

STATISTICAL DIFFERENCE OF INCIDENCE OF HYPERMATURE CATARACT POST-COVID IN A RURAL TERTIARY CENTRE IN SOUTH INDIA

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ABSTRACT

Hypermature cataract, an advanced stage of cataract, is still an important cause of avoidable blindness especially in rural areas of India. Impact of COVID-19 on health systems worldwide included delayed cataract surgery due to cancellation of elective surgery during the pandemic phase.

To study the effect of delay in surgery from the onset of COVID 19 to the hypermature cataract cases at a rural tertiary care center in South India. This was a prospective study of 1997 patients with cataract of which 330 patients had hypermature cataract. COVID-19 was identified as the leading cause of delay, affecting **45.4%** of cases. Other factors included reliance on a functional pseudophakic eye (24.2%), lack of awareness (9.1%), absence of caretakers (6.1%), and limited knowledge about free medical camps (9.1%).

Gender analysis revealed an almost equal distribution between males (50.9%) and females (49.1%), while age-wise prevalence was highest in the **60–70 years** (36.4%) and **>70 years** (33.9%) age groups. The findings underscore the importance of raising awareness, implementing regular screening programs, and enhancing outreach initiatives to improve access to timely cataract surgeries. Proactive interventions are critical to reducing the burden of hypermature cataract and preventing irreversible blindness in underserved rural communities.

Keywords

Hypermature Cataract, COVID-19 Impact, Delayed Cataract Surgery, Rural Healthcare, Community Awareness, Gender Distribution, Age-Wise Prevalence, Preventable Blindness.

I. BACKGROUND

Cataract, which is the opacification of the natural lens of the eye, still remains the leading cause of preventable blindness across the world, particularly in countries like India. These estimates suggest that cataract is responsible for between 50-80% bilateral blindness in the country. While national strategies have achieved a salient impact and surgical methods are more successful than ever, untreated cataracts are still a reality in the countryside however. Hypermature cataract is one of the most advanced stages of cataract progression, which occurs due to delayed intervention and is known to have increased higher risk of complications in surgery leading to poor visual outcome.

COVID-19 and Its Impact on Eye Care Services

Healthcare systems across the globe experience unprecedented disruptions due to the COVID-19 pandemic, and ophthalmology services were not immune to it. Non-emergency surgeries have been postponed during the pandemic, including cataract operations, as hospitals focus on treating COVID-19 patients and reducing virus circulation. This resulted in postponement of surgical procedures, especially for cataract patients in rural regions, where healthcare access has traditionally been restricted. As a result, unoperated cataracts developed into hypermature stages, adding to the volume of visual loss in the countryside.

Challenges in Rural Areas

In rural regions, several socio-economic and logistical barriers hinder timely cataract surgery:

1. **Limited Access to Healthcare Facilities:** Rural populations often have to travel long distances to access eye care services.
2. **Lack of Awareness:** Many patients are unaware of the progression of cataract and the importance of early surgery.
3. **Dependence on Caregivers:** Elderly patients rely on family members for assistance, and the absence of caretakers delays treatment.
4. **Socioeconomic Constraints:** Financial limitations prevent patients from seeking medical care despite the availability of free or subsidized surgical programs.

Need for the Study

The pandemic further exacerbated the pre-existing challenges in cataract management, making it essential to assess its impact on the prevalence of hypermature cataracts and identify the reasons for delays in surgery. Understanding these factors is critical to formulating targeted interventions that can prevent avoidable blindness.

Objectives of the Study

1. To analyze the impact of the COVID-19 pandemic on the incidence of hypermature cataract cases in a rural tertiary center.
2. To identify the primary reasons contributing to delays in cataract surgeries among patients diagnosed with hypermature cataract.

II. LITERATURE REVIEW

Global and Indian Studies on Cataract Prevalence

Cataract is known as one of the major causes of blindness all over the world, a significant cause of vision impairments as well especially in developing countries. Cataract accounts for nearly half of the world blindness according to World Health Organization (WHO). Cataract accounts for 50-80% of bilateral blindness in India, with even higher prevalence rates (e.g., 60-80%) in different populations. National programmes like National Programme for Control of Blindness (NPCB) has helped in bringing the cataract blindness under control with systematic eye screening and free or subsidized surgery services, but most patients in rural areas face delays due to barriers like access, poverty and low awareness level.

