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SERUM SODIUM AND POTASSIUM LEVELS AMONG PATIENTS WITH SENILE CATARACT AND INDIVIDUALS WITHOUT CATARACT

Dr. Kavita bansal[1], Dr. Nikhil Agrawal[2*], Dr. Mahendra K. Jharwal[3]

1, 2. Senior Resident 3. Senior Professor Department of ophthalmology SMS college of Jaipur

*Corresponding author - **Dr. Nikhil Agrawal**

Email id – nikhil.aiims87@gmail.com

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ABSTRACT

Background: Senile cataract is among one of the commonly seen consequences in the aging process. Approximately three fourth of population over 75 years of age suffer from cataract or lens opacity. Multiple mechanisms such as oxidative stress, protein aggregates, osmotic graduation, phase separation and post-translational protein changes were proposed for cataract formation. Biochemical researchers had reported significant results in relation to serum electrolytes concentration in patients suffering from age-related cataract. **Material & Methods:** A total of 200 patients who came for ophthalmic evaluation were enrolled for study by simple random sampling. Out of these 200 patients, 100 patients age and gender-matched individuals who had no cataract served as the control group and 100 with nuclear/cortical/posterior sub-capsular cataracts formed the study group. **Results:** Mean serum sodium levels were 143.83±4.16 meq/l in the case group and 139.02±3.26 meq/l in the control group. This difference was found statistically significant ($p<0.001$). The mean serum potassium levels were 4.28±0.13 meq/l in the case group and 4.09±0.27 meq/l in the control group. However, this difference was statistically non-significant (p-value = 0.03) **Conclusion:** Serum sodium levels in patients had senile cataract were observed to be higher in comparison to the control group, while this was not found for potassium levels. These findings indicate that diets that are rich in sodium content are a risk factor for the development of senile cataract.

Keywords: senile cataract, serum sodium, serum potassium.

INTRODUCTION

Senile cataract is among one of the commonly seen consequences in the aging process **(1)**. It represents the disease that affects eyesight. A senile cataract usually diagnosed in patients over 45 years of age. Approximately three fourth of population over 75 years of age suffer from cataract or lens opacity **(2)**. These changes are the major cause of poor vision and blindness worldwide. It was estimated that around 50 million people in the world suffering from age-related cataract and had a higher prevalence in developing countries than the developed countries **(3)**. In India, the Annual incidence of cataract was around 4 million **(4)**. Since cataracts making difficulties for the health system to achieve health goals, health programs directed towards cataract surgeries each year to improve quality of life and prevent disabilities. Hence it is important to direct research work towards clarifying its etiology, so that

much future morbidity can be prevented and treated, so the surgical costs can be reduced and the outcome can be improved.

Multiple mechanisms such as oxidative stress, protein aggregates, osmotic graduation, phase separation and post-translational protein changes were proposed for cataract formation, but the exact etiopathogenesis is a subject for research **(5)**. Several risk factors like UV light exposure, diet, quality of life, some metabolic disorders, lens metabolism disorder and cationic pump malfunction are believed to have a role in cataract formation. The lens metabolism is usually accompanying with aqueous humor and this fluid itself is produced from plasma secretions and serum electrolytes concentration directly regulates electrolytes of aqueous humor and likewise the metabolism of the lens **(6)**. Biochemical researchers had reported significant results according to serum electrolytes concentration in patients suffering from senile cataract **(7)**.

In the present study, an attempt was made to compare the mean serum Na+ and K+ levels among the senile cataract patients with the age-matched controls. The results were also compared with several similar studies which were conducted in the past.

MATERIALS & METHODS

The present cross-sectional study was conducted at Department of Ophthalmology, SMS Medical College & Hospital, Jaipur. A total of 200 patients who came for ophthalmic evaluation were enrolled for study by simple random sampling. Institutional Ethics Committee Clearance was taken before the start of the study and written informed consent for the study purpose was obtained from all the patients. Out of these 200 patients, 100 patients age and gender-matched individuals who had no cataract served as the control group and 100 with nuclear/cortical/posterior sub-capsular cataracts formed the study group. A detailed history was taken from patients of both the groups.

