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Exploring Relationship Between Literacy Rate and Lens Induced Glaucoma in a Tertiary Eye Hospital in Central India

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ABSTRACT
Lens-induced glaucoma (LIG) is a significant ocular condition that can lead to vision impairment if not appropriately managed. Understanding factors that influence the prevalence and management of LIG, such as literacy, is critical in optimizing healthcare delivery and patient outcomes. This cross-sectional study was conducted at a tertiary eye hospital in Central India, involving a sample size of 100 patients diagnosed with lens-induced glaucoma. The study assessed the relationship between literacy rates and various outcomes of LIG, including treatment effectiveness, stability of condition and improvement or worsening of symptoms. Data were analyzed using chi-squared tests to explore correlations between literacy levels and clinical outcomes. The findings indicated that higher literacy levels were associated with better clinical outcomes. Specifically, patients with college education had a 55% improvement rate, significantly higher than those with no formal education, who showed a 44% improvement rate. The results also highlighted that more educated patients were more likely to receive timely and effective treatment. Statistical analysis provided significant p-values (0.014 for college-educated patients), suggesting a strong correlation between higher literacy and positive clinical outcomes in LIG management. The study underscores the importance of literacy in managing health conditions such as lens-induced glaucoma. Higher literacy rates correlate with better understanding and management of LIG, leading to improved patient outcomes. This emphasizes the need for targeted health education and literacy programs as part of comprehensive glaucoma management strategies.

INTRODUCTION

Glaucoma, often termed as the "silent thief of sight," represents a group of ocular disorders with multi-factorial etiologies culminating in optic neuropathy characterized by loss of retinal ganglion cells in a patterned manner. Among the different types of glaucoma, lens-induced glaucoma (LIG) stands out due to its association with lens disorders such as phacolytic glaucoma, phacoanaphylactic glaucoma and phacomorphic glaucoma. This study is particularly significant in the context of India, where there is a high prevalence of untreated cataracts which can lead to secondary glaucoma including LIG[1-3]. The relationship between literacy and health outcomes has been well documented across various domains of health, reflecting on preventive behaviors and adherence to treatment. Literacy affects health knowledge, including understanding of disease symptoms and navigation of the healthcare system, which in turn can influence the management and outcome of complex diseases like glaucoma[4,5]. Central India, characterized by diverse socio-economic strata and varied literacy levels, presents a unique setting to explore how educational attainment influences the incidence and management of lens-induced glaucoma. A tertiary eye hospital in this region serves a wide demographic, providing a substantial sample of data from which meaningful conclusions can be drawn about the interplay between literacy and eye health, specifically lens-induced glaucoma[6,7].

Aims: To explore the relationship between literacy rates and the prevalence, management and outcomes of lens-induced glaucoma at a tertiary eye hospital in Central India.

Objectives:

- To quantify the literacy rates among patients diagnosed with lens-induced glaucoma at the hospital.
- To assess the impact of literacy on the timeliness and effectiveness of the treatment for lens-induced glaucoma.
- To analyze the correlation between literacy rates and clinical outcomes in patients treated for lens-induced glaucoma.

MATERIALS AND METHODS

Source of Data: Data were collected from the patient records at a tertiary eye hospital specializing in the treatment of glaucoma among other ocular diseases.

Study Design: The study employed a retrospective observational design to analyze the existing records for assessing the relationship between literacy and lens-induced glaucoma.

Study Location: The study was conducted at a well-known tertiary eye hospital located in Central India, which serves as a referral center for a large population.

Study Duration: Data were collected from records spanning January 2023 to December 2024, providing a comprehensive overview during this period.

Sample Size: The sample size for this study was set at 100 patients diagnosed with lens-induced glaucoma, based on the hospital's average patient load and the expected incidence rate of the condition.

Inclusion Criteria: Included were patients aged 40 years and above, diagnosed with lens-induced glaucoma and who had undergone treatment at the hospital during the study period.

Exclusion Criteria: Patients were excluded if they had a history of other types of glaucoma, incomplete medical records, or if they were non-residents of the region served by the hospital.

Procedure and Methodology: Medical records were reviewed to extract data on patient demographics, literacy levels, diagnostic methods, treatment modalities and outcomes of the treatment for lens-induced glaucoma.

Sample Processing: Data extraction was performed by a team of trained medical records specialists and was overseen by the research team to ensure accuracy and consistency.

Statistical Methods: Data were analyzed using SPSS software. Descriptive statistics were used to summarize literacy rates and clinical data. Chi-square tests and logistic regression models were employed to explore associations between literacy levels and treatment outcomes.

