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Original Research Article

Cataract in Young Patients - A Study of Socioeconomic and Occupational Risk Factors

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Abstract:

Background: Cataract in young adults is a significant public health issue in developing countries, contributing to visual disability during the most productive years of life. This condition is particularly prevalent among those from lower socioeconomic strata who are occupationally exposed to risk factors such as ultraviolet radiation and extreme heat, including industry workers and farmers. Early identification and intervention are critical to prevent lifelong visual impairment and associated social and economic burdens.

Methods: This retrospective, comparative study was conducted at Terna Medical College and Terna Speciality Hospital and Research Centre, Navi Mumbai, over a period of five years (2013-2017). 237 cataract cases in patients between the ages of 20 and 49 were examined. Data included occupational exposure to heat and UV light, socioeconomic background, cataract severity, and associated ocular comorbidities. Patients with hereditary, traumatic, or drug-induced cataracts were excluded. Detailed ophthalmic evaluations including slit lamp and fundus examinations were performed.

Results: Out of 237 patients, 120 (50.6%) were female and 117 (49.4%) were male. Cataracts were significantly associated with occupations involving exposure to heat and UV radiation ($p < 0.001$), particularly among industry workers and farmers. Unilateral cataracts were more common, with the right eye being affected in 60.75% of cases. Most patients underwent SICS with PCIOL (220 cases). Postoperative visual outcomes were favorable in the majority, with 131 (55.3%) achieving visual acuity between 6/12 and 6/6. Visual improvement was limited in 15 patients due to pre-existing ocular comorbidities.

Conclusion: The study highlights a high prevalence of cataracts in young individuals with occupational exposure to heat and ultraviolet radiation, particularly among those from lower socioeconomic backgrounds. Strengthening awareness, occupational eye protection, and early screening strategies are essential to reduce the burden of cataract-related visual disability in this vulnerable population.

Keywords: Cataract, Visual Disability, Ultraviolet Light, Heat Exposure, Occupation, Socioeconomic Status, Young Adults.

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Introduction

Cataract, a leading cause of avoidable blindness, poses a significant public health concern in developing countries, especially when it affects individuals during their youth and prime working years. While commonly associated with aging, cataracts in young patients are increasingly recognized, particularly among populations with low socioeconomic status. In these groups, limited access to timely healthcare, lack of awareness, and economic constraints often delay diagnosis and treatment. As a result, many young individuals continue to live with visual impairment, which not only impacts their quality of life but also hinders their ability to work and earn a livelihood. Over

time, untreated cataracts may progress to advanced stages, becoming non-operable and resulting in irreversible blindness, further compounding social and economic hardships.

A notable risk factor identified in early-onset cataract is occupational exposure. Individuals working in environments with intense heat-such as furnace workers in industries-or prolonged exposure to ultraviolet radiation-such as farmers and field laborers-are particularly vulnerable to the development of cataracts at a younger age. [1–2] These occupational hazards, combined with poor protective measures and inadequate healthcare access, contribute to the early manifestation and progression of the disease. Despite cataracts being preventable, treatable, and often curable through surgical intervention, these young patients are frequently unable to seek timely treatment due to financial dependency on their impaired vision for work.

This study aims to analyse the correlation between cataracts in young patients and their occupational and socioeconomic backgrounds, emphasizing the need for targeted preventive and interventional strategies.

Aims and Objectives: This study aims to investigate the incidence of cataract in young patients aged 20 to 49 years, focusing on the influence of socioeconomic conditions and occupational exposures. The study seeks to explore how factors such as unprotected UV (Ultra-Violet) radiation, sun exposure, certain medications, and nutritional deficiencies contribute to early cataract development. By identifying the socioeconomic and occupational risks associated with early-onset cataracts, the study intends to emphasize the importance of early detection and timely treatment to prevent lifelong visual impairment. Furthermore, the research aims to highlight the significant economic and social burden of preventable blindness, underscoring the need for targeted interventions to reduce cataract-related disability in this vulnerable age group.

