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COMPARATIVE STUDY OF SERUM ELECTROLYTE LEVEL IN CATARACT PATIENT WITH HEALTHY CONTROLS IN WESTERN RAJASTHAN

Biochemistry

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ABSTRACT

Background: Cataract is a vision-impairing disease characterized by thickening of lens. The amount of incoming light is reduced due to cloudiness of lens that affects vision .The prophylactic measures are still great choice of treatment to prevent the onset and progression of cataract. The various epidemiological, nutritional, photochemical and genetic aspects are being studied to develop proper medical cure to mitigate the problem of cataract. The present study aimed to find out the serum electrolytes level in cataract patients in the tertiary care hospital in Bikaner , western rajasthan india.

Material & Method: This study was conducted at Sardar Patel Medical College and associated hospital in Bikaner, Rajasthan from Dec 2018 to april 2019. There were 50 cases and 50 controls in the age groups from 25 to 75 years. Fresh samples were taken and required tests were performed following standard protocol. sodium and potassium level was estimated by backman coulter fully auto analyser.

Result: The level of serum sodium was significantly high and serum potassium was found non significantly low in cataract patient.

Conclusion: We concluded that, the increase serum sodium concentration affects sodium-potassium ATPase which may lead to cationic imbalance in lens which could result to cataract. So, a balanced diet with low sodium content can be a preventive factor for cataract.

KEYWORDS

INTRODUCTION

Cataract is the leading cause of blindness in the world and the most prevalent ocular disease.[1] The number of cataract blind is expected to increase dramatically in coming decades as the number of elderly in the world's population increases. It is suggested that the number of cataract-blind could reach close to 40 million by the year 2025. There are several risk factors which are associated with induction of cataractogenesis, such as diabetes, oxidative stress, ultraviolet radiation, age, etc.[2]

The crystalline lens is a transparent, biconvex structure in the human eye that functions in a similar way to the lens of a camera. A cataract is a lens abnormality characterized by decreased transparency and increased cloudiness. Cataract is the leading cause of reversible visual impairment and blindness globally. The condition is most prevalent in populations with lower socioeconomic status and developing countries.[3]

Several previous reports give details about the prevalence and incidence of cataract worldwide, Age-related cataracts are responsible for 51% of world blindness, about 20 million people.[4] Globally, cataracts cause moderate to severe disability in 53.8 million (2004), 52.2 million of whom are in low and middle income countries.[5]

Cataracts are the leading cause of blindness worldwide, accounting for visual loss in about half of the world's estimated 23 million persons with best corrected acuities of 3/60 or worse. The number of cataract blind is expected to increase dramatically in coming decades as the number of elderly in the world's population increases.[6]

However, a recently published survey from East Baltimore indicated that unoperated age-related cataract was the leading cause of blindness in blacks, accounting for almost one-third of all blindness in this population.[7]

In physiology, the primary ions of electrolytes are mainly sodium (Na^+) and potassium (K^+). Sodium is the main electrolyte found in extracellular fluid and potassium is the main intracellular electrolyte; both are involved in fluid balance and blood pressure control.[8]

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.[9,10]

Many studies have shown that serum electrolytes concentration directly affects the concentration of electrolytes in aqueous humor and thereby induces the cataract formation1. 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.[11]

MATERIAL AND METHODS

This study was carried out in department of Biochemistry with collaboration of department of ophthalmology of Sardar Patel Medical College and attached Hospital, Bikaner . The cataract patients, registered to the P.B.M Hospital satisfying both the inclusion criteria and exclusion criteria were selected for this study. The control group was taken from patient's attendants, staff, students and may be from personal request.

It was an observational comparative study which was conducted on 100 subjects. Out of 100 subjects, 50 subjects were patients of cataract and 50 were healthy controls having matched age and sex.

Persons with diagnosed cataract, age between 25-75 years were included in the study and subjects having hypertension , ocular trauma , liver disease , and having serious physical illness , and history of long term steroid use were excluded from the study .

Blood samples were obtained by antecubital vein puncture. Standard aseptic precautions were taken and samples with the singn of hemolysis were discarded .

Serum were subjected for the estimation of electrolytes by using analytic grade chemicals on ISE electrolyte backman coulter.

RESULT

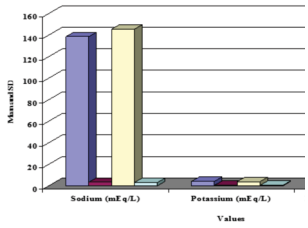
The blood samples of healthy control group as well as study group were withdrawn and analyzed for serum sodium and potassium levels. Table shows serum levels of sodium and potassium in cases and controls with significant difference (Figure).

Serum sodium was significantly increased in patients with cataract (145.44±3.07) and , respectively; p <0.001 and serum potassium level shows non significant decreased in patients with cataract (3.95±0.44; p>0.005).

TABLE
LEVELS OF SODIUM AND POTASSIUM IN CASES AND CONTROLS

Parameters	Mean ± SD		P-value	Inference
	Control group	Study group		
Sodium(mEq/L)	138.56±3.37	145.44±3.07	<0.001	HS*
potassium(mEq/L)	4.12±0.48	3.95±0.44	<0.05	NS*

HS*- highly significant
NS*- non significant



Figure

DISCUSSION

Above Table shows that the mean serum sodium level in control and study group was found to be 138.56±3.37mEq/L and 145.44±3.07 mEq/L respectively . The Sodium level was increased statistically significant as evident by p-value (p <0.001).

Sodium levels were higher in the study group than control groups, these results agree with previous studies, which reported increased plasma Sodium level.

We have found a significant elevation in serum sodium levels in cataract patients as compared to healthy controls. Elevation in serum sodium levels is in accordance with the studies by Adeeb A K et al. (2018). Our results are matching with the conclusions drawn by various studies, even though controversies exist.[12]

The mean serum Potassium level in control and study group was found to be 4.12 ±0.48mEq/L and 3.95±0.44mEq/L respectively. The insignificant decrease (p>0.05) Potassium level was observed in cataract subjects or case group when compared to healthy controls.

In this study, it was observed that the level of sodium was significantly elevated in cataract when compared with the control. This elevated sodium could affect the sodium potassium pumps which make it difficult to maintain the low concentrations of intracellular sodium required for lens transparency. This is consistent with the work of Rayees A S et al.(2015).[13] Hence, the elevation in serum sodium can induce changes in aqueous humor. The increase in sodium concentration of the lens could probably worsen the formation of cataract. The serum sodium elevation directly affects its elevation in aqueous humor fluid which can alter lens membrane permeability, as well as osmotic imbalance. Also, it was observed that the level of potassium in cataract was not significant when compared with the control. However, the elevation of sodium and stability of potassium is dangerous to the eye lens.[14]

CONCLUSION

In conclusion, there is limited data available concerning the role of electrolytes in cataract patients. This observation shows that increased sodium level in cataract patients could probably result in elevation of aqueous humor of the lens which contributes to osmotic disorder across the lens membrane. Therefore, salt restricted diet could be beneficial to cataract patients by preventing electrolyte disorder, hypernatremia and maintain the electrolyte balance.

Studies on electrolytes reveal significant change in the serum concentration of these ions in cataract patients. Thus, these ions can be recognized as potential and effective therapeutic targets or strategies for the treatment of cataract. The diets with high sodium contents could be a risk factor for cataract formation. As it seems, a high level of serum sodium in turn contributes to cataract formation. The administration of antioxidants along with low sodium diet, reduce the effect and complications in cataract requires more research and investigation.

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