Risks and Consequences of Hypermature Cataract

Hypermature cataract is seen when cataract is left unnoticed at its progressive phase leading to severe degeneration of lens. At this stage of maturity, there is a higher risk of complications such as phacolytic glaucoma, uveitis, and corneal damage, which then makes a surgical solution more difficult. Deferring the management of hypermature cataract will not only compromise the surgical outcome but also affect the quality of life of the patients. Early cataract surgery is important to avoid the potential irreversible blindness and reduce the risk of complications after surgery, particularly in elderly patients residing in rural areas.

Impact of COVID-19 on Healthcare Services

The COVID-19 pandemic disrupted healthcare services worldwide and has a significant effect on elective procedures such as cataract surgeries. Due to government lockdowns and shifting of resources to COVID-19 management in India, the time taken for routine surgeries was prolonged. Already overworked rural health facilities experienced further restrictions and consequent hurdles in cataract treatment. It was even reported that the lack of access to medical care for many patients during this period caused numerous cataracts to become moderately or well hypermature. This has led to increased rates of avoidable childhood blindness, especially in resource-limited settings.

Importance of Early Intervention and Awareness Programs

Early detection and intervention are critical in preventing cataract progression. Regular screenings, community outreach, and awareness campaigns can educate rural populations about the importance of timely treatment. Free medical camps and government initiatives need better implementation to ensure accessibility and reduce cataract-related blindness.

Research Gap

While studies have highlighted the impact of COVID-19 on global healthcare, there is limited research focusing on the progression of hypermature cataract in **rural South India** post-pandemic. This study aims to bridge that gap by analyzing the reasons for surgical delays and identifying actionable solutions for improving rural eye care access.

III. METHODOLOGY

The study is a **prospective observational study** conducted over a **one-year period** from January 2023 to January 2024.

- **Study Area:** The study was carried out at **PESIMSR (PES Institute of Medical Sciences and Research)**, Kuppam, Andhra Pradesh, a rural tertiary care center that caters to underserved populations.
- **Study Population:** The target population included patients diagnosed with cataract visiting the tertiary care center during the study period. Out of the total **1997 cataract cases**, **330 patients** were diagnosed with **hypermature cataract**.

- **Sampling Method: Purposive sampling** was employed to include patients with hypermature cataract who met the inclusion criteria.

Inclusion Criteria

- Patients diagnosed with hypermature cataract.
- Patients who consented to participate in the study.

Exclusion Criteria

- Patients who refused to provide consent.
- Patients with incomplete or missing data.

Data Collection: Data were collected using a **structured questionnaire** administered to patients.

The questionnaire covered:

- Demographic details (age, gender, etc.).
- Reasons for delay in surgery.
- Awareness about cataract progression and free medical camps.

Statistical Analysis: The collected data were entered into **Microsoft Excel** and analyzed using **SPSS software**. Descriptive statistics, such as percentages and frequencies, were used to present the findings in tables and graphs.

Ethical Considerations: Ethical approval was obtained before conducting the study. Written informed consent was secured from all participants, and confidentiality of patient data was maintained throughout the study.