Materials and Methods

Study Design: This retrospective**,** comparative analysis was conducted for a period of five years, from 2013 to 2017 at Terna Medical College and Terna Speciality Hospital and Research Centre. A total of 237 cases of young patients aged between 20 and 49 years with cataracts were analyzed in relation to their occupation, exposure to hot climates and UV light, socioeconomic status, and environmental factors.

Inclusion and Exclusion Criteria: The study included patients aged 20 to 49 years diagnosed with cataracts between 2013 and 2017, with a focus on their occupation, exposure to hot climates and ultraviolet light, and socioeconomic conditions. Only those with cataract development due to environmental and occupational factors, rather than hereditary or developmental causes, were included. Patients with conditions such as diabetes or those on medications like corticosteroids or phenothiazine-related drugs that predispose to cataract formation were excluded. Additionally, individuals with a history of trauma, smoking, or any pre-existing retinal pathologies (e.g., diabetic retinopathy, macular degeneration) were also excluded to avoid confounding variables.

Data Collection Procedure

Study Design: This retrospective**,** comparative analysis was conducted for a period of five years, from 2013 to 2017. A total of 237 cases of young patients aged between 20 and 49 years with cataracts were analyzed in relation to their occupation, exposure to hot climates and UV light, socioeconomic status, and environmental factors. The study aimed to establish the presence and severity of visual disability, the degree of symptoms, and the impact of cataract on the daily functioning of the patients. Comprehensive ocular examinations, including slit-lamp and fundus examinations, were performed to evaluate the type and density of cataracts and to rule out any retinal pathologies. Visual disability was assessed in terms of the patient's ability to achieve desired visual acuity with corrective lenses and under glare conditions.

Inclusion Criteria: The study included all patients between the ages of 20 and 49 years who were diagnosed with cataract during the study period (2013-2017). These patients were selected based on their occupation, exposure to environmental factors such as hot climates and UV radiation, and socioeconomic conditions. Patients with varying degrees of cataract severity were included for evaluation, and visual disability was assessed to determine the impact on the patients' daily activities and work. All participants underwent slit-lamp examination to classify the cataract type and density, with follow-up fundus examination to rule out any retinal pathologies. Visual acuity was measured with refraction, and the improvement with glasses was noted. Additionally, glare scores were recorded to assess the effect of glare on visual performance.

Exclusion Criteria: Participants having a history of trauma, diabetes, smoking, or genetic or developmental cataracts were excluded from the study. Individuals on medications known to predispose to cataract formation, such as corticosteroids or phenothiazine-related drugs, were also excluded. Moreover, patients with any pre-existing retinal pathologies, such as diabetic retinopathy or macular degeneration, were excluded as they could confound the results related to cataract severity and visual disability. These exclusions were

