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A clinical study on evaluation of risk factors and visual outcome after phacoemulsification in presenile cataract patients

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ABSTRACT

Aim: To evaluate the risk factors, types of pre senile cataract and to assess the visual outcome after phacoemulsification and intraocular lens implantation in pre senile cataract.

Materials and Methods: This was a hospital based cross sectional study of 90 patients who presented to Ophthalmology OPD of a tertiary care hospital and was diagnosed to have pre senile cataract. The study was done from June 2020 to November 2021. Patients who gave written informed consent were included in the study. Detailed history was taken regarding the age, gender, risk factors such as diabetes mellitus, myopia, occupation, smoking, corticosteroid use, dermatological disease etc. All the patients were subjected to routine ophthalmological evaluation. All the patients underwent phacoemulsification and IOL implantation. Visual acuity was noted before and after the surgery. The risk factors for pre senile cataract and visual acuity before and after cataract surgery was statistically analysed.

Results: Out of 90 patients included in the study, 60% were females Mean age at presentation was 42.94 ±5.93 years. Most common cause of pre senile cataract was diabetes mellitus (42.2%) followed by tobacco consumption (20%) and dermatological diseases (15.6%). Posterior subcapsular cataract was the most common type of cataract seen among young population and it has been significantly associated with diabetes mellitus. 87.8% had a best corrected visual acuity of 6/6-6/9 after phacoemulsification surgery.

Conclusion: In this study diabetes mellitus and tobacco consumption are the two strongest modifiable risk factors for cataractogenesis in younger working population which is mainly because of the lifestyle changes. Majority of the patients attained a good visual acuity post phacoemulsification and IOL implantation surgery.

1. Introduction

According to WHO, Cataract and refractive errors are the leading causes of visual impairment and blindness globally out of which cataract accounts for 17%.[1] While glaucoma constitute major cause of moderate to severe vision loss in western high income countries, cataract and uncorrected refractive error has a major contribution in Southeast Asia, North Africa and middle east.[2] There is a four fold increase in the blindness due to cataract in developing countries as compared to developed countries.[1] In India, almost 62.6% of blindness is attributed to cataract.[3,4] Data from a study carried out in Punjab showed that the age-specific prevalence of cataract in India was three to six times higher than that in the Framingham Eye study in the United States.[5]

Cataract is a clouding or opacification of the clear lens of eye or its capsule that obscures the passage of light through the lens to the retina of the eye.[6] Most commonly cataract develops in fifth to sixth decade of life with slight female preponderance. However with change in lifestyle, genetic factors, and environmental risk factors there has been a shift

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in the occurrence of cataract to an early age group. Pre senile cataract refers to an onset of cataract anytime from 35 years to 50 years of age which is the major working population of the country.[7] This reduces the overall productivity and add on to the existing financial burden in low income countries like India.

Major risk factors attributed for development of pre senile cataract are diabetes mellitus, smoking, dermatological diseases, tuberculosis, corticosteroid use, high myopia etc. There are many landmark studies done to evaluate the risk factors of age related cataract. The 'Beaver Dam Eye Study' showed increased incidence of age related cataract in patients diagnosed with Diabetes mellitus and with high glycemic index.[8] The 'Blue Mountain eye study' showed dietary factors, smoking, alcohol consumption, medication and refractive errors as risk factors of age related cataract.[9]

Though cataract remains a major cause of vision impairment, it can be treated efficiently with cataract surgery. With the advent of Phacoemulsification and intraocular lens implantation, patients have an early postoperative recovery and good visual outcome thereby enhancing the overall patient satisfaction physically and psychologically. Phacoemulsification has also helped the patients to revert back to their normal routine activities thereby improving the productivity.

The main objective of this study is to evaluate the risk factors associated with pre senile cataract and the types of cataract in South Indian population. As per our our knowledge there are very few studies conducted in India to assess the role of Phacoemulsification in improving the visual outcome in pre senile cataract. This study also focus on evaluation of visual outcome after uncomplicated phacoemulsification in pre senile cataract.

2. Materials and Methods

This was a hospital based cross sectional study of 90 patients who presented to Ophthalmology OPD of a tertiary care hospital and was diagnosed to have pre senile cataract. The study was done from June 2020 to November 2021. Institutional ethical clearance was obtained and the study was in accordance with the Declaration of Helsinki. Patients who gave written informed consent of any gender between the age group of 30-50 years were included in the study whereas patients with congenital, developmental, traumatic or complicated cataract were excluded from the study.

Detailed history regarding duration of onset of cataract and associated risk factors like smoking, diabetes mellitus, high myopia, occupation, dermatological disease (atopy) was taken. Patients were also enquired about the history of chemotherapy, radiotherapy, chronic intake of corticosteroids, substance abuse and history of early onset of cataract in the family.

