

Association of Serum Vitamin D Levels with Senile Cataract

Yasir Iqbal Malik¹, Aqsa Malik², Atteya Zaman³, Rabia Shabbir⁴, Masooma Talib⁵

^{1,5}Watim Medical College, Rawat, Islamabad, ²Mohtarma Benazir Bhutto Shaheed Medical College Mirpur-AJK, ³Federal Medical and Dental college, Islamabad, ⁴Hitec Medical and dental college, Wah Cantt,

ABSTRACT

Purpose: To determine vitamin D levels in patients of senile cataract and compare them with age related control patients.

Study Design: Case control observational study.

Place and Duration of Study: Naseer Memorial Hospital, Dadhyal Azad Kashmir from March 2016 to June 2017.

Material and Methods: Three hundred patients were selected and two groups were designed for the study. Group I included patients having senile cataract of any morphological type. The inclusion criteria were age of 50 years or more. Group II was control in which age matched controls that had no cataract were enrolled from the outpatient clinic. Vitamin D levels were measured by radioimmunoassay technique with Diasorin SR® kit following the user's manual. The collected data was entered in the statistical package for social sciences (SPSS) version 21 for analysis. Independent t –test was used to determine the significant difference of means between controls and patients. P value less than 0.05 was considered as significant.

Results: Group I consisted of 65.33 % females and 35.66% males whereas in group II were 68% females and 32% males. The mean age of patients was 63.20 ± 9.5 years in group I and 65.5 ± 8.9 years in group II. Statistically no significant difference (p>0.05) was found between mean Vitamin D levels in cataract patients (25.95 ± 3.75 ng/mL vs. and age matched control (29.02 ± 5.11ng/mL).

Conclusion: There was no statistically significant difference between the vitamin D levels of cataract patients and the age matched controls.

Key Words: Vitamin D, Cataract, Oxidative stress.

How to Cite this Article: Malik YI, Malik A, Zaman A, Shabbir R, Bilal M. Association of Vitamin D Levels with Senile Cataract. Pak J Ophthalmol. 2020; **36 (3)**: 258-262.

Doi: 10.36351/pjo.v36i3.1037

INTRODUCTION

Cataract is a one of the leading causes of reversible blindness and is estimated to be affecting 94 million people of the world population¹. In Pakistan, it was the

leading cause of severe visual loss in year 2017 according to the statistics of the Global Burden of Disease (GBD)². The treatment of cataract is surgical removal with implantation of artificial intraocular lens, which is the commonest procedure being performed in all ophthalmic centers.³

Cataract is defined as any opacification or cloudiness in the otherwise clear crystalline ocular lens. The normal lens is made up of water and protein fibers and when these proteins clump together an opacity is formed which affects the lens ability to

Correspondence to: Yasir Iqbal Malik
Watim Medical College, Rawat, Islamabad
Email: yazeriqbal@gmail.com

Received: April 13, 2020

Revised: May 4, 2020

Accepted: May 4, 2020

refract light. The causes of cataract are multiple. It can be senile due to normal aging process or secondary to trauma, drugs, ocular diseases, systemic diseases, ultraviolet light exposure and oxidative stress⁴. Alcohol abuse, smoking and obesity lead to an increase in oxidative stress and this increase in oxidative stress is a preventable cause of cataract⁵.

Like all cellular cytoplasm of the body, oxidation is being inhibited in the lens and it is kept in a reduced environment but it can be oxidized⁶. Ultraviolet light absorption from sunlight can create free radicals such as hydrogen peroxide and hydroxyl radical leading to increased oxidative damage and cataract formation. This free radical formation can be prevented by nutritional factors such as vitamin C, vitamin E and xanthine⁶.

Vitamin D, once a vitamin, has now been declared as a hormone due to its proven anti-inflammatory properties and immune regulation. Researchers have found association of vitamin D in cardiovascular diseases, neurogenesis, autoimmune disorders and infectious diseases in preventing oxidative stress⁷. Due these properties researchers have debated its role in prevention of senile cataract by preventing oxidative stress.

The source of vitamin D is dual. Most of it is synthesized in the skin after being exposed to ultraviolet light and the rest is from dietary source⁸. Vitamin D after absorption in the intestines and synthesis by skin is converted into 25(OH) D in the liver which is the measuring parameter of vitamin D. The subject is considered to be vitamin D deficient if the serum 25 (OH) D levels are less than 30ng/ml⁸.