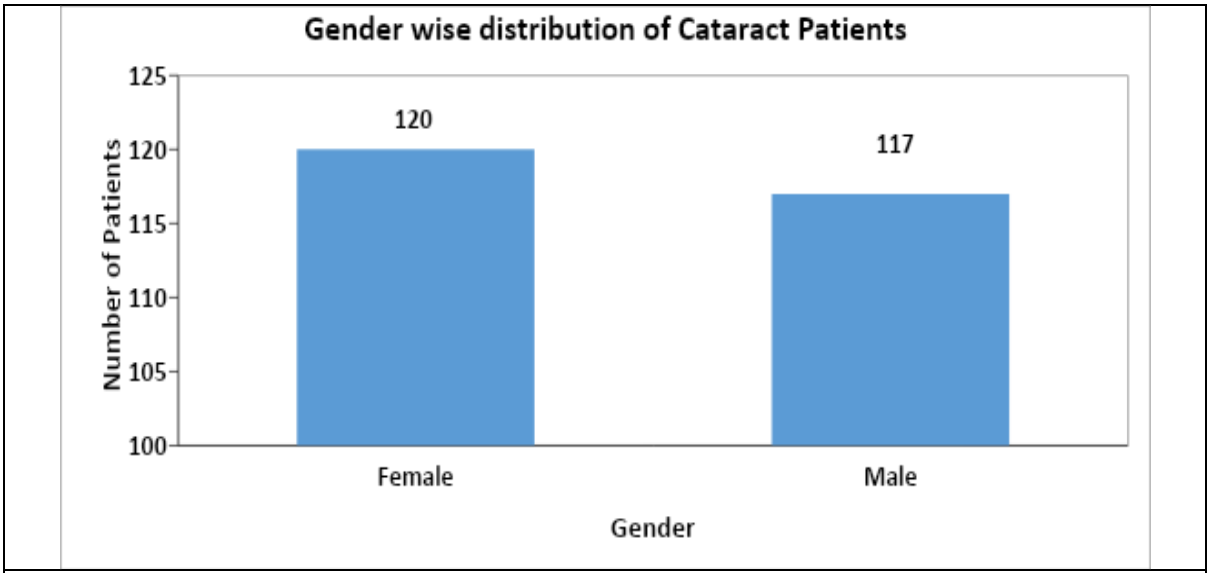
made to ensure that the study focused solely on cataract cases that were potentially linked to occupational, environmental, or socioeconomic factors, rather than other systemic conditions.

Data Collection Procedure: Data collection for this study was retrospective, with data gathered from hospital records and clinical files of patients who were diagnosed with cataracts between 2013 and 2017. Information related to the patient's occupation, exposure to hot climates or UV light, socioeconomic status, and environmental factors was extracted from their medical history. A detailed ocular examination was conducted for each patient, including a slit-lamp examination to assess cataract type and density before and after mydriatic pupil dilatation. Fundus examinations were carried out to rule out any retinal conditions, and visual acuity tests were performed to determine the presence and severity of visual disability. The data on glare scores, refraction, and improvement with corrective glasses were collected to assess the visual potential of each patient. The impact of glare on visual performance was measured by noting the number of lines lost on the visual acuity chart under glare conditions. This comprehensive data collection process allowed for a thorough analysis of the cataract cases in relation to occupational and socioeconomic factors, as well as the degree of visual impairment in the affected individuals.

