



## STUDY OF ELECTROLYTES IN CATARACT PATIENTS

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### ABSTRACT

**Background and Objectives:** Cataract is one of the age related eye disorder due to opacity of lens and accounts for 50 million blind people around the world. A number of factors are pre-requisite in the development of cataract formation and one of the key factors being concentration of serum electrolytes which directly affects the concentration of electrolytes in aqueous humor. Hence, this study aims at assessing the serum electrolyte levels in cataract patients. **Material and Methods:** The present study was a case control study and included 30 cataract patients and 30 healthy controls which are age and sex matched. Blood samples were drawn to estimate serum electrolyte levels in cases and controls. Relevant statistical analysis was applied to analyze the data. **Results:** Mean sodium levels in cases were  $141.6 \pm 2.9$  mEq/l and in controls were  $139.5 \pm 1.9$  mEq/l. Similarly Mean potassium levels in cases were  $4.5 \pm 0.4$  mEq/l and in controls were  $4.1 \pm 0.3$  mEq/l. There was significant difference in sodium and potassium levels between two groups. **Conclusion:** Though the study group was small serum sodium and potassium levels were increased in cataract patients when compared with healthy controls which are comparable to the studies done on a larger population. This suggests that diets with high content of sodium and potassium might act as a risk factor for the development of age related cataract.

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### INTRODUCTION

One of the most common age related eye disorders incurred due to opacity of lens (cataract) is the major cause of poor vision all over the world (Rewatkar M, 2012 *et al*, Mirsamdi M. 2004 *et al*) Approximately 50 million in the world suffer from age related cataract out of which it is much more common in developing countries when compared to developed ones (Bunce GE 1990 *et al*, Minassian DC 1990 *et al*, Sperduto RD 2000 *et al*).

There are several factors in the development of cataract and some of them are osmotic graduation, protein aggregates, oxidative stress, UV light exposure, metabolic disorders, diet, and quality of life. Cationic pump malfunction and lens metabolism disorders are also believed to have a role in cataract formation (Rewatkar M, 2012 *et al*, Mirsamdi M. 2004 *et al*).

Lens metabolism is associated with aqueous humor which is produced from blood secretions. To maintain the lens permeability water and electrolyte balance must be maintained in both intracellular and extracellular cell milieu, hence responsible for lens transparency (Mirsamdi M. 2004 *et al*, Van Heyningaen R 1961)

Many studies have shown that serum electrolytes concentration directly affects the concentration of electrolytes in aqueous humor and thereby induces the cataract formation<sup>1</sup>. Concentration of sodium in lens is less when compared to serum concentrations where as it is vice versa in case of potassium concentrations and this cationic balance is maintained by the osmotic pressure and thus water balance by the action of enzyme NaKATPase ( Rewatkar M, 2012 *et al*, Van Heyningaen R 1961).

Any changes in osmotic pressure, affect the concentration of electrolytes in aqueous humor which may ultimately alter lens permeability and thus lead to opacity of lens (Phillips C. 1. 1980 *et al*).

Many factors including nutritional status, ageing, family history and altered blood electrolyte levels have a role in the development of cataract, so we decided to measure the serum electrolyte level in cataract patients and to compare them with normal healthy controls in a small set of subjects in order to find out any impending association.

### MATERIAL AND METHODS

The present study was a case control study and undertaken on 30 cataract patients in the age group of 45 to 70 yrs diagnosed

in the outpatient department of ophthalmology at a tertiary care hospital and research centre and 30 age and sex matched controls. Exclusion criteria included patients with diabetes mellitus type 2, renal diseases, previous ophthalmic surgeries, hypertension and any other systemic disorders.

The study protocol was approved by institutional ethical committee before the commencement of the study. Aseptically 5ml of venous blood was collected and written consent was taken from the respective patients and controls. Blood samples were carried in an ice pack to the laboratory and the separated serum was used to estimate random blood sugar (RBS), creatinine, and electrolytes.