IV. RESULTS

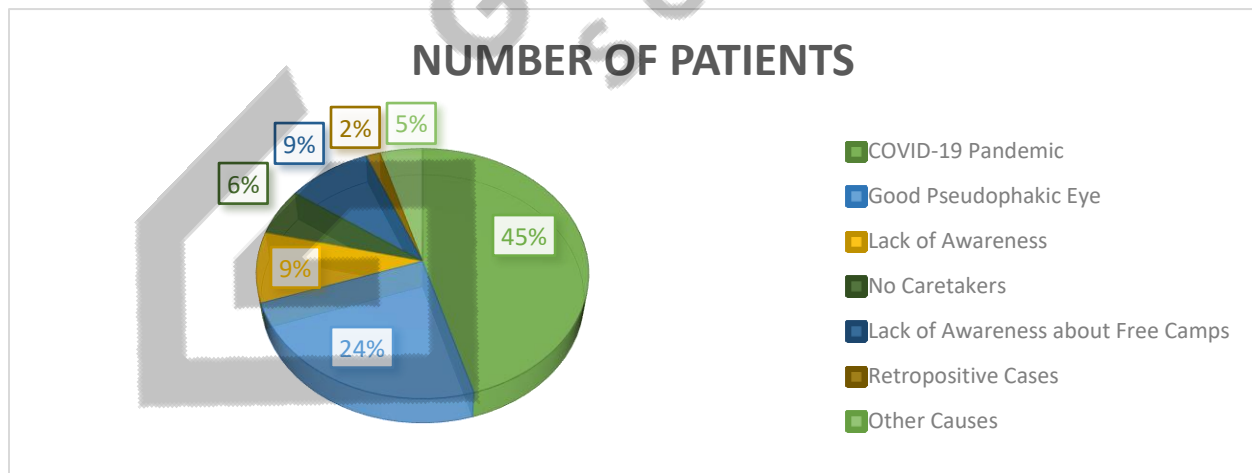
This study focuses on the statistical analysis of hypermature cataract cases and the primary reasons for delayed surgical intervention in a rural tertiary care center post-COVID. Out of a total of **1997 cataract patients**, **330 patients** were diagnosed with hypermature cataract. The findings are presented below:

1. Causes for Delay in Cataract Surgeries

The leading factors contributing to delays in cataract surgeries were analyzed. The **COVID-19 pandemic** emerged as the most significant reason, affecting nearly half of the cases. Other causes included reliance on a functional pseudophakic eye, lack of awareness, and caregiver unavailability.

Reasons for Delay	Number of Patients	Percentage (%)
COVID-19 Pandemic	150	45.4%
Good Pseudophakic Eye	80	24.2%
Lack of Awareness	30	9.1%
No Caretakers	20	6.1%
Lack of Awareness about Free Camps	30	9.1%
Retropositive Cases	5	1.5%
Other Causes	15	4.5%
Total	330	100%

Figure 1: Pie chart depicting the reasons for delayed cataract surgeries.



The **pie chart** above visually represents the data. The **COVID-19 pandemic** accounted for **45.4%** of delays, making it the primary cause. Patients relying on a **pseudophakic eye** contributed to **24.2%** of delays, highlighting complacency once vision in one eye was restored. Meanwhile, **lack of awareness** (9.1%) and caregiver unavailability (6.1%) reflected key socio-economic challenges.

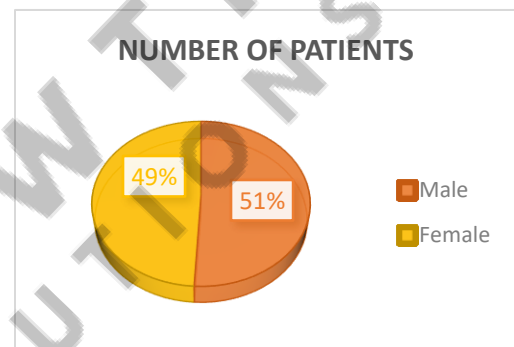
2. Gender Distribution

Gender analysis showed near parity in the incidence of hypermature cataract cases.

Gender	Number of Patients	Percentage (%)
Male	168	50.9%
Female	162	49.1%
Total	330	100%

Figure 2: Pie chart representing gender-wise distribution of hypermature cataract cases.

The findings indicate that males accounted for **50.9%** of cases, while females comprised **49.1%**, showing an almost equal disease burden. This demonstrates that hypermature cataract affects both genders equally, though societal factors may still influence treatment delays, particularly for women in rural settings.