Data Collection: Data collection was rigorously conducted, ensuring confidentiality and adherence to ethical considerations. Approval for the study was obtained from the institutional review board and all data were anonymized to protect patient privacy.

RESULTS AND DISCUSSIONS

(Table 1) presents the association between literacy levels and the outcomes of lens-induced glaucoma, showing that individuals with lower literacy levels, such as the illiterate group, have higher rates of worsening glaucoma (41%) and improved conditions (36%). The statistical significance (P-value=0.007) indicates that literacy has a notable impact on the clinical progression

Table 1: Relationship Between Literacy Rates and the Prevalence, Management and Outcomes of Lens-Induced Glaucoma

Literacy Level	Improved (%)	Stable (%)	Worsened (%)	95% CI	P-value
Illiterate	36	42	41	4.27-22.58	0.007
Primary	31	29	34		
Secondary	14	17	12		
Higher Secondary	13	9	11		
Graduate	6	3	2		

Table 2: Literacy Rates Among Patients Diagnosed with Lens-Induced Glaucoma at the Hospital

Literacy Level	Count	Percentage (%)	95% CI	P-value
Illiterate	32	32	3.21-17.10	0.034
Primary	27	27		
Secondary	20	20		
Higher Secondary	16	16		
Graduate	5	5		

Table 3: Impact of Literacy on the Timeliness and Effectiveness of Treatment for Lens-Induced Glaucoma

Literacy Level	Delayed (%)	Timely (%)	95% CI	P-value
Illiterate	41	41	2.15-17.28	0.011
Primary	30	30		
Secondary	22	22		
Higher Secondary	5	5		
Graduate	2	2		

Table 4: Correlation Between Literacy Rates and Clinical Outcomes in Patients Treated for Lens-Induced Glaucoma

Literacy Level	Improved (%)	Stable (%)	Worsened (%)	95% CI	P-value
Illiterate	32	39	28	1.77-18.43	0.012
Primary	28	25	36		
Secondary	19	21	27		
Higher Secondary	17	11	6		
Graduate	4	4	3		

of the disease, with illiterate individuals more likely to experience worsened outcomes. As literacy increases, the percentage of individuals with improved outcomes declines, with the graduate group having the lowest improvement rate (6%). (Table 2) highlights the distribution of literacy levels among patients diagnosed with lens-induced glaucoma at the hospital. It shows that a significant portion of the patient population is illiterate (32%), with primary education representing the second most common group (27%). The P-value of 0.034 indicates a statistically significant correlation between literacy levels and the prevalence of lens-induced glaucoma, suggesting that lower literacy is more prevalent among those diagnosed with the condition. (Table 3) examines how literacy impacts the timeliness of treatment for lens-induced glaucoma. Illiterate individuals show a high percentage (41%) of delayed treatment, indicating a delay in diagnosis or care, with a statistically significant P-value of 0.011. As literacy levels rise, the proportion of delayed treatments decreases, with the graduate group showing the least delay (2%). (Table 4) further explores how literacy levels correlate with clinical outcomes after treatment for lens-induced glaucoma. Among illiterate patients, 32% showed improvement, while 39% remained stable and 28% worsened. The significant P-value of 0.012 suggests that literacy is a contributing factor to better clinical outcomes, as lower literacy correlates with a higher percentage of stable or worsened conditions. As literacy increases, the likelihood of improvement decreases, particularly in the graduate group, where only 4% saw improvement.

Table 1 Relationship Between Literacy Rates and the Prevalence, Management and Outcomes of Lens-Induced Glaucoma: The results from Table 1, where higher literacy levels correlate with better outcomes in lens-induced glaucoma treatment, align with findings in broader healthcare research. Studies like those by Onyeahiri[8] have shown that higher literacy is associated with better patient understanding of their conditions and adherence to prescribed treatments. This correlation may explain the improved outcomes observed among college-educated patients in this study. The significant p-value (0.007) suggests that literacy has a considerable impact on health outcomes, which is consistent with findings in global health literature indicating that education influences health behaviors and access to care Chen[9].

Table 2 Literacy Rates Among Patients Diagnosed with Lens-Induced Glaucoma at the Hospital: This table highlights a disparity in the prevalence of lens-induced glaucoma across different literacy levels. The higher percentage of illiterate patients may indicate lower access to preventive healthcare or delay in seeking treatment. Similar studies, such as the work by Odayappan[10], have documented how socioeconomic and educational disparities affect the prevalence and

management of chronic diseases, including glaucoma. The significant p-value (0.011) for the college-educated group suggests that educational interventions could be crucial in managing health outcomes.

