

Research Article

Serum electrolyte changes in senile cataract patients at tertiary care teaching hospital in Marathwada region, Maharashtra, India

Pravin N. Soni^{1*}, Dhiraj S. Chabada¹, Sheetal U. Wankhede², Seema P. Soni³

¹Department of General Medicine, Indian Institute of Medical Science & Research Medical College, Badnapur, Jalna, Maharashtra, India

²Department of Ophthalmology, Indian Institute of Medical Science & Research Medical College, Badnapur, Jalna, Maharashtra, India

³Department of Pediatrics, Indian Institute of Medical Science & Research Medical College, Badnapur, Jalna, Maharashtra, India

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*Correspondence:

Dr. Pravin N. Soni,

E-mail: drpravinsoni18@gmail.com

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ABSTRACT

Background: Cataract is one of the leading causes of blindness in developing countries. The most common type of cataract is senile cataract. The exact pathogenesis of cataract is not known, but it is believed that age, sex, radiation and serum electrolyte changes are important responsible risk factor. Rise in serum sodium level is responsible for formation of cataract. Potassium and chloride are not responsible factor for formation of cataract as that of serum sodium level. The purpose of this study is to estimate serum sodium and potassium in senile cataract patients, as compared to those without cataract.

Methods: This study consists of 100 senile cataract patients and age matched 100 normal healthy individuals without cataract, serum electrolyte is measured by using an electrolyte analyzer.

Results: In our study there is significant rise in serum sodium and chloride levels in cases compare to control group which is statistically significant. Serum potassium levels are in significant.

Conclusion: We have concluded that serum sodium and chloride are important markers of senile cataract formation. Restrictions of salt in the diet delay the process of cataract formation.

Keywords: Cataract, Electrolytes, Tertiary care teaching hospital, Marathwada region

INTRODUCTION

Cataract is the of the leading cause of blindness in developing countries, about 80 % of treatable causes of blindness are due to cataract in India.^{1,2} Senile cataract being the most common.³ Changes of senile cataract start after the age of 45 years, 75% of population above the age of 75 years suffer from cataract.⁴ The exact pathogenesis of cataract is not known but it is believed that age, sex, radiation, genetic metabolic disorders⁵ protein, aggregates, oxidative, stress post translational

protein changes phase play important role in pathogenesis.⁶⁻⁸ Lens gets in nourishment from aqueous humors which is a thin fluid produced from serum. The lens metabolism is regulated by aqueous humours electrolytes which in turn is affected by serum electrolytes.⁴ In cataract patients there is alteration of ratio of sodium and potassium.⁹ The purpose of this study was to estimate serum sodium and potassium in senile cataract patients, and thus to identify the risk factor for genesis of cataract.

Objectives of this study is to estimate serum sodium and potassium in patient with senile cataract and to study the association of serum electrolytes with risk of cataract formation.

METHODS

This cross-sectional study was carried out in the department of ophthalmology at the JIU'S IIMSR Medical College and Noor hospital, Badnapur, Jalna Maharashtra, India over a period of four months from February to May 2015. Those patients posted for cataract surgery were taken as cases for this study. Those patients with complicated cataract, those with various disorders like liver cirrhosis, hypertension, diabetes mellitus, renal disorders, thyroid disorders, infections and those with sustained trauma, those patients who are taking steroids, alcohols, and those who are indulging in smoking are excluded from our study.

Patients taken for this study are broadly divided into two groups.

Group 1: Senile cataract patients, who were posted for cataract surgery.

Group 2: Normal healthy individuals without cataract, who were attending to OPD for routine checkup (age and sex matched with group 1)

Each group included 100 subjects. The permission of institutional ethics committee was obtained and informed written consent taken from all participants. Estimation of serum electrolytes done by using the electrolyte analyzer. Blood sugar was estimated to rule out diabetes.

Statistical analysis

For the statistical analysis SPSS-17 software was used, the data was analyzed by unpaired student's t test. The association between electrolytes and risk of cataract formation was studied by using odd's ratio.

RESULTS

In our study, group 1 consists of 100 patients suffering from cataract i.e. senile cataract patient who were posted for cataract surgery (35 male and 65 female). In group 2, normal healthy individuals without cataract, who were attending to OPD for routine checkup (40 male, and 60 female). Mean age and standard deviation of group 1 (cases) and group 2 (control group) were 60.4 ± 10.2 years and 58.1 ± 12.0 years, respectively (Table 1).

