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Risk factors for presenile cataract

Rashmi G[1], **Yamini K**[1]*

[1] *Dept. of Ophthalmology, Sri Devaraj Urs Medical College, Kolar, Karnataka, India*

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ABSTRACT

Aim: To assess the risk factors causing presenile cataract.

Materials and Methods: This was a cross sectional study comprised of 80 patients in a tertiary care centre in kolar district, who underwent comprehensive eye examination with detailed history including systemic diseases and usage of medication. Complete ophthalmological examination included best corrected visual acuity using Snellens visual acuity chart, anterior segment evaluation with slit-lamp biomicroscopy and intraocular pressure measurement using non-contact tonometer. After pupillary dilatation with topical phenylephrine-tropicamide eye drops, cataract was graded with slit lamp examination and posterior segment evaluation was performed using Indirect ophthalmoscopy.

Results: The study consisted of 80 patients of which 53 were females (66%) and 27 males (34%). Out of 80 patients, 10 (13%) patients had history of tobacco consumption, 6 (8%) had history of ocular trauma, 39 (49%) patients were field workers, 9 (11.3%) patients had used corticosteroids for long duration. 5 (6.3%) patients were diabetic, 2 (2.5%) were known hypertensive, 1 (1.3%) patient was high myopic and 1 (1.3%) had bronchial asthma.3 (3.8%) patients were diagnosed with dermatological diseases and were on treatment.

Conclusion: Presenile cataract is most commonly associated with exposure to UV light, steroids usage and consumption of tobacco.So, Personal lifestyle changes such as quitting smoking and avoiding radiation exposure will aid in delaying or preventing the early onset of cataract and thereby preventing blindness.

1. Introduction

Cataract is leading cause of blindness worldwide, with higher frequency in developing nations such as in India.[1,2] Presenile cataract is defined as opacification of lens before the age of 50 years.[3]

Recent epidemiological studies have indicated a rising incidence of presenile cataract, prompting investigations in to its potential associations with genetic predisposition, life style choices and various environmental factors leading to development of presenile cataract. Understanding the changing prevalence and demographics of this condition is crucial for planning effective public health strategies and patient management.

Population in India has been widely exposed to risk factors i.e., environmental as well as a genetic propensity to cataract development. Family history, refractive defects, metabolic disorders, long-term corticosteroid usage, and atopy are all risk factors for presenile cataract.[1,2,4,5]

Smoking, alcohol consumption, and exposure to ultra violet ß (UV B) and X-rays all contribute to cataractogenesis.[1,2,4]

The various modifiable risk factors for development of cataract are exposure to UV and X rays, alcohol consumption, hypertension, diabetes, body mass index, drug usage, severe dehydration crisis, smoking and

* *Corresponding author*.
E-mail address: yamini560@gmail.com (Yamini K).

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socioeconomic status.[1,2,4]

Addressing the preventable risk factors of cataract can help ophthalmologists to increase awareness among young patients about the modifiable lifestyle practices to decrease the pre-existing burden of senile cataract in the community and thereby reducing the visual morbidity.[2]

Multiple studies have been performed to identify the risk factors associated with the development of pre senile cataract however the precise contributory factors for the occurrence of such a disease still remain eluded. This study aims to assess the various risk factors associated with the development of presenile cataract.

2. Materials and Methods

This cross-sectional study has been conducted on 80 patients in tertiary care hospital from May 2021- December 2022. Patients of age less than 50 years diagnosed with cataract were included in the study and patients with senile cataract were excluded. Institutional ethical clearance was obtained prior to starting of study and informed consent was taken from all the participants in the study.

All patients underwent comprehensive eye examination with detailed history regarding their complaints, including occupation, smoking, use of smokeless tobacco, systemic diseases like Diabetes mellitus, hypertension, bronchial asthma, dermatological diseases, long-term use of corticosteroids and ocular trauma. Complete ophthalmological examination including best corrected visual acuity using Snellens visual acuity chart, anterior segment evaluation was done with slit-lamp biomicroscopy and the intraocular pressure was measured using non-contact tonometer. After pupillary dilatation with topical phenylephrine-tropicamide eye drops, cataract was graded with slit lamp examination and posterior segment evaluation was performed using Indirect ophthalmoscopy.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Chi-square test or Fischer's exact test was used as test of significance for qualitative data.

