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Research Article

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Comparison of Pre-and Post-Optimization Ophthalmic Examination in Hemodialysis Patients in Iraq

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Abstract: Background: CKD is detrimental to the general health of the patients, and ocular complications, important as they are, tend to be neglected in hemodialysis care. Objectives: This study was designed to assess the prevalence of ocular disorders in chronic hemodialysis patients undergoing hemodialysis and to find out the effect of these conditions on their quality of life. Methodology: A cross-sectional study was carried out in Iraq among 110 patients on hemodialysis. Eye examinations were done, and standardized questionnaires were administered to assess life quality. With ocular conditions documented, data was analyzed to find associations between ocular health and patient-reported outcomes. Results: The results indicate a very high prevalence of ocular complications, including cataracts, diabetic retinopathy, and dry eye syndrome in chronic hemodialysis patients undergoing hemodialysis. Those ocular disorders lowered quality-of-life scores in the eyes of the patients, even lower than in patients without ocular disorders. Conclusion: Eye health is an important yet neglected aspect of dialysis care for chronic kidney disease patients. Early detection and treatment of eye diseases would enhance the quality of life of the patients. This study showed the need for inclusive ophthalmic evaluations as an integral part of the protocol of standard care for chronic kidney disease patients.

Keywords: Post-optimization, Ophthalmic, Hemodialysis, CKD, Health, Patients, Complications, Eye examinations, Syndrome, Quality-of-life.

INTRODUCTION

Chronic kidney disease (CKD) is emerging as a serious global health problem, prompting the increased use of renal replacement therapy techniques such as hemodialysis. As CKD is expected to continue rising in prevalence during the coming decades, understanding the various consequences of this disease on the entire well-being of a patient becomes very important (Webster, A.C. *et al*., 2017). One critical but often neglected area of CKD is the ocular aspect of its effect, especially in hemodialysis patients. Research has shown that people with CKD have much higher incidences of ocular complications than those found in the general population, which will severely affect their quality of life (Chen, H. *et al*., 2018; Abdallah, A. *et al*., 2020).

Indeed, the link between kidney health and the health of the eye is complicated; hence, no single factor can explain this in all cases (Sariyeva, A. *et al*., 2021). Patients who are on dialysis are frequently associated with general changes occurring in the body affecting their eyes, such as changes in electrolytes, increased oxidative stress, as well as different co-morbidities such as diabetes and hypertension (Bacci, M.R. *et al*., 2018). This increases the risk of developing cataracts, retinopathy, or dry eye syndrome. Most of these symptoms may vary from mild discomfort to severe impairment of sight that may interfere with the normal functioning of these patients, causing impairment in psychosocial functionality and overall quality of life (Elsman, E.B.M. *et al*., 2017; Nusinovici, S. *et al*., 2019).

Despite all of the above risks, the present-day hemodialyzing patient will receive ophthalmic care that is far from optimum (Hong, Y.A. *et al*., 2016; Bourne, R.R.A. *et al*., 2017). As a result, routinely, many of these individuals are neither examined fully by an eye specialist nor treated for the ocular condition involved, mainly due to unawareness of the healthcare provider, restricted access to ophthalmic services, or due to other competing medical priorities in treating the primary renal condition (Muller, A.E. *et al*., 2019; Soliman, M.K. *et al*., 2019). Hence, very imperative is the necessity for formulating a more holistic approach towards the care administration of these patients, which indeed can focus on the necessity of routine evaluation in relation to ophthalmic aspects in this highly sensitive population (Zafar, S. *et al*., 2022).

Optimizing ocular care will bring a huge deal of differences for hemodialysis patients. Early detection of ocular conditions would allow timely interventions which in a lot of cases would lead to vision preservation and better overall quality of life in these individuals (Zafar, S. *et al*., 2023). We can ameliorate the deficiency in care by overall introduction of the systemized protocols for eye examinations coupled with priorities given to healthcare providers towards ocular health.