Results

Table 1: Gender Wise Distribution of Cataract Patients

Gender	No. of Patients	Percentage
Female	120	50.6
Male	117	49.4
Total	237	100.0

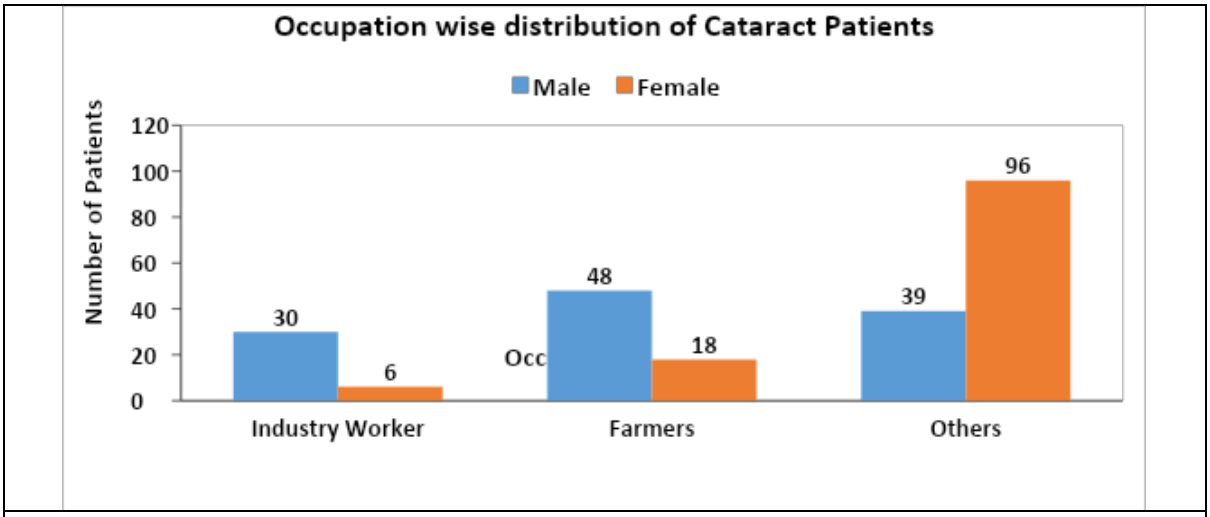


Graph 1: Gender Wise Distribution of Cataract Patients

Table 1 shows the gender-wise distribution of cataract patients, revealing a nearly equal proportion of males (49.4%) and females (50.6%) among the total 237 patients.

Table 2: Occupation Wise Distribution of Cataract Patients

Occupation	Male	Female	Total	Chi square test	P-value	Significant at 5% level
Industry Worker	30	6	36	53.674*	<0.001	Yes
Farmers	48	18	66			
Others	39	96	135			
Total	117	120	237			

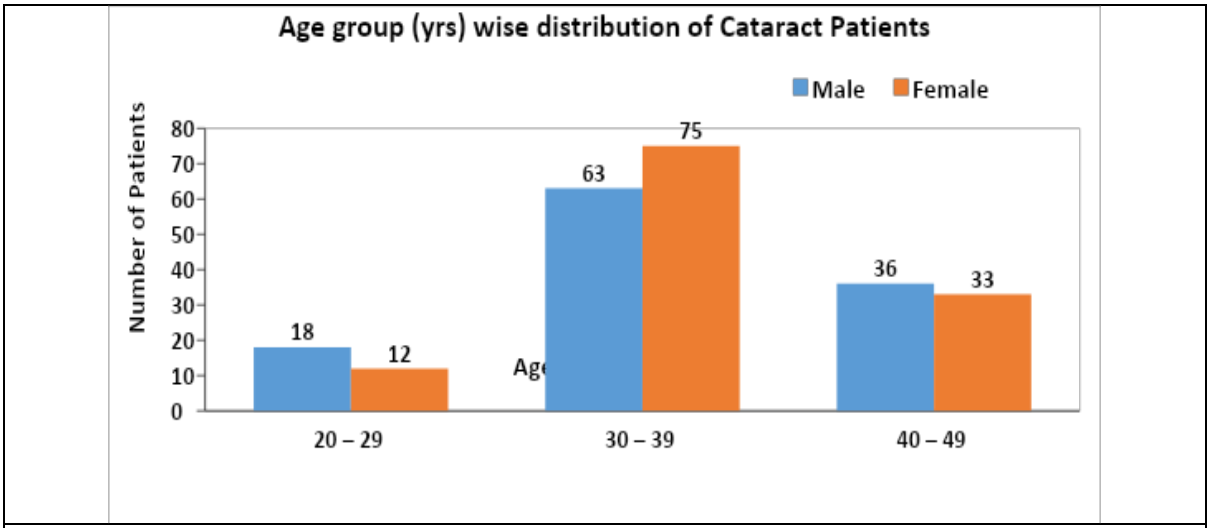


Graph 2: Occupation Wise Distribution of Cataract Patients

Table 2 observes the occupation-wise distribution of cataract patients, with a significantly higher number of industry workers (36) affected by cataracts, particularly among males, as indicated by the chi-square test (P<0.001).