Patients had a drug history, diabetes, hypertension or any other systemic diseases, secondary causes of cataract in the matched age groups, for example, post-inflammation and steroid-induced were excluded from the study. Detailed ophthalmic examination, which includes slit-lamp examination and also fundus evaluation, was done. LOCS III classification was used for grading the cataract. Serum potassium and sodium levels were estimated using flame photometry method. The normal serum sodium level used for analysis was 130 - 143 mEq/L and normal potassium level used for analysis was 3.5 - 5.5 mEq/L. All the patients were subjected to a detailed clinical examination in accordance with pretested proforma. The data were analyzed using MS Excel 2010, Epi Info v7 and SPSS v22.

RESULTS

In this study, the case group comprised of 100 senile cataract patients out of which 62 were males and 38 were females. The control group consisted of 100 age-matched individuals out of which 57 were males and 43 were females. Mean age of the subjects in the case group was 64.5 ±15.3 years and in the control group was 62.8 ±14.2 years (Table-1).

Table 1: Age and sex distribution of cases and controls

Lens opacity group	Mean age (± SD) in years	Males (%)	Females (%)
Case group(n=100)	64.5 (±15.3)	62	**38**
Control group (n=100)	**62.8 (±14.2)**	**57**	**43**

Mean serum sodium levels were 143.83±4.16 meq/l in the case group and 139.02±3.26 meq/l in the control group. This difference was found statistically significant ($p<0.001$). The mean serum potassium levels were 4.28±0.13meq/l in the case group and

4.09±0.27meq/l in the control group. However this difference was statistically non-significant (p-value = 0.03) (Table-2).

Table 2: Mean serum sodium and potassium levels

Serum levels	Case group	Control group	P value
Serum sodium (meq/l))	143.83±4.16	139.02±3.26	**< 0.001**
Serum potassium (meq/l)	**4.28± 0.13**	**4.09±0.27**	**0.03**

DISCUSSION

The present study was conducted to evaluate the comparison of serum potassium and sodium levels among patients had senile cataract and normal individuals. Total study subjects were 100 cases and 100 controls, which were enrolled based on inclusion and exclusion criteria. The most characteristic result of the present study was elevated serum sodium levels in patients with senile cataract which was in compliance with previous studies **(8)**. Since aging by itself was a most important precipitating factor for cataract formation, other risk factors such as family history of cataract and some biochemical electrolytes alterations were may be the responsible ones. Many researches had been conducted to verify the relationship between serum biochemical elements and cataract development. Some of these studies verified the relationship between some serum electrolytes (such as Na+) and cataract formation **(9)**. However, other studies, namely Italian – American cataract study, there was no relation between serum electrolytes and cataract had been reported. This difference may be due to diet difference and nutrition quality in countries all over the world **(10)**.

Serum sodium level was one of the postulated risk factors for cataract development. The ocular lens has a low content of sodium and high content of potassium. Lens sodium level is 14-26 mmol/kg of lens water and a potassium level of the lens is 125 mmol/kg of lens water. These two cations are in equilibrium with each other, which is possible due to lens membrane permeability and Na+-k+ ATP-ase pump. Any change in their equilibrium leads to cation imbalance in the lens which develops in cataract development. Hence alteration in electrolyte concentration of aqueous humor which is linked to alterations in serum electrolyte concentration can be a probable risk factor for the development of cataract **(11)**.

Sodium pump activity in aqueous humor in the lens is as in other cells of the body and it is similar to intracellular sodium, extracellular potassium and subsequently to serum concentrations of these cations. Studies conducted by Clayton et al **(12)** and Philips et al reported that statistically significant difference between serum sodium in patients suffering from senile cataract versus healthy controls. It was also reported that there was not any correlation found for serum potassium in their studies.

In the present study, the mean of serum sodium level in senile cataract patients was 143.83±4.16 and 139.02±3.26 among the control group, which was statistically highly significant (P<0.0001). Though the mean level of serum sodium of the case group was in the normal range of serum sodium (135-150 mEq/Lit) but still it was in the higher limit of the range and also statistically higher in comparison with control group. Results of the present study were in compliance with studies conducted by Clayton et al and Philips et al **(12)** and Shoepheld-ER et al **(13)**.

In the present study, it seems that diets with high sodium content may serve as a risk factor for senile cataract development. Likewise, the high sodium content of the diet leads to high serum sodium levels, which in ultimately contributes to the development of senile cataract **(31, 32, 33)**. However, further elaborative studies with larger sample size should be implemented for age-related cataract patients with

certain diets is suggested.

CONCLUSION

We concluded from the present study Serum sodium levels in patients had senile cataract were observed to be higher in comparison to the control group, while this was not found for potassium levels. These findings indicate that diets that are rich in sodium content are a risk factor for the development of senile cataract.

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