ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 6, Issue – 3, June – 2021 , Page No. : 267 - 271

Comparison of aqueous sodium & potassium levels in immature, mature and Hypermature cortical senile cataract patients

[1]Dr. Vaibhav Jirotiya, Resident, Department of Ophthalmology, Sardar Patel Medical College & Associate Group of Hospitals, Bikaner, Rajasthan

[2]Dr. Jaishree Murli Manohar, Professor & Head, Department of Ophthalmology, Sardar Patel Medical College & Associate Group of Hospitals, Bikaner, Rajasthan

Corresponding Author: Dr. Vaibhav Jirotiya, Resident, Department of Ophthalmology, Sardar Patel Medical College & Associate Group of Hospitals, Bikaner, Rajasthan

Citation this Article: Dr. Vaibhav Jirotiya, Dr. Jaishree Murli Manohar, "Comparison of aqueous sodium & potassium levels in immature, mature and Hypermature cortical senile cataract patients", IJMSIR- June - 2021, Vol – 6, Issue - 3, P. No. 267 – 271.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: In India, cataract has been reported to be liable for 50-80% of bilateral blindness. In present scenario, the most effective treatment of cataract is the surgical removal of the opacified lens; however, there continues to be a backlog of the services provided in many parts of the world. This study was to determine the correctness levels of aqueous sodium and potassium levels in immature mature & hypermature cortical senile cataracts.

Methods: This study to assess aqueous sodium & potassium levels in immature mature & hypermature cortical senile cataract attending OPD in Department of Ophthalmology S.P. Medical College & Associated group of hospitals. Cases were divided in terms of cataract grading & to be investigated accordingly.

Results: These 100 patients were divided as immature, mature and hypermature on the basis of cataract grading. In this study, it was found that 43% cases were of immature cataract, 33% cases were of mature cataract and 24% cases were of hypermature cataract. The overall mean value of sodium was found to be 142.87 ± 6.17mEq/lit. The mean value of sodium was 144.64 ± 5.62mEq/lit in immature group, 142.35 ± 5.87mEq/lit in mature group and 140.40 ± 6.75mEq/lit in hypermature group.

Conclusion: The mean value of sodium and potassium was found to be significantly associated with the grading cataract. Serum sodium and potassium levels can be utilized as markers to determine the risk involved in senile cataract formation. Simple measures like dietary restriction of salt may prolong cataractogenesis, which can be a preventive measure useful to the community.

Keywords: Cataract, Hypermature, Blindness

Introduction

It has been estimated that, globally, approximately 45 million people worldwide are blind, half of them due to

cataract [1,2,3]. However, changing demographic structures of populations, particularly the increasing proportion of the elderly, and enhanced life expectancy in the developing world, suggest that this number will increase dramatically in the coming years. In fact, projections by the World Health Organization indicate that in 2020, close to 40 million people will be blind due to cataract [4,5]. In India, cataract has been reported to be responsible for 50-80% of bilateral blindness[6,7,8].

As of now, the most effective treatment of cataract is the surgical removal of the opacified lens; however, there continues to be a backlog of the services provided in many parts of the world. Globally, the two main techniques of cataract surgery are manual small incision cataract surgery and phacoemulsification; a third technique, microincision cataract surgery, is becoming increasingly popular[9].

With increasing safety of ocular surgical techniques and improved visual results, it is no longer necessary to wait for the cataract to become sufficiently mature; in fact, surgery can be performed at a much earlier stage when phacoemulsification is used[10].

Cataract surgery may be performed depending on the patient's age and visual function demands[11]. Certain surgical complications can be avoided if the cataract is removed before it becomes too advanced[12]. Surgery should be considered when the benefits from removal of symptoms outweigh the small risks caused by modern surgery.

The lens is an avascular tissue that it experiences tremendous physiological, all nutrients should be obtained from the surrounding fluid, as well as all the waste products that must be removed fluidity . Most of lens cells in adults experience a reduction in metabolic activity and epithelial membrane to regulate the hemostatic balance. On a normal lens has a lower sodium level (10 mmol / L) and high potassium level (120 mmol /L) otherwise on aqueous humor the sodium content approximately 150 mmol /L (high) and potassium approximately 5 mmol /L (low) . Sodium and potassium balance is maintained by a sodium pump activity with the participation of the enzyme Na + K + -ATPase.[13]

Several studies have shown significant differences between serum electrolyte levels in senile cataract patients compared with patients without cataracts. As we get older increased membrane permeability of lens from damaged pump activity of Na + K + ATPase, thus causing an increase in intracellular sodium on the lens. High levels of extracellular sodium make it harder for Na + K + ATPase pumps to maintain low levels of intracellular sodium. Variations in serum electrolytes can change the cation concentration of aqueous humor that can affect the metabolism of the lens, causing the formation of cataract .[11-12]This study was to determine the accuracy levels of aqueous sodium and potassium levels in immature mature &hypermature cortical senile cataracts.