Table 3: Age Group Wise Distribution of Cataract Patients

Age Group	Male	Female	Total	Chi Square Test	P-value	Significant at 5% Level
20 – 29	18	12	30	2.336	0.311	No
30 – 39	63	75	138			
40 – 49	36	33	69			
Total	117	120	237			

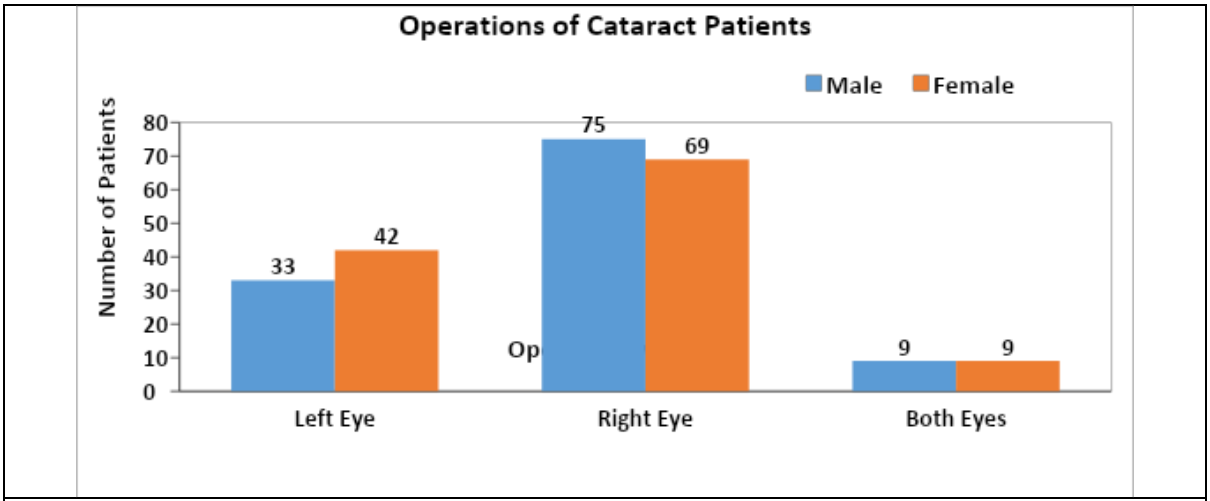


Graph 3: Age Group Wise Distribution of Cataract Patients

Table 3 presents the age group-wise distribution of cataract patients, showing a majority of patients in the 30–39 age group (138), with no statistically significant difference between male and female patients (P = 0.311).

Table 4: Operations of Cataract Patients

Operation	Male	Female	Total	Chi Square Test	P-Value	Significant at 5% Level
Left Eye	33	42	75	1.292	0.524	No
Right Eye	75	69	144			
Both Eyes	9	9	18			
Total	117	120	237			

