Original Article

Serum Sodium and Potassium Levels in Senile Cataract Patients and Age Matched Normal Individuals

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Purpose: The purpose of the study was to compare the mean sodium and potassium levels in patients with senile cataract and age-matched normal individuals in Kashmir.

Material and Methods: The study was designed as cross sectional observational study. 200 senile cataract patients scheduled for cataract surgery in the Department of Ophthalmology and 200 individuals of the same age group without cataract were selected. Mean serum sodium and potassium levels in the senile cataract group were calculated and compared with the control group. Serum sodium and potassium levels were measured by flame photometry technique. Statistical software SPSS-16 was used and means were compared between two groups by t-test. Since the study was a non interventional one, clearance was given by the department and study abides by the guidelines laid in the declaration of Helsinksi.

Results: Mean serum sodium level in senile cataract patients and normal individuals was 139.60 ± 5.23 mEq/L and 137.15 ± 2.93 mEq/L respectively and there was statistically significant difference ($p < 0.0001$). Mean serum potassium level in senile cataract patients and normal individuals was 4.35 ± 0.574 mEq/L and 4.31 ± 0.45 mEq/L, and the difference was not statistically significant ($p = 0.60$).

Conclusion: Serum sodium level in senile cataract patient was higher as compared to the control group. This outcome might suggest that increased dietary intake of the sodium leads to higher levels of serum sodium which in turn influences the cataractogenesis in senile patients.

Keywords: Cataract, risk factors, sodium, dietary.

Several studies have been carried out to elucidate the risk factors which are responsible for the development of cataract. Cataract, being the most important cause of blindness worldwide[1], has a heavy toll on public health. Senile cataract usually develops in persons after 45 years of age. Risk factors for cataract which are established include use of corticosteroids, diabetes and smoking[1]. Approximately, 75 percent of population over the age of 75 years suffers from lens opacity or cataract[2] and it is reported that worldwide 50 million people suffer from age-related cataracts[3]. In India, the number of new cataract cases reported annually is 4 million.[3] Every year, a substantial amount of financial resources are spent on cataract surgeries, mostly aimed at preventing blindness and improving quality of life, which makes it difficult for the health system to carry on[4-5] since financial allocation for health services in developing countries is deficient. Although, the exact etiology of senile cataract is not understood, multiple mechanisms have been proposed such as oxidative stress of highly reactive oxygen species,[6-7] protein aggregates,[7] osmotic imbibitions,[8] post translational protein changes[9] and phase separation[9] have been

suggested. Several studies have evaluated the role of nutritional status in general and that of elevated serum sodium in particular, and the possibility to use biochemical parameters as markers for determining the risk for development of cataract, considering that nutritional status can be modified.[9-11] Although, Kashmiri diet is very high in salt content,[12] and we tried to figure out any association.

MATERIAL AND METHODS

The study was conducted in the Department of Ophthalmology, mobile surgical eye unit Srinagar, Kashmir. It was a cross sectional observational study. A total of 400 individuals who came for ophthalmic evaluation were included in the study. They were further grouped into study groups, defined as individuals with nuclear/cortical/posterior subcapsular cataracts. Controls were age- and gender-matched individuals who had no cataract, and the ones who did not have any confounding factors. Both groups were asked about and investigated for drug history, hypertension, diabetes or any other systemic diseases which formed the exclusion criteria and subsequently such individuals were not included in either of the groups. Patients having secondary causes of cataract in the same age groups like post-inflammation, steroid induced, were also excluded according to the study protocol. Detailed ophthalmic evaluation, including slit-lamp examination and fundus evaluation was done. LOCS III classification was used to grade the cataract. Serum sodium and potassium were measured by flame photometry method. The normal serum sodium and potassium levels used for analysis were 130 – 143 mEq/L and 3.5 – 5.5 mEq/L respectively.

Data were analyzed on SSPS-16 software and means were compared in both groups by *t*-test. The procedure was carried out with appropriate informed consent of the patients participating in the study and ethical committee clearance was obtained.

The following assumptions on data have been made;

1. Dependent variables showed to be normally distributed.
2. Samples drawn from the population should be random.
3. Cases of samples should be independent. The student t test has been used to find the significance of study parameters on a continuous scale within each group.

RESULTS

In our study, the case group consisted of 200 patients suffering from senile cataract, with 120 female and 80 male patients. Control group, taken in the same number, consisted of 200 individuals who were healthy volunteers with 120 male and 80 female patients. The age range of the cases and controls was taken as 50-70 years. The mean age and standard deviation for cases' group was 58.2 ± 12.7 years and that of controls' group was 56.33 ± 11.9 years, and the difference was statistically insignificant ($p = 0.35$).

Comparison of mean sodium levels among cases and controls demonstrated mean serum sodium levels to be higher in cases (139.60 ± 5.23 mEq/L) compared to controls (137.15 ± 2.93 mEq/L) Table 1. The difference was statistically significant ($p < 0.0001$), albeit the means of the two groups were within the normal range.

Comparison of mean serum potassium levels among the cases and controls revealed slightly increased levels of serum potassium in cases (4.35 ± 0.57 mEq/L) compared to controls (4.31 ± 0.45 mEq/L). The difference was statistically not significant ($p = 0.60$).

DISCUSSION

It is complex to identify the risk factors for cataract; however, attempting to do so provides valuable insights into the etio-pathology and helps in lowering the economical burden of the disease. In perspective of Kashmir, high salt (sodium chloride) content diet has been implicated in esophageal carcinomas[12], but the

Table 1: Comparison of mean serum sodium and potassium levels

Serum Cation	Cases (Cataract)	Controls (No Cataract)	P-value
Serum sodium (mEq/L)	139.60 ± 5.23	137.15 ± 2.93	p < 0.0001
Serum potassium (mEq/L)	4.35 ± 0.57	4.31 ± 0.45	p = 0.60

effect of this diet on development of cataract has not been explored. Our study provides the first attempt at recognizing high sodium levels as a risk factor for cataract genesis in the Kashmir valley.

The aim of this study was to find whether a significant difference exists between serum sodium and serum potassium levels in individuals with cataract and age-matched normal individuals. Certain previous studies have also found significantly higher levels of bilirubin, alkaline phosphatase, and glutamyl transpeptidase in senile cataract patients compared to normal individuals[13]. Although, age is itself the most important risk for senile cataract, and thus its name but several other risk factors have also been cited[7]. There are studies[9-11] which have demonstrated relationship between serum biochemical elements such as sodium and cataract development while there is some contradiction to the claim as well, by reports[14] that could not find a veritable connection. One of the important findings of our study include the reaffirmation that serum sodium levels are elevated in persons suffering from senile cataract as has been found by various previous studies.[9-11] Therefore, alteration in concentrations of cations in aqueous humor, which is attributed to the alterations in serum cation concentration, can be known as a risk factor for development of cataract.[15] It should be noted, however, that many studies[15-17] have demonstrated significant and meaningful difference between serum sodium levels of individuals afflicted with senile cataract against those that do not have cataract, but the same does not hold true for serum potassium levels as is also the case in our study. In turn, it seems like high level of serum sodium contributes to formation of cataract[18]. Levels of sodium was found high in cataract patients and it seemed lowering their dietary intake may retard the cataract progression.[19-20]

CONCLUSION

Serum sodium levels in senile cataract patients were found to be higher as compared to the control group, while this did not hold true for potassium levels. These findings suggest that diets that are high in sodium content are a risk factor for the formation of senile cataract. As such, higher sodium intake may be a risk factor.

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