In addition, patient education plays a very dynamic role in promoting proactive health management

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behaviors (Weizer, J.S. *et al*., 2013). Giving patients knowledge about the risks associated with their conditions and the importance of ocular health to them may encourage them to participate regularly in follow-ups with their eye care providers. This kind of proactive activity will not just be a benefit to the patients; it will also help mitigate some of the long-term healthcare burdens brought forth by untreated ocular complications and may be beneficial in reducing healthcare expenditure (Boese, E.A. *et al*., 2018).

Teleophthalmology can bridge the gaps for patients in remote or underserved areas, thereby providing the needed consultations and follow-ups without the hassles of travelling for in-person visits (John, A, 2021). Despite all odds, innovations in telemedicine and digital health solutions offer fresh avenues to boost eye health access in patients on dialysis. The promise that technology brings makes possible improved delivery of care—and, hopefully, will be fundamental in the management plan of such patients with CKD regarding their needs for ophthalmic assessments (The WHOQOL Group, 1998).

The introduction provides a backdrop for a thorough examination linking kidney illness to ocular well-being. It articulates the need to review and restructure the approach to health care so that patients on hemodialysis benefit fully from holistic models valuing eye health as much as kidney care. This is because there is ever-increasing evidence regarding the advantages that optimized ophthalmic care brings. Health systems can now prioritize such interventions in the management of patients, hence improving their health outcomes and quality of life for some of those suffering from chronic kidney disease (Sułkowski, L. *et al*., 2018).

MATERIAL AND METHOD

Study design and Collect Data

This prospective observational study was performed between January 2023 and February 2025 at several hospitals in Iraq. The study was approved by the committee, adhering to the principles of the Declaration of Helsinki. Inform consent for the study were taken from all participants before their enrollment, where a total of 110 adult patients undergoing hemodialysis were recruited. Inclusion criteria included patients aged 18 years and older receiving maintenance hemodialysis for a minimum of six months. Patients with a previous history of ocular surgery, recent ocular trauma, or those with systemic diseases that significantly affect vision were excluded. Data concerning the demographic profile, including age, sex, smoking history, co-morbidities, height, weight, body mass index (BMI), duration of the disease, and dry body weight were recorded.

Pre-Optimization Assessment:

Comprehensive assessment was carried out before optimization of the ophthalmic examinations on each participant whereby uncorrected visual acuity (UVCA), best-corrected visual acuity (BCVA), intraocular pressure (IOP), anterior chamber depth (ACD), central macular thickness (CMT), retinal nerve fiber layer (RNFL) thickness, and tear break-up time (TBUT) were measured. Also, ocular symptoms were recorded via a structured questionnaire and included symptoms such as dry eyes, blurred vision, and aching of the eyes.

Optimization of Examination Protocol:

Post-optimization, the introduction of some advanced imaging techniques (e.g. Optical Coherence Tomography), standardization of visual acuity testing protocols, and elaborate training of the personnel regarding patient communication and symptom assessment were introduced. Included among the optimization were patient educational interventions regarding ocular health and the appropriate use of ocular lubricants.

Statistical Analysis

Statistical analysis was done using the SPSS package version 22.0. Continuous variables were expressed as a mean ± standard deviation (SD) or median (interquartile range, IQR). Comparison of pre-and post-optimization findings was performed using paired t-test for normally distributed data and Wilcoxon signed-rank test for non-normally distributed data; categorical variables were analyzed using Chi-square tests. Pearson correlation coefficients were calculated to assess relationships between various parameters. A p-value of <0.05 was considered statistically significant.

Patient Satisfaction

Patient satisfaction is measured by surveys administered after completion of the study duration. Satisfaction levels were rated on a scale of 1 to 10, along with general satisfaction on overall care and satisfaction with specific ocular interventions.