Materials and Method

It is a hospital based prospective observational study to assess aqueous sodium & potassium levels in immature mature & hypermature cortical senile cataract attending OPD in Department of Ophthalmology S.P. Medical College & Associated group of hospitals. Cases was divided in terms of cataract grading & to be investigated accordingly. All patients having the diagnosis of immature mature & hypermature cortical senile cataract of either sex were studied. Cataract due to any other aetiology like radiation, diabetes mellitus, trauma, hypertension etc. Patients with asthma, acute or chronic renal failure, any history of drug intake like

antipsychotics, chemotherapy etc. were excluded from this study.

Results

This hospital based prospective observational study was conducted on 100 senile cataract patients attending OPD in the Department of Ophthalmology S.P. Medical College & Associated group of hospitals Bikaner. Both male and females were included in this study with no major illness. These cases were divided in terms of cataract grading and to be investigated accordingly. These 100 patients were divided as immature, mature and hypermature on the basis of cataract grading. In this study, it was found that 43.00% cases were of immature cataract, 33.00% cases were of mature cataract and 24.00% cases were of hypermature cataract.

There were 67.00% male and 33.00% female in the studied population while this male-female population was 58.14% and 41.86% in immature group, 81.82% and 18.18% in mature group and, 62.50% and 37.50% in hypermature group respectively. No significant difference was there between groups. (Table 1)

The overall mean value of sodium was found to be 142.87 ± 6.17mEq/lit. The mean value of sodium was 144.64 ± 5.62mEq/lit in immature group, 142.35 ± 5.87mEq/lit in mature group and 140.40 ± 6.75mEq/lit in hypermature group. These mean values of sodium were significantly different between groups. (Table 2)

The overall mean value of potassium was found to be 4.27 ± 0.19mEq/lit. The mean value of potassium was 4.20 ± 0.21mEq/lit in immature group, 4.28 ± 0.15mEq/lit in mature group and 4.38 ± 0.18mEq/lit in hypermature group. These mean values of potassium were very significantly different between groups. (Table 3)

Discussion

Cataract is opacification of the lens that occurs due to the process of degeneration and usually starts at the age of 40 years. Cataract is multifactorial. Of the 100 studied patients, three groups were formed on the basis of cataract gradation, which were immature, mature and hyper-mature. There were 43.00% patients in the immature group, 33.00% in the mature group and 24.00% in the hyper-mature group. Among the total 100 patients, there were 67.00% male and 33.00% female. No significant difference was there between on the basis of gender-wise distribution of population.

The mean age of the studied population was 64.56 ± 7.90 yrs. This mean age was 62.58 ± 7.34 in immature group, 63.12 ± 8.08 yrs. in mature group and 70.08 ± 6.11 yrs. in hyper-mature group.

The mean value of sodium in aqueous was found to be significantly associated with the grading of cataract. The mean value of sodium was 144.64 ± 5.62 mEq/lit in immature group, 142.35 ± 5.87 mEq/lit in mature group and 140.40 ± 6.75 mEq/lit in hypermature group. Similar findings have been reported in the studies done by Nourmohammadi et al. (2001)[14], Mirsamadi et al. (2004)[15] and Mathur and Pai (2016).[16] Na^+ pump activity in lens is as in other cells and it is related to intracellular Na^+, extracellular K^+ and eventually to serum concentrations of these ions.[17,18] The mean value of potassium in aqueous was found to be very significantly associated with the grading of cataract. The mean value of potassium was 4.20 ± 0.21 mEq/lit in immature group, 4.28 ± 0.15 mEq/lit in mature group and 4.38 ± 0.18 mEq/lit in hypermature group. Higher levels of extracellular Na+ and K+ might make it more difficult for Na+ K+ ATPase pump to maintain the low levels of intracellular Na+ and K+ required for lens transparency.[19,20]Delamere et al. (2001)[21] reported that

variation of electrolytes in the serum in turn alters cation concentration of aqueous humors, which ultimately affect lens metabolism leading to cataract formation.

Lens has high content of potassium and low content of sodium. Lens K^+ level is 125 mmol/kg of lens water and lens Na^+ is 14-26 mmol/kg of lens water.[21]These two cations are in balance with each other, which is mainly due to Na^+-k^+ ATP-ase pump and lens membrane permeability. Alteration in either of these ions leads to cation imbalance in lens which in turn results in cataract formation.[21] Hence alteration in cation concentration of aqueous humor which is attributed to alterations in serum cation concentration, can be known as a risk factor for cataract formation.

Summary And Conclusion

Among the total 100 patients, there were 67.00% male and 33.00% female. No significant difference was there between on the basis of gender-wise distribution of population. The age was not found to be associated with the grading of cataract.

The mean value of sodium and potassium was found to be significantly associated with the grading cataract. Serum sodium and potassium levels can be used as markers to determine the risk involved in senile cataract formation. Simple measures like dietary restriction of salt may prolong cataractogenesis, which can be a preventive measure useful to the community.