The blood samples were allowed to clot and serum was separated by centrifugation at 5000rpm for 5 minutes. The separated serum was then used for estimating RBS by glucose oxidase peroxidase method, creatinine by Jaffe's method using Erba EM 100 fully automated auto analyzer. Serum electrolytes were estimated by direct ISE method using Elschweiler combiline electrolyte analyzer.

### Statistical Analysis

Data was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. p value of <0.05 was considered as statistically significant.

Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

## RESULTS

In the present study, Mean age of cases were  $56.8 \pm 8.1$  years and control were  $55.5 \pm 7.5$  years out of which 48.4% were females and 51.6% were males respectively. There was no significant difference in age and gender distribution between two groups.

Table 1 shows the mean and SD values of electrolytes, RBS and creatinine in cases and control respectively.

**Table 1** Comparison of Electrolytes, creatinine and RBS parameters between two groups

	Groups				P value
	Cases		Controls		
	Mean	SD	Mean	SD	
Sodium (mEq/l)	141.6	2.9	139.5	1.9	0.001*
Potassium (mEq/l)	4.5	0.4	4.1	0.3	<0.001*
Chloride (mEq/l)	103.1	3.5	101.4	3.1	0.046*
Creatinine (mg/dl)	0.9	0.1	0.9	0.1	0.662
RBS (mg/dl)	97.0	10.9	92.6	10.2	0.113

Statistically significant difference was observed in the electrolyte levels between cases and controls as shown in the above table.

## DISCUSSION

Multiple risk factors are involved in the development of cataract despite the fact that identifying them is very tedious, but various attempts have been made to reduce the morbidity and cost of treating it. The aim of the study was to find out

whether there is a difference in serum electrolyte levels in cataract patients and healthy controls.

Many studies have verified the relationship between biochemical parameters and cataract (Donnelly CA, Seth J 1985 *et al*, Nourmohammadi I 2001 *et al*). In contrast, many studies including Italian American collaborative cataract study, have shown that there is no difference between biochemical parameters and cataract but might be due to difference in nutritional quality and different diets all over the world. (Shoenfeld ER. 1993 *et al*, Barber CW 1963).

Serum electrolyte levels may be one of the risk factor for cataract formation Sperduto R, Hiller R 1984, Clayton RM.1980 *et al*) Lens has high content of potassium and low content of sodium and these two should be in balance together, which is maintained by  $\text{Na}^+\text{-k}^+$  ATPase pump and lens membrane permeability, but an imbalance between any of these ions results in cataract formation (Delamere NA 2001 *et al*)

Studies have notified that there is a significant difference between serum sodium those in cataract and healthy patients but there was no significant difference in serum potassium levels in their studies Clayton RM.1980 *et al*, Delamere NA 2001 *et al*)

Newyork eye study hypothesizes that lens metabolism is associated with aqueous humor which is produced from blood secretions, therefore serum electrolytes concentration may directly affect concentration of electrolytes in aqueous humor and in turn lens metabolism and found that there is a significant difference in both sodium and potassium level in cataract patients when compared —to healthy controls. (Mirsamdi M 2004 *et al*).

One of the studies has observed that there is a remarkable difference in cation concentration (sodium) of aqueous humor in turn a difference in serum cation concentration (sodium) and it thus can be one of the risk factors for cataract (Phillips C. I. 1980 *et al*).

Along with the increase in sodium concentration, which is a prominent finding in most of the studies in cataract patients, we also found that there is increase in potassium concentration in cataract patients which is in contrast with other studies. (Rewatkar M 2012 *et al*, Mirsamdi M 2004 *et al*).

## CONCLUSION

Biochemical parameters such as serum electrolytes, that is sodium and potassium can act as modifiable risk factors in the development of age related cataract and their modification in diet might lead to delay in progression of cataract.

Limitation of our study: small sample size and correlation with aqueous humor electrolytes.

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