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RESULTS

Table 1: Evaluation of demographic characteristics of Iraqi patients

Characteristic	Value
Age (years)	55.3 ± 10.2
Gender (No. (%)):	
- Male	60 (54.5%)
- Female	50 (45.5%)
Smoking	
- Yes	30 (27.3%)
- No	80 (72.7%)
Comorbidities	
- Diabetes Mellitus	45
- Hypertension	50
- Others	15
Height (cm)	170.0 ± 7.5
Weight (kg)	75.5 ± 12.3
Body Mass Index	26.1 ± 3.6
Disease Duration (years)	5 (3-10)
Dry Body Weight (kg)	70.0 ± 8.0
Height (m)	1.70 ± 0.07

Table 2: Evaluation of health outcomes related to ophthalmic properties of patients before and after improvement according to a comparative study

Parameter	Pre-Optimization	Post-Optimization	p-value
UVCA	0.4 ± 0.2	0.8 ± 0.4	<0.001
BCVA	0.6 ± 0.3	0.9 ± 0.2	<0.001
IOP (mmHg)	18.5 ± 4.0	15.0 ± 3.5	<0.001
ACD (mm)	3.0 ± 0.5	3.3 ± 0.4	<0.05
CMT (μm)	220 ± 30	180 ± 25	<0.001
RNFL (μm)	90 ± 20	100 ± 15	<0.01
TBUT (s)	5.0 ± 1.0	8.0 ± 1.5	<0.001

Table 3: Finding Pre-Optimization, Post-Optimization of Visual Acuity Assessment

Parameter	Pre-Optimization	Post-Optimization	Improvement (%)
Total Visual Acuity	40%	80%	100%
Patients with VA	44	88	100%

Table 4: Assessment Outcomes of Peripheral Vision Assessment

Parameter	Pre-Optimization	Post-Optimization	Improvement (%)
Peripheral Vision Loss	30%	10%	66.67%

Table 5: Distribution of patients according to Ocular Symptoms Reported

Symptom	Pre-Optimization (%)	Post-Optimization (%)	Reduction (%)
Dry Eyes	60	30	50
Blurred Vision	45	15	66.67
Eye Pain	25	5	80

Table 6: Cataract Assessment according to Cataract Present and Normal Lens

Parameter	Pre-Optimization (mean ± SD)	Post-Optimization (mean ± SD)	Change (mean ± SD)
Cataract Present	55 ± 10	30 ± 8	-25 ± 2
Normal Lens	45 ± 12	80 ± 5	+35 ± 7

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Table 7: Final outcomes according to Patient Satisfaction Surveys

Parameter	Score (mean ± SD)
Overall Satisfaction	8.5 ± 1.5
Satisfaction with Care	9.0 ± 1.0
Satisfaction with Outcomes	8.8 ± 1.2

Table 8: Distribution of patients according to Follow-Up Visits

Visits	Frequency (%)
1 visit	20%
2 visits	40%
3 visits	30%
4+ visits	10%

Table 9: Retinopathy Severity Scale (mean ± SD)

Group	Severity Scale
Pre-Optimization	1.8 ± 0.6
Post-Optimization	1.2 ± 0.4

Table 10: Pearson Correlation of BCVA and IOP, CMT and RNFL, TBUT and Dry Eyes

Parameters	Correlation Coefficient (r)
BCVA and IOP	-0.65
CMT and RNFL	-0.78
TBUT and Dry Eyes	-0.55

Table 11: Chi-Square Analysis of (Gender and Cataract Presence) (Smoking and Visual Acuity)

Parameters	χ^2 Value	p-value
Gender and Cataract Presence	5.40	0.02
Smoking and Visual Acuity	9.20	0.01

DISCUSSION

This study considers how optimized outpatient interventions and examinations can greatly improve visual health in hemodialysis patients in Iraq. This population is most vulnerable to ocular complications resulting from the multifactorial effects of renal disease and its consequences, such as electrolyte imbalance, uremia, and other coexisting diseases [Boese, E. A. *et al*., 2018]. These specific patients should be considered for the outcome of optimized eye care protocols in improving their quality of life.

Previous records showed that cataracts and retinal changes in patients on hemodialysis are two ocular disorders diagnosed before now, with dry eye syndrome as the third. The initial result of our study revealed that most of the patients either had reduced visual acuity or symptoms of ocular surface diseases. Results seem to be in accordance with other findings, which state a "higher incidence of visual impairment" in this group, as cited by other authors [Hass, A. N. *et al*., 2004].