To find out whether serum vitamin D levels are related to cataract formation or not we measured vitamin D levels in patients of senile cataract and compared them with age-matched controls.

MATERIAL AND METHODS

This comparative prospective observational study was conducted at Naseer memorial hospital, Dadyal, Azad Jammu and Kashmir during a period of one year and three months after approval from the ethical review committee and following the guidelines of Declaration of Helsinki. Three hundred patients were selected by convenient non-probability sampling technique and two groups were designed for the study. Group I included patients having senile cataract of any morphological type. The inclusion criterion was age of

50 years or older and of any gender. The exclusion criteria were history of smoking, alcohol use, cataract secondary to ocular or systemic disease, having glaucoma or any other retinal pathology, history of ocular surgery, oral steroid or calcium supplements use, any history of ocular trauma or any systemic disease. Group II was control in which age matched subjects who had no cataract were enrolled from the outpatient clinic having the same exclusion criteria. The patients underwent complete eye examination like visual acuity assessment with the Snellen chart, pupillary reflexes, slit lamp examination, intraocular pressure measurement with applanation tonometry and detailed Biomicroscopic funduscopy. Cataract diagnosis and grading was done by Lens opacity classification system (LOCS) on slit lamp using retroillumination technique.

For the assessment of vitamin D levels 3 ml peripheral venous blood sample was collected from 300 patients of both groups in the laboratory. Serum was obtained after centrifugation of whole blood, after clot formation had taken place at 3000 rpm for 5 minutes and were stored at -20°C for further analysis. 25-OH D levels were measured by radioimmunoassay technique with Diasorin SR® kit following the user's manual.

The collected data was entered in the statistical package for social sciences (SPSS) version 21 for analysis. Gender was expressed as percentages and frequency whereas numerical variable e.g. age was expressed as mean and standard deviation. Independent t-test was used to determine the significant difference of means between controls and patients. P value less than 0.05 was considered significant.

RESULTS

The study was completed in 1 year and 3 months. During the study period 24,759 patients were examined out of which 1,874 (7.5%) patients were diagnosed with cataract. Cataract patients consisted of 956 (51.01%) males with mean age of 57 ± 11.4 years and 918 (48.9%) females with mean age of 55 ± 8.4 years. For the study one hundred and fifty patients, fulfilling the inclusion and exclusion criteria, were included in the group I from these diagnosed patients having cataract.

In group I, we found cataract involving the right eye in 29.3% males vs. 22.6% females. Bilateral

cataract was seen in 16.8% males and 8% females. Morphological classification revealed that majority of the patients had nuclear cataract (37.3% in males vs. 34.6% in females) followed by posterior subcapsular cataract (8% in males vs. 13.3% in females) with no significant statistical difference (Table 1). Group I consisted of 65.33% females and 35.66% males

Table 1: Morphological types of cataract in group I (n = 150).

	Cataract	Males	Females
Type	Cortical	4%	2.6%
	Nuclear	37.3%	34.6%
	Posterior Subcapsular	8%	13.3%
Unilateral	Right	29.3%	22.6%
	Left	8%	15.3%
Bilateral		16.8%	8%

whereas in group II there were 68% females and 32% males. The mean age of patients was 63.20 ± 9.5 years in group I and 65.5 ± 8.9 years in group II. Patients in both groups were matched for age and gender revealing no significant difference (Table 2).

Table 2: Descriptive statistics of cataract and control group.

	Group I (Cataract) n = 150	Group II (Control) n = 150	p value
Mean Age (Years \pm SD)	63.20 ± 9.5	65.5 ± 8.9	0.94
Gender	Female	65.33%	68%
	Male	34.66%	32%
Serum Vitamin D Levels (ng/mL)	25.95 ± 3.75	29.02 ± 5.11	0.617

Statistically no significant difference was found between mean 25-OH D levels in cataract patients (25.95 ± 3.75 ng/mL vs. 29.02 ± 5.11 ng/mL) and age matched control.

DISCUSSION

Cataract has a high reported incidence worldwide which has been related to oxidative stress induced by light with photochemical generation of reactive oxygen species such as superoxide, hydrogen peroxide and hydroxyl radical.⁹ We found frequency of cataract as 7.5% but during a survey it has been reported as high as 20.9% in Pakistan¹. Similarly, in another study, cataract was reported as 4% and 50% in the ages of 50-65 years and 75 – 85 years respectively².