All the patients underwent detailed ophthalmic evaluation like Snellens visual acuity testing, slit lamp examination to look for the type and grade of cataract, dilated fundus examination with 90D and indirect ophthalmoscopy to look for other potential causes for visual impairment, intraocular pressure measurement with Goldman applanation tonometer, lacrimal syringing.

Manual keratometry and A scan biometry was done to calculate the IOL power. Additional investigation like B-scan or OCT was done when needed to rule out other causes of low vision. After preoperative evaluation and explaining the patients about the surgery, all the patients underwent phacoemulsification and IOL implantation surgery without any complications. Postoperative best corrected visual acuity was recorded.

Sample size estimation was done using Open Epi software version 2.3.1. At 95% confidence level, At 10%, absolute precision, Sample size estimated is 87 which is rounded off to 90. Formula used was n= [DEFF*Np(1-p)]/ $[(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]$.

Data was entered in MS excel and analyzed using SPSS version 20. Mean, standard deviation and proportions were calculated. Yate's chi square test was used. P value of < 0.05 was considered statistically significant.

3. Results

In our study of 90 patients diagnosed with presenile cataract, mean age at presentation was 42.94 ±5.93 years. Most of the patients belongs to the age group of 45-50 years. (Table 1) There was an increased female preponderance in our study with female to male ratio of 3:2. (Graph 1)

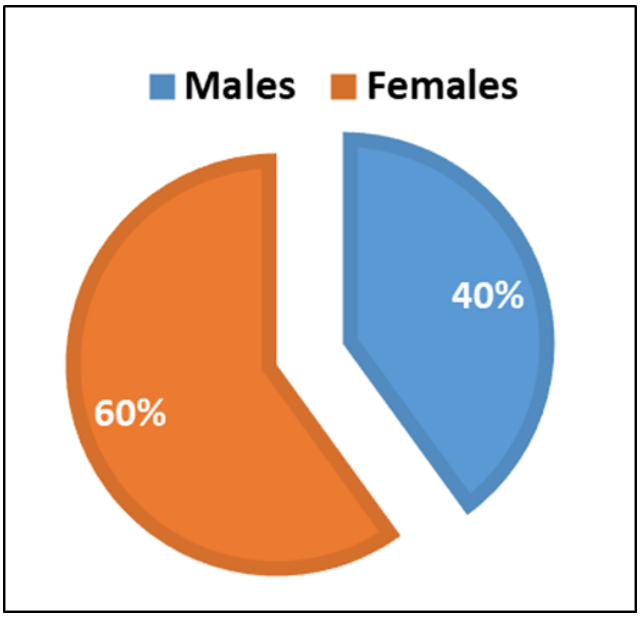
Table 1:

Age	Frequency	Percentage
30-35	13	14.4
36-40	16	17.8
41-45	21	23.3
46-50	40	44.4

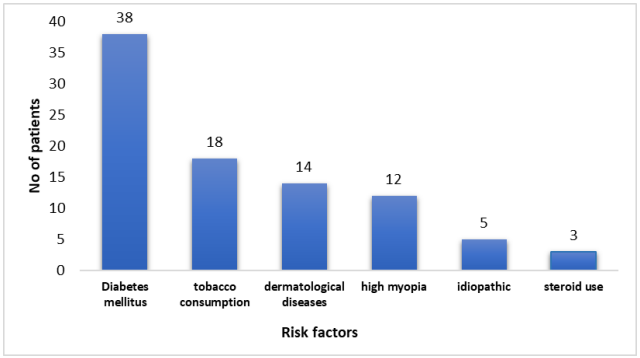
Diabetes mellitus was the most common risk factor in our study which constituted 42.2% followed by tobacco consumption (20%) and dermatological diseases (15.6%).(Graph 2)

Most prevalent type of cataract was Posterior subcapsular cataract seen in 58.9% followed by nuclear sclerosis (23.3%) and cortical cataract (14.4%).(Graph 3) There was a statistically significant association between the prevalence of posterior subcapsular cataract in patients with diabetes mellitus and steroid usage.(Graph 4)

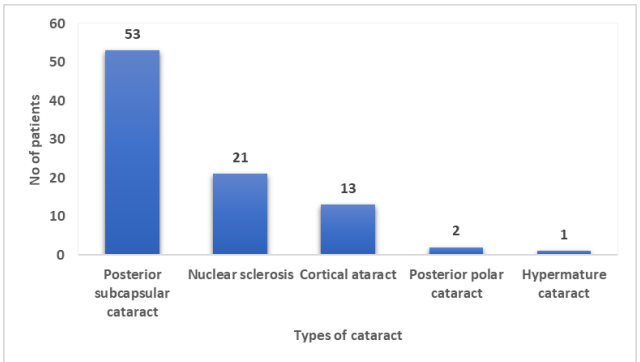
Post operative best corrected visual acuity was 6/6 in 50% of patients followed by 6/9 in 37.8% of the patients. (Table 2)