P value (Probability that the result is true) of <0 05 was considered as statistically significant.

3. Results

The study included total of 80 patients of which 53 were females (66%) and 27 males (34%). Of these 50 patients (62.5%) were in the age group of 41-50 years, 21 patients (26.25%) between 31-40 years, 8 patients (10%) in 21-30 years and 1 patient (1.25%) less than 20 years of age.

Out of 80 patients, 10 (13%) patients had history of tobacco consumption, 6 (8%) had history of ocular trauma, 39 (49%) patients were field workers, 9 (11.3%) patients had used corticosteroids for long duration. 5 (6.3%) patients were diabetic, 2 (2.5%) were known hypertensive, 1 (1.3%) patient was high myopic and 1 (1.3%) had bronchial asthma. 3 (3.8%) patients were diagnosed with dermatological diseases and were on treatment.(Table 1)

4. Discussion

In India, 17.6 million cases worldwide contribute to cataract of which 9-12 million are bilaterally blind.[1]

Every year, 2 million cases were added as case of blindness in India where as due to cataract 4 million people become blind.[6,7]

As cataract formation is multifactorial, greater exposure to risk factors such as ultraviolet light, poor diet, tobacco usage explains the development of cataract at a younger age.[4,8]

The onset of cataract causes progressive loss of eyesight, making daily labour increasingly difficult, particularly in the young people earning a living for their families. If left untreated, it may eventually imperil their jobs, lowering the patients' and their families' quality of life. As a result, understanding modifiable risk factors is critical from public point of view. A greater understanding of its causes can undoubtedly have a significant impact on its care, as eliminating causes is the primary route to eradicating any disease.[4]

This study has a higher female preponderance with 66.3%, which corresponds with a study done in south India by Vasudevan et al. Also, the majority of females in this study worked in agriculture, i.e., as field workers (48.8%), and exposure to sunlight was more in females than males. Small amount of the high-energy UVRays B 300 nm travelling through the cornea is absorbed by the lens epithelium, making lens substance principal target for injury leading to development of lens opacification.[9,10]

Prolonged exposure to infrared radiation can cause posterior subcapsular opacities and exfoliation on anterior capsule(Exfoliation syndrome) seen in glass workers. Irradiation cataract can be induced by X-rays, gamma rays, neutrons, or microwave radiation. Cataract formation often has a latent phase that lasts 6 months to a few years. Technicians who are not fully shielded, patients being treated for malignant tumours, and atomic energy plant personnel are at danger of developing cataract.[11]

In our study, 11.3% of patients had used corticosteroids for the treatment of bronchial asthma and dermatological conditions like tinea corporis. Steroids, such as prednisone, alter the lens's normal metabolism of connective tissue. Even low-concentration steroid creams applied to the eyelids might result in increased intraocular pressure and cataract formation. The aetiology of corticosteroid-induced cataract is uncertain; however, osmotic imbalance, oxidative damage, or altered lens development factors could all be contributors.[12]

Table 1: Combined frequency distribution of all risk factors

Risk factors		Female		Male		P value
		N	%	N	%	
Tobacco consumption	No	47	88.7%	23	85.2%	0.726
	Yes	6	11.3%	4	14.8%	
Trauma	No	49	92.5%	25	92.6%	1.00
	Yes	4	7.5%	2	7.4%	
High myopia	Yes	0	.0%	1	3.7%	0.337
	No	53	100.0%	26	96.3%	
Diabetes Mellitus	No	51	96.2%	24	88.9%	0.329
	Yes	2	3.8%	3	11.1%	
Hypertension	No	53	100.0%	25	92.6%	0.111
	Yes	0	.0%	2	7.4%	
Bronchial asthma	Yes	1	1.9%	0	.0%	1.00
	No	52	98.1%	27	100.0%	
Field worker	No	24	45.3%	17	63.0%	0.161
	Yes	29	54.7%	10	37.0%	
Long term corticosteroid usage topical/systemic/ inhalational	No	48	90.6%	23	85.2%	0.477
	Yes	5	9.4%	4	14.8%	
Dermatological diseases	No	51	96.2%	26	96.3%	1.00
	Yes	2	3.8%	1	3.7%	