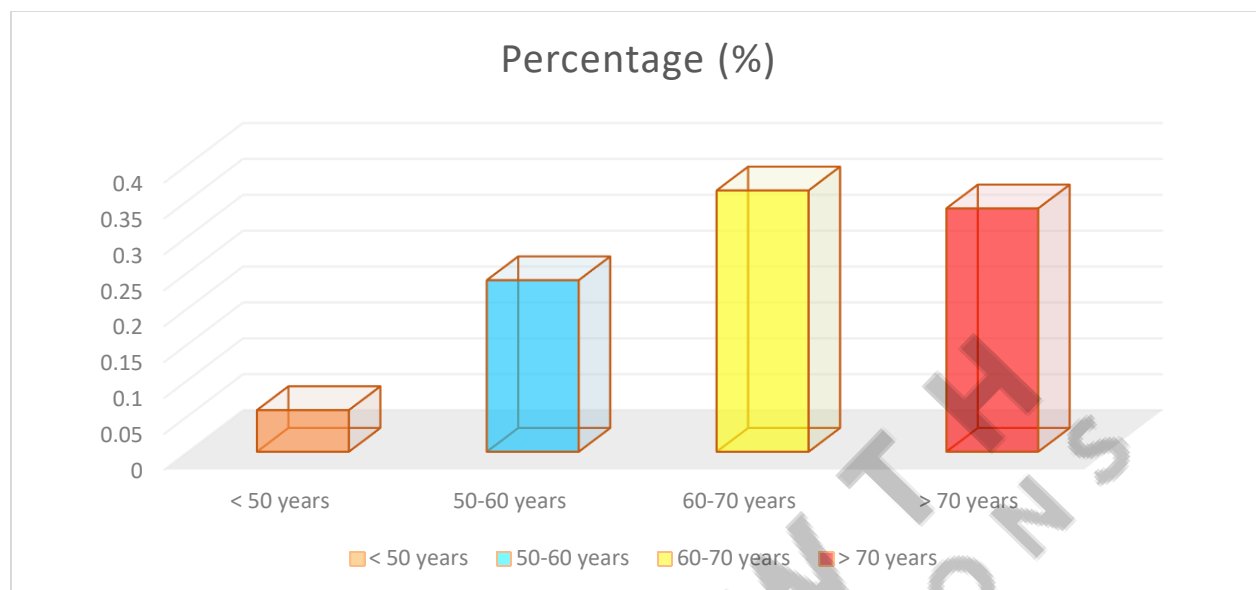


3. Age-Wise Prevalence of Hypermature Cataract

The prevalence of hypermature cataract was higher in older age groups, particularly individuals above 60 years.

Age Group	Number of Patients	Percentage (%)
< 50 years	19	5.8%
50-60 years	79	23.9%
60-70 years	120	36.4%
> 70 years	112	33.9%
Total	330	100%

Figure 3: Bar graph showing the age-wise prevalence of hypermature cataract.



The results revealed that the highest prevalence of hypermature cataract was in the **60–70 years** age group (**36.4%**), followed closely by those aged **>70 years** (**33.9%**). Younger age groups had a relatively lower incidence, with only **5.8%** of cases observed in patients below 50 years. This emphasizes the need for targeted interventions in elderly populations to ensure timely diagnosis and treatment.

Summary of Key Findings

1. **COVID-19** was the leading cause of delays, affecting **45.4%** of cases.
2. **Functional pseudophakic eye** contributed to delays in **24.2%** of cases.
3. Lack of awareness and caregiver availability together accounted for **15.2%** of delays.
4. Gender distribution showed near parity, with males (**50.9%**) and females (**49.1%**) equally affected.
5. The highest age-wise prevalence was seen in patients aged **60–70 years** (36.4%) and those **>70 years** (33.9%).

The findings of this study highlight critical challenges faced by rural populations, particularly during the pandemic, and underscore the importance of early intervention, targeted awareness programs, and improved access to eye care services.

V. DISCUSSION

Impact of COVID-19 on Delayed Cataract Surgeries

The COVID-19 pandemic affected healthcare systems worldwide, but ophthalmology was more greatly impacted due to the limited availability of elective surgeries like cataract surgeries. Of these delays, 45.4% were directly attributable to the pandemic in this study. The lockdowns, the travel bans, and the fear of virus exposure stymied patients from receiving timely medical attention. In addition, rural healthcare facilities became overcrowded, causing long waiting times for the provision of non-urgent treatment (for instance, cataract surgery). This caused backlog of cataracts that if untreated, advanced to hypermature cataracts with increased surgical risk and poorer surgical outcome.