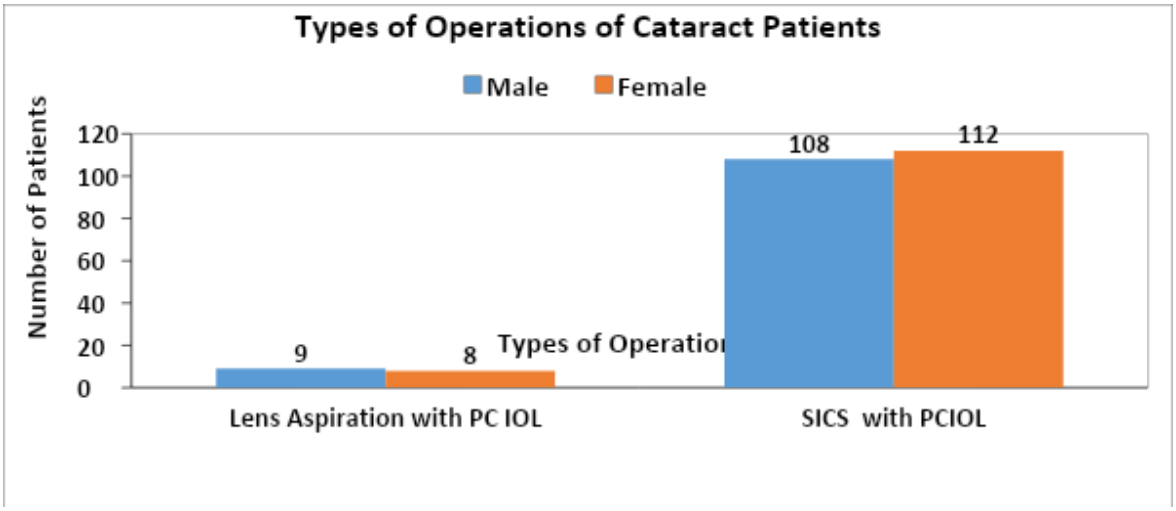


Graph 4: Operations of Cataract Patients

Table 4 outlines the distribution of cataract surgeries by eye, with the right eye being more commonly operated on (144 cases), and no significant gender difference in the surgical distribution (P = 0.524).

Table 5: Types of Operations of Cataract Patients

Types of Operations	Male	Female	Total	Chi Square Test	P-Value	Significant at 5% Level
Lens Aspiration with PC IOL	9	8	17	0.094	0.760	No
SICS with PCIOL	108	112	220			
Total	117	120	237			

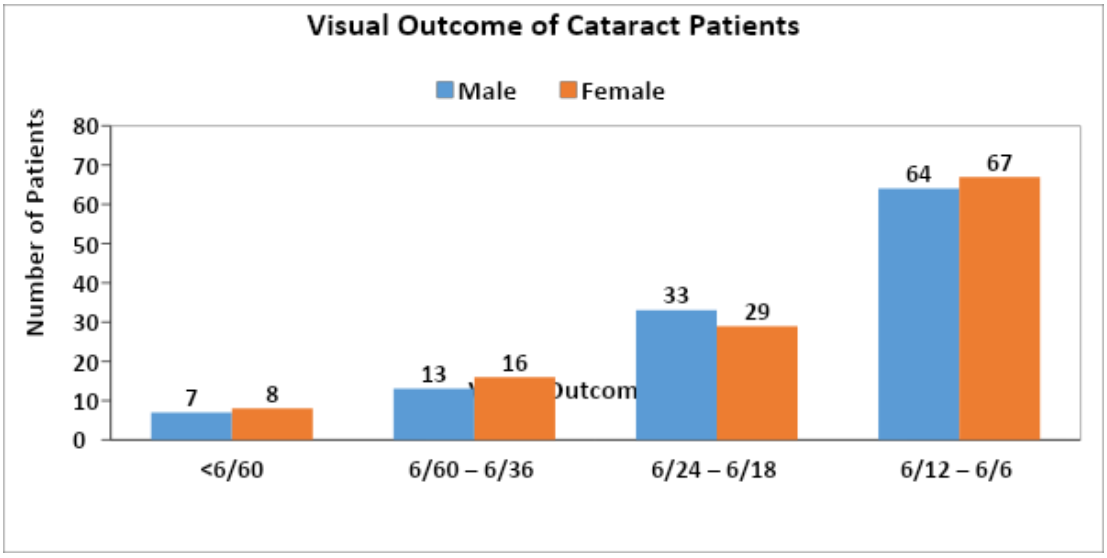


Graph 5: Types of Operations of Cataract Patients

Table 5 depicts the types of cataract surgeries performed, with the majority of patients undergoing SICS with PCIOL (220), and no significant difference in surgery type between genders (P = 0.760).

Table 6: Visual Outcome of Cataract Patients

Visual Outcome	Male	Female	Total	Chi square test	P-Value	Significant at 5% Level
<6/60	7	8	15	0.666	0.881	No
6/60 – 6/36	13	16	29			
6/24 – 6/18	33	29	62			
6/12 – 6/6	64	67	131			
Total	117	120	237			



Graph 6: Visual Outcome of Cataract Patients

Table 6 shows the visual outcomes of cataract patients' post-surgery, with a majority achieving visual acuity of 6/12 or better and no significant gender difference in the visual outcomes (P = 0.881).