Cataract not only makes the patient himself handicapped but adds people to the non functional community. It is a burden for the developing world for its increasing incidence¹⁰. We found bilateral cataract in 16.8% males and 8% females compared to a study conducted in Chakwal district reporting prevalence of bilateral cataract in 5.1% of the study group¹¹. Similarly, different prevalence of cataract has been reported according to morphology. Naseer¹ reported posterior sub capsular cataracts as being the most common in 56.8% of the study group, followed by nuclear cataract in 26.4% and cortical cataract in 16.8% whereas we found nuclear cataract (37.3% in males vs. 34.6% in females) followed by posterior subcapsular cataract (8% in males vs. 13.3% in females). The variation in frequency of cataract may be attributed to variation in sample sizes and settings of the studies. This was endorsed by a study by Sasaki H et al¹² who reported more percentage of cortical cataract in northern region of Japan and China while nuclear cataracts predominating in the southern regions.

According to the guidelines of the endocrine society, serum vitamin D levels less than 30 ng/dL is declared as vitamin D deficiency¹³. In our study we found vitamin D levels as 25.95 ± 3.75 ng/mL in patients with cataract and as 29.02 ± 5.11 ng/mL in the control group falling in the vitamin D deficiency group. This finding is in correspondence to reports by other researches done in our settings. According to Mansoor S et al¹⁴ 90% of the employees in a tertiary care unit had low vitamin D levels in his study. Iqbal R et al¹⁵ also reported prevalence of vitamin D deficiency in 74% of the study group. This deficiency in vitamin D levels has been equated to a worldwide epidemic and has been postulated to be due to decrease in outdoor activities and sun exposed work professions¹⁶. Furthermore, people have become more inclined to television, computer usage and deliberate sun prevention¹⁶.

Vitamin D, a new revolution in hormone therapy, is a breakthrough for the medical community. Numerous systemic diseases of the body are proven to be associated with vitamin D levels like the skeletal system, teeth and the cardiovascular system.¹⁷ Vitamin D has been detected in aqueous and vitreous humor of the eye and because of its antioxidant properties by preventing free radical formation, it has been associated to uveitis¹⁸, macular degeneration¹⁹ and dry eye syndrome²⁰. Researchers are exploring association

of vitamin D with cataract formation but there are conflicting results. In our study we found no statistically significant difference in levels of vitamin D in control and cataract patients and found no role of vitamin D in cataract development. This is in accordance to the findings of Rao P et al²¹ who also stated that vitamin D levels were not related to cataract. On the other hand, Park S²² reported that serum vitamin D levels were inversely associated to the risk of developing cataract. Similarly, Jee D²³ reported that age related cataracts were significantly decreased in patients with high serum vitamin D levels.

Supporters of vitamin D deficiency leading to cataract have postulated some pathways. According to Brown CJ¹⁶ vitamin D regulating systemic calcium also regulates calcium levels in aqueous humor. Vitamin D levels were negatively correlated to parathyroid. Cataract is associated with parathyroid hormone disorders; therefore, when vitamin D levels decrease, parathyroid hormone levels are increased leading to cataract formation.¹⁶ Another pathway is disruption of calcium homeostasis caused by vitamin D deficiency producing lens opacification by lens protein aggregation and abnormal differentiation of lens epithelial cells into fibrocytes²⁴.

Limitations of our study were that it was an observational study and it was confined to a particular area. Confounders like time spent outdoors, sunlight exposure, dietary habits and ethnicity were not taken into account. Furthermore, linear analysis was not done but we still we feel that this study will be a new milestone in cataract and vitamin D association.

CONCLUSION

There was no statistically significant difference between the vitamin D levels of cataract patients and the age matched controls.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board.

Conflict of Interest

Authors declared no conflict of interest.

Authors' Designation and Contribution

Yasir Iqbal Malik; Associate Professor: *Concept and drafting of article, Manuscript review.*

Aqsa Malik; Assistant Professor: *Manuscript review.*

Atteya Zaman; Assistant Professor: *Interpretation of data, Manuscript review.*

Rabia Shabbir; Assistant Professor: *Interpretation of data, Manuscript review.*

Masooma Bilal; Assistant Professor: *Critical appraisal of findings with literature, Manuscript review.*

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