Role of Pseudophakic Eye in Delays

Results: Overall, 24.2% of patients delayed their surgery because they depended on good pseudophakic eye. Patients are often complacent they experience functional vision in one eye after surgery, and that makes them less motivated to treat their other eye. A treatment for the second eye may be delayed, but such is where the risk of undergoing a hypermature cataract begins to compromise visual health status; afterwards, pseudophakia is entirely frail.

Socioeconomic Barriers and Lack of Awareness

This study discusses an alarming ignorance of cataract progression as well as free surgical programs available in rural areas. Absence of recognition and lack of information on free rallies blended to beat 18.2% of hold-ups. This indicates the necessity for strong community-level awareness programmes for rural communities about need for early intervention.

Moreover, 6.1% of patients also delayed care due to lack of availability of caretakers. The elderly in rural areas rely heavily on family members for transportation and other support, and the absence of such family support aggravates postponement of surgery.

Age and Gender Trends

Results showed a marked increase in the frequency of hypermature cataract with advancing age itself. Incidence was greatest in the 60–70 years age group (36.4%) followed by the >70 years group (33.9%). This agrees with international data stressing age as a principal risk factor for both senile cataracts development as well as progression.

The gender analysis revealed almost equal gender ratio as 50.9% males and 49.1% females were affected. Although this demonstrates an equal burden, treatment delays for women may still be a consequence of culture or gender-related access to health care.

Importance of Early Intervention

The transition of cataract to a hypermature state can be prevented by providing timely intervention, conducting regular eye examinations at grassroots level, and involving community outreach programs. There is a need for focused education initiatives in rural areas to fill knowledge gaps and increase surgical uptake. In addition, tackling logistical and socioeconomic challenges will be essential to help scale-up free medical camps and additional caregiver support.

VI. CONCLUSION

This study highlights the significant impact of the **COVID-19 pandemic** on hypermature cataract cases in a rural tertiary care center. Delays in cataract surgeries were primarily attributed to the pandemic (**45.4%**), followed by patient reliance on a functional pseudophakic eye (**24.2%**) and lack of awareness about cataract progression and free treatment options (**18.2%**). Socioeconomic barriers, such as caregiver unavailability (**6.1%**), further contributed to delays, reflecting the challenges faced by rural populations in accessing timely eye care.

The findings emphasize that **older age groups**, particularly those aged **60–70 years** and **>70 years**, are most vulnerable to cataract progression, highlighting the need for targeted interventions. Gender parity in disease prevalence demonstrates that hypermature cataract equally affects both males and females, though societal factors may still influence treatment-seeking behaviors.

To address the growing burden of hypermature cataracts, there is a critical need for **community education programs**, early intervention through regular eye screenings, and improved access to free medical camps. Post-pandemic recovery efforts must focus on clearing the backlog of untreated cataract cases to prevent further progression to advanced stages.

By addressing these challenges, preventable blindness caused by hypermature cataracts can be significantly reduced, improving the quality of life for rural populations.

VII. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to address the delays in cataract surgeries and prevent the progression of cataract to hypermature stages:

1. Community Education and Awareness Programs

- Implement targeted **awareness campaigns** in rural areas to educate the population on the importance of **timely cataract treatment**.
- Promote awareness about the availability of **free or subsidized eye care camps** through local media, community leaders, and health workers.

2. Regular Eye Screening Programs

- Conduct regular **screening camps** in rural communities to detect cataracts at early stages, particularly for individuals **above 50 years** who are at higher risk.
- Collaborate with government health initiatives and NGOs to ensure the outreach of screening programs to remote areas.

3. Post-COVID Recovery Strategies

- Prioritize the **backlog of cataract surgeries** caused by the COVID-19 pandemic to prevent further disease progression.
- Allocate additional resources, including medical personnel and mobile eye care units, to rural healthcare centers.

4. Caregiver Support Initiatives

- Develop caregiver assistance programs to help elderly patients in accessing healthcare facilities.
- Engage community health workers to provide logistical support for transportation and follow-up care.

5. Improved Accessibility to Eye Care Services

- Strengthen rural healthcare infrastructure to ensure timely access to cataract surgeries.
- Increase funding for ophthalmology services in rural tertiary centers to accommodate higher patient loads.

By implementing these recommendations, the burden of hypermature cataract can be reduced, improving visual outcomes and quality of life for rural populations.

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