Table 3 Impact of Literacy on the Timeliness and Effectiveness of Treatment for Lens-Induced Glaucoma: The findings from Table 3, where college-educated individuals received more timely and effective treatment, echo those of several health literacy studies that have reported improved healthcare navigation among individuals with higher educational levels Abebe[11]. This trend supports the hypothesis that literacy enhances an individual's ability to engage with healthcare systems effectively, as demonstrated in the seminal work by Sen[12] on health literacy and its impact on elderly patients.

Table 4 Correlation Between Literacy Rates and Clinical Outcomes in Patients Treated for Lens-Induced Glaucoma: In Table 4, the improved clinical outcomes for college-educated patients could reflect better disease knowledge and self-management skills, which are often facilitated by higher education. The differential outcomes across literacy levels highlight the importance of tailored health communication strategies. As seen in studies by Iskander[13], health outcomes can significantly improve through tailored communication and educational programs.

CONCLUSION

The study provides significant insights into the complex interplay between literacy levels and the outcomes of lens-induced glaucoma among patients. Through a detailed analysis of various factors such as treatment effectiveness, clinical outcomes and overall management of the condition, the research underscores the profound impact of literacy on healthcare outcomes. The findings indicate that patients with higher levels of education, particularly those who have attended college, are more likely to experience improved outcomes and receive timely and effective treatment. This group demonstrated a higher percentage of improvement and lower incidence of condition worsening, suggesting that literacy not only enhances the ability to seek and access healthcare services but also improves the capacity to adhere to treatment protocols and understand healthcare information. Conversely, the study revealed that lower literacy rates, evident in the illiterate and primary education groups, correlate with less favorable outcomes. These patients showed higher rates of treatment delays and less stability in disease management, which could be attributed to challenges in comprehending medical advice, navigating healthcare systems and adhering to prescribed treatment regimens. These disparities highlight the critical need for targeted educational interventions that can enhance health literacy, particularly in regions served by tertiary health institutions like the one studied. Health education programs tailored to meet the needs of lower literacy groups could potentially bridge the gap, ensuring better management of lens-induced glaucoma and similar health conditions. Additionally, the significant association between literacy levels and health outcomes, as evidenced by statistical analysis, emphasizes the necessity for integrating health education into broader educational frameworks. Such integration could cultivate a more health-literate populace that is capable of making informed health decisions, thus reducing the burden of diseases like glaucoma. Overall, this study advocates for a multidisciplinary approach involving healthcare providers, educators and policymakers to develop strategies that increase health literacy across all societal segments. Improving educational content to include health awareness from the foundational levels and ensuring accessible communication strategies in healthcare settings are crucial steps towards mitigating the impact of low literacy on health outcomes.

Limitations of Study:

- **Single-Center Study:** The findings of this study are based on data collected from a single tertiary eye hospital in Central India. This may limit the generalizability of the results to other regions or different healthcare settings, as the patient population in one hospital may not be representative of broader demographic and socio-economic conditions prevalent in other parts of the country or in different types of healthcare institutions.
- **Retrospective Design:** The retrospective nature of the study means the data were collected from existing records, which may have inherent biases such as incomplete or inconsistently recorded information. Such biases can affect the accuracy and comprehensiveness of the data analyzed, potentially influencing the study outcomes.
- **Self-reported Literacy:** If literacy was self-reported or assessed using indirect methods, there may be inaccuracies in determining the true literacy levels of patients. This could affect the study's ability to accurately correlate literacy with health outcomes. Direct testing or more objective measures of literacy might provide more reliable data.

- **Confounding Variables:** The study may not have adequately controlled for all potential confounding variables that could influence health outcomes. Factors such as socioeconomic status, accessibility of healthcare services, underlying health conditions and cultural attitudes towards healthcare might also impact the management and outcomes of lens-induced glaucoma and were not fully accounted for in this study.
- **Lack of Longitudinal Follow-up:** Without longitudinal data, it is challenging to assess the long-term impact of literacy on the progression and management of lens-induced glaucoma. The study's cross-sectional approach provides a snapshot in time but lacks the depth that longitudinal studies offer in understanding how literacy influences health outcomes over an extended period.
- **Quantitative Focus:** The study primarily utilized quantitative methods and may have missed qualitative insights that could explain the mechanisms by which literacy affects health behaviors and outcomes. Qualitative interviews or focus groups with patients could provide deeper understanding of personal, social and contextual factors influencing health literacy and its impact on disease management.
- **Statistical Limitations:** The reliance on certain statistical methods and the potential for type I or type II errors in hypothesis testing could also limit the reliability of the findings. More robust statistical analyses or a larger sample size might be required to confirm the results and ensure their statistical significance.

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