Other risk factors discovered in our study include tobacco intake (12.5%), which contains cyanide, which leads to early cataract formation, as mentioned by Renyi Wu et al.[13] Harmful components of tobacco, such as nicotine, free radicals and other toxic substances exert various detrimental effects on ocular tissues, particularly the lens. Oxidative stress is caused by the release of reactive oxygen species (ROS). Oxidative damage affects lens proteins, lipids, and DNA leading to structural changes and reduced transparency leading to cataract formation.[14]

Tobacco consumption triggers chronic inflammation in the body, releasing inflammatory mediators and cytokines that affect lens epithelial cells and leads to breakdown of lens fibres, accelerating cataract formation. It also causes disruption in metabolic processes in lens that affects the proper osmotic balance, nutrient exchange compromising lens transparency and accumulation of damaged proteins. It also alters DNA, and causes mutations in lens epithelial cells and is responsible for progression of cataract. Microvascular changes are noted with tobacco consumption leading to reduced blood flow to lens epithelium, exacerbates oxidative stress fastening the formation and progression of cataract.[15]

Trauma was also observed as the cause of cataract development in 6 (7.5%) patients in this study. Gupta et al., states that traumatic cataract is usually formed after penetrating or blunt trauma to the eye leading to discontinuation of the lens capsule and denaturation of lens proteins causing impaired light transmission and cataract formation.[4]

Trauma disrupts the network of blood vessels that supply nutrients and oxygen to lens leading to fibre degeneration and formation of cataract. Also triggers inflammatory response and cytokine release that promotes cellular damage and apoptosis of lens cells leading to opacification. Severe trauma that causes rupture of lens capsule, releases lens proteins in to aqueous humor, that settle on anterior surface of lens triggering immune response and aggregation of lens proteins and cataract formation. It also disrupts fluid and ionic balance in the lens altering the spacing between lens fibers and aggregation of lens proteins.[16]

In our study, 6.3% of the patients had diabetes mellitus. Ischemia-induced hypoglycemia leads to death of lens epithelial cell (LEC) by apoptosis which will lead to development of cataract.[17] Diabetes mellitus is connected to the development of numerous systemic and ocular problems, including vision loss.[18,19] Uncontrolled diabetes causes hyperglycemia, which is linked to nonenzymatic protein glycation, osmotic stress, and oxidative stress in ocular tissues.

Insulin therapy, rigorous blood glucose management, exercise, anorexia, and ischemia induced hypoglycemia all result in unfolded protein response (UPR), lens epithelial cell (LEC) death via activation of particular death pathways, and apoptosis.[20]

In our study, 3.8% of the patients were on long term treatment for tinea corporis. Syndromatotic cataracts are lens opacities caused by cutaneous illnesses that arise at an early age and are bilateral.[11] The most prevalent disorder related with atopic dermatitis (AD) is atopic cataract, particularly in youngsters.[21] Patients with atopic dermatitis have increased levels of protein flare in their aqueous humour. The mechanism is unknown; however, in pruritic situations, habitual tapping and rubbing of the cheeks may play a role.[22]Poikiloderma, vascular atrophicus, scleroderma, and keratotis follicularis are all skin conditions related with cataract.

Thus, many more studies need to be performed globally to assess the epidemiological, environmental and genetic factors associated with pre senile cataractogenesis.

5. Conclusion

1. Presenile cataract is most commonly associated with exposure to UV light, steroids usage and consumption of tobacco.
2. So, lifestyle modifications at personal level such as refraining from use of tobacco, exposure to radiation will help in delaying or preventing the early onset of cataract and thereby preventing blindness.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Author's biography

Rashmi G, Professor https://orcid.org/0000-0002-4991-4028

Yamini K, Final Year Junior Resident https://orcid.org/0009-0007-6686-9955

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