Discussion

Several studies from India and abroad have emphasized the role of environmental factors such as high temperature and UV radiation in the pathogenesis of cataracts, particularly in populations exposed through their occupations. These exposures are more prevalent among individuals from low socioeconomic backgrounds, where employment in agriculture, construction, or industrial sectors involves extended periods in harsh sunlight or heat, and healthcare access is limited. In such contexts, vision loss due to cataracts can have a profound impact, not only on quality of life but also on the ability to work and sustain livelihoods.

The present study showed a statistically significant relationship between occupational exposure and early cataract formation, with a chi-square value of 53.674 and a p-value of <0.001. Occupations involving heat exposure-such as industry workers operating near furnaces-and field workers, including farmers, showed higher prevalence of cataracts. This aligns with findings from other studies that have demonstrated an increased risk of young-age cataract among those using traditional cooking fuels or working in hot environments. [3-5] Female patients (50.6%) slightly outnumbered males, but the male subgroup was predominant in industrial roles (49.4%). Many female patients were employed as cooks in canteens and hostel kitchens, working over high-flame burners, thereby contributing to heat-related ocular stress.

With respect to laterality, 60.75% of the patients had right eye cataracts, 31.64% had left eye involvement, and only 7.59% presented with bilateral cataracts. This asymmetry may be due to occupational habits or sun exposure patterns. Furthermore, patients with unilateral cataracts and preserved vision in the contralateral eye may postpone clinical consultation, allowing for progression and potential complications. Delayed intervention due to the functional adequacy of one eye is a commonly observed trend that limits timely surgical care.

As noted in earlier population-based studies, such as the Framingham Eye Study, the prevalence of cataract in India is significantly higher-up to six times-than in Western countries. [6-7] This may be attributed to a combination of genetic predisposition and higher exposure to UV radiation, compounded by childhood illnesses like recurrent diarrheal diseases that result in dehydration and common nutritional deficiencies in essential antioxidants.

The study population was predominantly from lower middle class and below-poverty-line households, reflecting the vulnerability of these groups to preventable visual impairment. Fifteen patients in our series did not achieve satisfactory visual improvement postoperatively due to coexisting ocular conditions such as macular degeneration, retinal pigmentary changes, and postoperative macular edema.

Cataracts tend to occur earlier and more frequently in populations residing in developing countries due to chronic UV exposure and limited access to protective measures. However, establishing a direct causal link remains difficult, and there is still ongoing debate among experts regarding the exact mechanism and influence of environmental triggers. [8-10] Nevertheless, lack of essential nutrients during formative years, especially in resource-poor settings, may contribute significantly to early lens opacification.

Strengthening early detection strategies, occupational safety measures (such as the use of UV-protective eyewear), and community-based awareness programs are imperative. Factory and field workers, as well as rural populations, should be the primary targets for cataract screening initiatives. Given the low awareness and disease recognition in these groups, integrating cataract education into routine public health campaigns could substantially reduce the burden of avoidable blindness.

This five-year retrospective study sheds light on the specific characteristics of young patients with cataracts and underlines the importance of proactive clinical and public health strategies in addressing this neglected issue.

Conclusion

This five-year study highlights a significant association between early-onset cataract and occupational exposure to heat and ultraviolet radiation, particularly among individuals from lower socioeconomic backgrounds engaged in farming, industrial labor, or cooking-related work. With 237 young patients analyzed, the findings underscore the urgent need for improved awareness, early screening, and preventive strategies targeting high-risk groups. Addressing nutritional deficiencies, enhancing occupational eye protection, and implementing public health interventions could play a pivotal role in reducing the burden of preventable visual disability and economic hardship caused by young-age cataracts.

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