease. *Kidney International* 2005; 67: S14–S18.
7. **Bakris GL, Ritz E.** The Message for World Kidney Day 2009: Hypertension and Kidney Disease: A Marriage That Should Be Prevented. *The Journal of Clinical Hypertension* 2009; 11: 144–147.
8. **Alebiosu CO, Ayodele OE.** The global burden of chronic kidney disease and the way forward. *Ethnicity & Disease* 2005; 15, 418-423.
9. **Bajracharya L, Shah DN, Raut KB.** Ocular evaluation in patients with chronic renal failure -a hospital based study. *Nepal Med Coll J* 2008; 10(4): 209-214.
10. **Kian-Ersi F, Taheri S, Akhlaghi MR.** Ocular Disorders in Renal Transplant Patients. *Saudi J Kidney Dis Transpl* 2008; 19:751-755.
11. **Klaassen-Broekema N, Van Bijsterveld OP.** Red eyes in renal failure. *Brit J Ophthalmol*, 1992; 76: 268-271.

12. **Aktas Z, Özdek Ş, ASlidinc, U, *et al.*** Alterations in ocular surface and corneal thickness in relation to metabolic control in patients with chronic renal failure. *Nephrology*, 2007; 12: 380–385.
13. **Dursun D, Demirhan B, Oto S, *et al.*** Impression cytology of the conjunctival epithelium in patients with chronic renal failure. *Brit J Ophthalmol* 2000; 84: 1225-1227.
14. **William B**. Dry eye more prevalent than expected in cataract patients. *Cataract and Refractive Surgery Today* 2011; 10-11.
15. **Easterbrook M, Mortimer CB.** Ocular signs in chronic renal failure. Brit. *Ophthal*. (I970) 54, 724.
16. **Friedman DS, Congdon NG, Kempen JH, *et al.*** Prevalence of Cataract and Pseudophakia/Aphakia Among Adults in the United States. *Arch Ophthalmol.* 2004;122(4):487-494.
17. **Berlyne GM, Danovitch GM, Ben Ari J, *et al.*** Cataracts of chronic renal failure. *The Lancet*, 1972; 299(7749):509–511.
18. **Ciro C, Giovanni I, Massimo M**, ***et al.*** Systemic human diseases as oxidative risk factors in cataractogenesis. II Chronic renal failure. *Experimental Eye Research* 1990; 51(6): 631–635.
19. **Prakash J, Lodha M, Singh SK, *et al.*** Diabetic retinopathy is a poor predictor of type of nephropathy in proteinuric type 2 diabetic patients. *J Assoc Physicians India* 2007; 55: 412-416.
20. **Ajloun K, Khader, Batieha A, Ajluni H, Khateeb M, *et al.*** An increase prevalence of diabetes mellitus in Jordan during ten years. *The Journal of Diabetes and its complications*, 2008; 22(5): 317-324.
21. **Al-Bdour M, Al-Till M, Abu Samra K.** Risk factors for diabetic retinopathy among Jordanian Diabetics. *Middle East Journal of Ophthalmology* 2008; 15(2):77-80.
22. **Yamamoto T, Iimuro S, Ohashi Y, *et al.*** Long-term risk factors for diabetic retinopathy and diabetic maculopathy in elderly Japanese patients with type 2 diabetes mellitus. *Geriatrics & Gerontology International* 2012; 12(1), 141-144.
23. **Trento M, Panero F, Porta M,** Diabetes-specific variables associated with quality of life changes in young diabetic people: The type 1 diabetes Registry of Turin (Italy). Nutrition, Metabolism and Cardiovascular Diseases 2013, 1-4. Availabl on line: http://www.sciencedirect.com/science/article/pii/S0939475313000070
24. **Ruta LM, Magliano DJ, LeMesurie R.** Prevalence of diabetic retinopathy in Type 2 diabetes in developing and developed countries. *Diabetic Medicine* 2013; 30(4), 387-398.