References

1. Asbell PA, Dualan I, Mindel J, Brocks D, Ahmad M, Epstein S.Agerelated cataract. Lancet 2005 Feb 12-18;365(9459):599-609.
2. Foster A, Resnikoff S. The impact of Vision 2020 on global blindness. Eye 2005;19:1133-1135.
3. Chang MA, Congdon NG, Baker SK, Bloem MW, Savage H, Sommer A. The surgical management of cataract: barriers, best practices and outcomes. Int Ophthalmol 2008; 28 (4) :247-60.
4. Resnikoff S, Pascolini D, Etya'Ale D, Kocur I, Pararajasegaram R, Pokharel GP et al. Global data on visual impairment in the year 2002. Bulletin of the world health organization. 2004;82:844-51.
5. Pascolini D, Mariotti SP, Pokharel GP, Pararajasegaram R, Etya'ale D, Négrel AD et al. 2002 global update of available data on visual impairment: a compilation of population-based prevalence studies. Ophthalmic epidemiology. 2004 Jan 1;11(2):67-115
6. Murthy GV, Gupta SK, Bachani D, Tewari HK, John N. Human resources and infrastructure for eye care in India: current status. Natl Med J India. 2004;17(3):128-34.
7. NirmalanPK, Thulasiraj RD, Maneksha V, Rahmathullah R, Ramakrishnan R, Padmavathi A et al. A population based eye survey of older adults in Tirunelveli district of south India: blindness, cataract surgery, and visual outcomes. Br J Ophthalmol. 2002;86(5):505-12.
8. Thulasiraj RD, Nirmalan PK, Ramakrishnan R, Krishnadas R, Manimekalai TK, Baburajan NP et al. Blindness and vision impairment in a rural south Indian population: the Aravind Comprehensive Eye Survey.Ophthalmology. 2003;110(8): 1491-8
9. Klonowski P, Rejdak R, Alio JL. Microincision cataract surgery: 1.8 mm incisional surgery. Expert Rev Ophthalmol 2013; 8(4), 375–391.
10. Snellingen T, Evans JR, Ravilla TR, Foster A. Surgical interventions for age-related cataract. Cochrane Database of Systematic Reviews. 2002(2).

11. Alkharashi M, Stark WJ, Daoud YJ. Advances in cataract surgery. Exp Rev Ophthalmol 2013; 8(5), 447–456.
12. Osborne SA, Adams WE, Bunce CV, Fraser SG. Validation of two scoring systems for the prediction of posterior capsule rupture during phacoemulsification surgery. British journal of ophthalmology. 2006 Mar 1;90(3):333-6.
13. Blumenthal M, Ashkenazi I, Assia E, Cahane M. Small incision manual extracapsular cataract extraction using selective hydrodissection. Ophthalmic Surgery 1992;23(10): 699–701.
14. NourmohammadiI, Gohari L, Modarres M, Ghayoumi A. Evaluation of erythrocyte glutathion peroxidase, superoxide dismutase and total antioxidants in cataract patients. Archives of Iranian Medicine. 2001;4:123–127
15. Mirsamadi M, Nourmohammadi I, Imamian M. Comparative study of serum Na(+)and K(+) levels in senile cataract patients and normal individuals. *Int J Med Sci*. 2004;1(3):165-169.
16. Mathur G and Pai V. Comparison of serum sodium and potassium levels in patients with senile cataract and age-matched individuals without cataract.Indian J Ophthalmol. 2016 Jun; 64(6): 446–447.
17. Phillips CI, Bartholomew RS, Clayton R, Duffy J. Cataract: A search for associated or causative factors. ExcerptaMedica. 1980;34:19-25.
18. Raven J. Physiology of the lens. In: Tasman W, Jeager A, editors. Duane's Clinical Ophthalmology. Philadelphia: Lippincott-Raven Publisher; 2001.
19. Cumming RG, Mitchell P, Smith W. Dietary Sodium Intake and Cataract The Blue Mountains Eye Study. American Journal of Epidemiology 2000; 151:624-626.
20. Paul L. Kaufman and Albert Alm, Editors. Adler's physiology of the eye: Clinical Applications. 10th Edition, Chapter 5, Mosby, St. Louis, MO, 2003; 132-134.
21. DelamereNA, Paterson CA. Crystalline lens. In: Tasman W, Jeager A, editors. Duane's Foundations of Clinical Ophthalmology. Philadelphia: Lippincott-Raven Publishers; 2001. pp. 5–11.

Legend Tables

Table 1: Gender-wise distribution of population among different Groups

Gender	Immature No. (%)	Mature No. (%)	Hypermature No. (%)	Total No. (%)	P value
Male	25 (58.14%)	27 (81.82%)	15 (62.50%)	67 (67.00%)	0.08
Female	18 (41.86%)	6 (18.18%)	9 (37.50%)	33 (33.00%)	
Total	43 (100.00%)	33 (100.00%)	24 (100.00%)	100 (100.00%)	

Table 2: Mean values of sodium (mEq/lit) among different groups

S. No.	Group	Mean	St. deviation	P value
1.	Immature	144.64	5.62	0.02
2.	Mature	142.35	5.87	
3.	Hypermature	140.40	6.75	
4.	Total	142.87	6.17	

Table 3: Mean values of potassium (mEq/lit) among different groups

S. No.	Group	Mean	St. deviation	P value
1.	Immature	4.20	0.21	0.001
2.	Mature	4.28	0.15	
3.	Hypermature	4.38	0.18	
4.	Total	4.27	0.19	