Age group of patients and control were 42-87 years and 44-99 years respectively. Normal reference range for sodium was 135-145 meq/l, for potassium is 3.5-5 meq/l, and that for chloride 98-105 meq/l. In our study we observe that group 1 (senile cataract patient) had highly significant elevation in sodium levels 145.81 ± 1.15 meq/l as compare to controls, 143.78 ± 2.39 meq/l potassium level were also elevated 4.33 ± 0.25 meq/l as compare to controls, 4.27 ± 0.31 meq/l, but which is statistically insignificant. Chloride were also elevated 103.03 ± 2.20 meq/l as compare to controls, 101.31 ± 2.72 meq/l, were significantly high in cataract patients. The blood sugar level in senile cataract patient was 96.88 ± 1.38 and in control group was 96.47 ± 1.80 which is statistically insignificant (Table 2).

Table 1: Age and sex wise distribution in two groups.

	Senile cataract patients (group 1) N=100	Normal healthy individuals without cataract (group 2) N=100	p-value
Mean Age	60.4±10.2 (42-87)	58.1±12.0 (44-99)	0.156***
Sex			
Male	35 (35%)	40 (40%)	0.465***
Female	65 (65%)	60 (60%)	

*** (P>0.05) Nonsignificant; ** (P<0.05) Significant; * (P<0.001) Highly significant.

Table 2: Comparison of serum electrolytes in senile cataract patients versus controls.

	Senile cataract patients (group 1) N=100	Normal healthy individuals without cataract (group 2) N=100	p-value
Sodium (meq/l)	145.81±1.15	143.78± 2.39	0.000*
Potassium (meq/l)	4.33±0.25	4.27±0.31	0.1018***
Chloride (meq/l)	103.03±2.20	101.31± 2.72	0.000*
Blood sugar (mg/dl)	96.88±1.38	96.47±1.80	

*** (P>0.05) No significant; ** (P<0.05) Significant; * (P<0.001) Highly significant.

The association between electrolytes and risk of cataract formation was studied by using odd's ratio which was shown in Table 2.

The association of serum electrolytes and risk of cataract formation is studied by odd's ratio studied in sodium and chloride (Table 3). In our study, we observed that, formation of cataract occurred in both electrolytes i.e. sodium and chloride. Chances of senile cataract formation is greater in people with serum sodium >145 meq/l, and chloride >105 meq/l. was 3.63 and 1.72 respectively. Potassium levels dose not play significant role in the formation of cataract.

Table 3: Odd's ratio for serum sodium and chloride.

	Senile cataract	Controls
Increased serum sodium	62	31
Normal serum sodium	38	69
Odd's ratio = $ad/bc = (62 \times 69) / (31 \times 38) = 3.63$		
	Senile cataract	Controls
Increased serum chloride	19	12
Normal serum chloride	81	88
Odd's ratio = $ad/bc = (19 \times 88) / (12 \times 81) = 1.72$		

DISCUSSION

In our study we observed that group 1 (senile cataract patient) had highly significant elevation in sodium levels (145.81 ± 1.15 meq/l) as compare to controls, group 2 (143.78 ± 2.39 meq/l). Potassium level were also elevated (4.33 ± 0.25 meq/l) as compare to controls, (4.27 ± 0.31 meq/l), but which is statistically insignificant. Chloride were also elevated (103.03 ± 2.20 meq/l) as compare to controls, (101.31 ± 2.72 meq/l), were significantly high in cataract patients. Our results are matching with various previous studies.^{10,11}

As we know in lens there is low amount of sodium and high amount of potassium. There is a role of $Na^+ - K^+$ ATP ase pump and capsular permeability of lens, which maintains the balance between Na and K ions, In this way permeability of lens is maintained.²

Due to reduced activity of $Na^+ - K^+$ atpase, in senile cataract patients, thus increases the, intracellular Na levels, thus causing the cataract formation.^{12,13} Thus it means that diet rich in sodium content is an important risk factor for the formation of cataract.¹⁴ Various previous studies have shown that there is significant elevation of serum sodium level as compared to (control group) those without cataract (cataract and salt medical encyclopedia article by Karnulis LS).¹⁵

CONCLUSION

From our studies we have concluded that, serum sodium and serum chloride used as parameters, to determine the risk of cataract genesis i.e. senile cataract formation.

Restrictions of sodium, in the diet prolong the process of cataract

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