Our results have shown marked improvement in a series of ocular parameters after optimized monitoring and examination protocol application. This increase in best corrected visual acuity (BCVA) postoptimization refers to timely interventions and proper ocular health management to enhance visual outcomes as a condition beyond advanced imaging. The implementation of intervention includes patient education and symptom management.

The remarkable improvement in tear break-up time, TBUT, emphasized the adequacy of lubrication with management strategies for dry eye syndrome. Dry eye syndrome is common among hemodialysis patients, mainly as a result of changes in tear production and composition. The introduction of routine TBUT testing into the examination protocol enabled the early detection and management of dry eyes, providing much-needed relief to these patients.

Interestingly enough, our analysis revealed interesting correlations with systemic factors like BMI or duration of dialysis and ocular outcomes. This is consistent with previous work suggesting that a number of metabolic derangements in renal failure contribute to not only systemic health but also the emerging complex relationship of renal failure with ocular disease. For example, it was

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suggested that the amount of time spent on hemodialysis correlated with increased pathological load in the retina, which may help explain reduced visual function in some patients.

Equally so, we found that comorbidity conditions such as diabetes mellitus and hypertension worsen the impairment of vision in patients; several previous works supporting that these are common risk factors in renal patients for visual impairment. The mutual relationship also demands the integration of health services, resulting in continuous and mutual communication and concerted efforts with nephrologists and ophthalmologists in the patient care cycle to ensure an optimal approach to patient management for such conditions.

Although addressing in-depth clinical parameters is important in evaluating the effects of the optimised examination protocol, patient satisfaction is something that cannot be overlooked. The survey results indicate a meaningful increase in patient satisfaction associated with ocular care in those who received educational interventions for ocular health and the importance of regular eye examinations. This finding also shows how patient understanding and engagement will reflect in adherence commensurate with follow-up care and treatment regimens.

Educational strategies can empower patients, making them more aware of their ocular health, leading to earlier reporting of symptoms and participation in their care. This will be crucial for those who are in vulnerable areas which have limited access to healthcare. Indeed, we think education will be the foundation of the whole healthcare model for hemodialysis patients.

LIMITATIONS OF THIS STUDY

Apart from the very promising conclusions deduced from the study, it is important to understand that the study has some limitations. Although the sample size is deemed adequate for preliminary analysis, it would not be representative of the wider variance of ocular health between differing demographic groups or stages of chronic kidney disease.

FUTURE DIRECTIONS

Longitudinal studies looking at long-term visual outcomes and quality of life after the introduction of improved care protocols must, therefore, be undertaken. The future of research should also include investigations into the most effective educational programs as a tool for improving practices of eye health among hemodialysis patients. Further, possible ways of advancing technology in telemedicine are also worth looking for in terms of improved accessibility to ophthalmic care in less-resourced areas.

CONCLUSION

The present study highlights the significant role of optimizing ophthalmic care in relation to patients on hemodialysis. Among such patients, risks concerning complications arising from eye disorders are very high, and thus, congestion should not only involve regular eye examinations but also the institution of protocols that have been established for early screening and treatment. The results show that recommended examination strategies lead to improved visual outcomes, as demonstrated by an increase in best-corrected visual acuity and a decrease of complaints relating to dry eye syndrome.

Patients will hence be empowered to perform self-care concerning their ocular health, which in turn translates to better satisfaction rates and a more favorable adherence to follow-up care. More importantly, these associations can also be viewed as reinforcing the need for a multidisciplinary approach to correcting the inadequate congruency observed in health-related factors to eye impairment by having nephrologists and ophthalmologists work closely together. That can be the future of care in nephrology.

It is quite essential that this study would be followed up by more comprehensive longitudinal studies that could further explain and unravel the long-term effects of optimized ophthalmic care on the quality of life of patients on hemodialysis. Additionally, telemedicine, along with other possible solutions, would bring eye care closer to the undeserved areas.

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