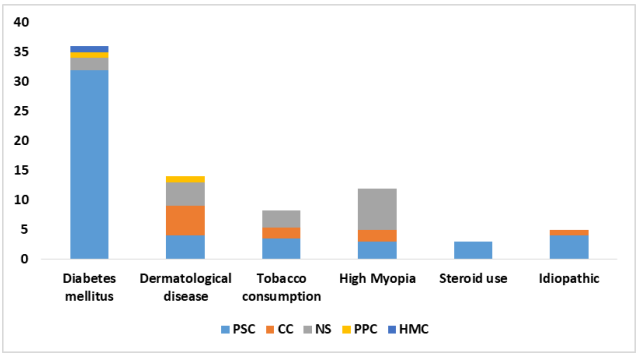
Graph 1: Gender wise distribution



Graph 2:



Graph 3:



Graph 4: Associationof risk factors and type of cataract (*PSC- Posterior subcapsular cataract, CC- Cortical cataract, NS- nuclear sclerosis, PPC- Posterior polar cataract, HMC- Hypermature cataract)

Table 2:

Post op BCVA	No of patients	Percentage
6/6	45	50
6/9	34	37.8
6/12	6	6.7
6/18	5	5.6

4. Discussion

Presenile cataract is emerging as one of the most common cause of visual impairment in the working population. In our study most of the patients belongs to age group of 45-50 years which was similar to study conducted by Verma S et al.[10]

There was increased prevalence of early onset cataract in females as compared to males in our study which was in accordance to other studies conducted by L Daniel et al and Das DK et al.[11,12]

Many risk factors were attributed to the development of cataract at any early age group. According to study conducted by Jyothi et al and Danya V S et al diabetes mellitus was the most common risk factor for presenile cataract similar to our study where we found Diabetes mellitus as a strongest risk factor for presenile cataract. This was because of accumulation of sorbitol within the lens that alters its metabolism leading to cataract formation.[7,13]

After diabetes in our study tobacco consumption was associated with pre senile cataract similar to study conducted by Wu R et al.[14] The human cataractous lens shows almost 50% deterioration in calcium- ATPase activity resulting in intra lenticular calcium deficiency as compared to normal lens. It may be correlated to a study on animal model which demonstrated cataract ogenesis as a result of disrupted ocular calcium homeostasis due to cyanide exposure from tobacco.[15] Among the modifiable environmental factors tobacco consumption has been proved to be responsible for cataract. Dermatological

disorders are the next common risk factor seen in our study. Exact mechanism of cataract formation is not known. However it has been observed through various studies the association of dermatological condition like atopic dermatitis, scleroderma with cataract.[16] Probable explanation for this can be vigorous rubbing of eyes in pruritic condition and also due to increased protein flare up in aqueous humor in patients with atopic dermatitis.[17,18] Myopia is one of the risk factor for early onset cataract. Endoplasmic reticulum stress and unfolded protein response on the lens epithelium results in an early onset of cataract in high myopia. With increase in screen time prevalence of myopia as well as the occurrence of cataract is on rise.

Use of long term steroids for various ocular or non ocular conditions by topical or systemic route can result in cataract formation. This is because the steroids bind to lens proteins causing alteration in the protein structure which further lead to cataract.[19] Posterior subcapsular cataract is the most common type of cataract seen in our study which was similar to study done by Danya et al.[13] Posterior subcapsular cataract in early age group develops due to oxidative stress and ion pump disruption that occurs due to various risk factors like diabetes mellitus, tobacco consumption etc. that alter the lens metabolism and result in abnormal migration and proliferation of lens epithelial cells into posterior pole.[20]

Nearly 90% of the patients had a best corrected visual acuity of 6/6-6/9 after phacoemulsification and IOL implantation surgery. Low vision in few patients with diabetes mellitus and high myopia was due to retinal changes associated with the disease.

5. Conclusion

In our study, strongest risk factors for cataract ogenesis in presenile age group are diabetes mellitus, tobacco consumption, dermatological diseases. There has been increased prevalence of posterior subcapsular cataract among all the risk factors. It was observed from our study that there was early postoperative recovery and less surgically induced astigmatism owing to better postoperative vision acuity with phacoemulsification and IOL implantation. This has also helped patients to revert back to their routine work at the earliest which improved the economical productivity making phacoemulsification the best choice of surgery in presenile cataract patients. One of the limitation of this study is a smaller study group which was mainly due to the unwillingness of patients to undergo phacoemulsification due to their poor economical status.

6. Source of Funding

None.

7. Conflict of Interest

None.

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