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RESEARCH ARTICLE

VISUAL HEALTH INEQUITIES AMONG SMALL-SCALE FARMERS IN INDIA: INSIGHTS FROM A SYSTEMATIC REVIEW

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Abstract

Small-scale farmers constitute a substantial segment of India's rural workforce and depend heavily on good visual function for agricultural productivity and occupational safety. However, visual impairment rema ins a persistent and under-recognized challenge among this population. This study synthesizes existing literature from India to examine the prevalence of visual impairment among small-scale farmers, identify barriers to eye-care utilization, and assess the implications of poor vision for work performance and quality of life. A narrative review of peer-reviewed studies, government reports, and program evaluations published in the Indian context was undertaken,with particular attention to rural and agricultural populations.The reviewed literature consistentl y indicates a high burden of avoidable visual impairment, primarily due to cataract and uncorrected refractive errors. Despite the availability of effective and low-cost treatments, uptake of eye-care services among farmers remains limited. Key barriers identified across studies include financial constraints, geographic inaccessibility of eye-care facilities, low awareness of eye diseases, fear or misconceptions regarding treatment, and competing livelihood priorities. Several Indian studies further report that farmers with untreated visual impairment experience reduced work efficiency, difficulty in performing precision based agric ultural tasks,and increased vulnerability to occupational injuries.Eviden ce from community-based outreach programs in India demonstrates that strategies such as mobile eye camps, vision centers, and locally supported referral systems can improve early detection and service utilization. The findings highlight the need for context specific, afforda ble, and farmer-centered eye-care interventions integrated into rural health and agricultural development frameworks to improve both visual health and productivity outcomes.

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Introduction:-

In India, the majority of agricultural workers operate on small or marginal landholdings and depend heavily on manual labor and adequate visual function for everyday farming activities (Government of India, 2021). Agricultural tasks such as identifying crop pests and diseases, applying fertilizers and pesticides, harvesting produce, and operating tools and machinery require good visual acuity. Despite this dependence on vision, the eye health needs of small-scale farmers remain insufficiently addressed within rural health and agricultural development policies.Visual impairment among farmers has consequences that extend beyond individual health outcomes. Poor vision can reduce work efficiency, limit the ability to perform precision-based tasks, and increase susceptibility to occupational injuries, particularly in environments involving sharp instruments, heavy machinery, and chemical exposure (Alawneh et al., 2025). Empirical evidence from rural and agrarian settings suggests that untreated visual impairment is associated with reduced productivity, income instability, and diminished quality of life (Sagemüller et al., 2022). At a broader level, compromised farmer productivity may indirectly affect household food security and rural economic resilience.

In rural India, access to eye-care services is shaped by a complex interaction of structural, economic, and sociocultural factors. Geographic inaccessibility, including long distances to health facilities and limited transportation options, remains a major barrier to service utilization (Kovai et al., 2007). Financial constraints further restrict access, as small-scale farmers often face both direct costs of treatment and indirect costs such as wage loss during travel and recovery (Vishwakarma et al., 2025). In addition, low awareness of eye diseases, fear of surgical procedures, misconceptions regarding treatment outcomes, and the normalization of vision loss as a natural consequence of aging contribute to delayed care-seeking behavior (Nicholson et al., 2025).Studies conducted across rural regions of India consistently report that cataract and uncorrected refractive errors are the leading causes of visual impairment among farming and rural populations (Rao et al., 2021; World Health Organization [WHO], 2019). These conditions are largely preventable or treatable through cost-effective interventions such as spectacles and cataract surgery. Nevertheless, despite the availability of effective treatments, the uptake of eye-care services remains suboptimal, reflecting persistent inequities in access and utilization.

Encouragingly, evidence from Indian community eye-health programs indicates that decentralized and outreach-based service delivery models—such as mobile eye camps, door-to-door screening, vision centers, and the engagement of trained field workers—can substantially reduce access barriers and facilitate early diagnosis and treatment (Dixit et al., 2025; Rashmi and Datti, 2015). When aligned with local contexts, including agricultural calendars and community structures, such approaches have demonstrated improved service uptake in a cost-efficient manner.Given the fragmented nature of existing research and the continued burden of avoidable visual impairment among small-scale farmers, a systematic synthesis of Indian evidence is warranted. This review aims to consolidate findings from the Indian literature on visual health inequities among small-scale farmers, with a focus on prevalence, barriers to eye-care access, and implications for productivity and well-being. By identifying gaps and effective strategies, this review seeks to inform future policy initiatives, program design, and research efforts aimed at achieving equitable eye-care access for India's farming communities.

Review Objectives:-

The primary objective of this systematic review is to synthesize available evidence from Indian studies on visual impairment and eye-care access among small-scale farmers and rural agricultural populations.

Specifically, the review aims to:

Assess the burden of visual impairment among small-scale farmers in India by examining reported prevalence and patterns of visual impairment in rural and farming populations.Identify the major causes of visual impairment affecting small-scale farmers, with particular emphasis on avoidable and treatable conditions such as cataract and uncorrected refractive errors.Examine barriers to eye-care access and utilization, including economic, geographic, sociocultural, and health system–related factors that contribute to inequities in eye-care service use.Explore the occupational and productivity-related impacts of visual impairment on farming activities, work efficiency, and safety, as reported in the Indian and comparable agrarian literature.Review the effectiveness of community-based and outreach eye-care interventions implemented in rural India, such as eye camps, vision centers, and field worker–led initiatives, in improving access and early detection.Identify gaps in the existing literature and highlight areas requiring further research to inform policy and programmatic interventions aimed at reducing visual health inequities among small-scale farmers.

Literature Review:-

The reviewed literature consistently highlights a substantial burden of visual impairment among farmers and rural populations, with cataract and uncorrected refractive errors emerging as the most common and avoidable causes. Early foundational studies from rural South India identified financial hardship, lack of awareness, and social constraints as major barriers to accessing eye-care services—barriers that continue to persist in more recent studies (Kovai et al., 1998).Recent cross-sectional and program evaluation studies conducted across various regions of India reaffirm that rural populations, including small-scale farmers, experience delayed or inadequate utilization of eye-care services despite the availability of effective treatments (Dixit et al., 2025; Vishwakarma et al., 2025). Sociocultural beliefs, fear of surgery, and the prioritization of daily agricultural work over health care remain dominant factors influencing care-seeking behavior (Nicholson et al., 2025).

Occupational and environmental risks further compound visual health challenges among farmers. Studies focusing on agricultural workers document frequent ocular injuries and exposure-related morbidities, underscoring the importance of preventive measures such as protective eyewear (Alawneh et al., 2025). However, qualitative evidence suggests low acceptance and inconsistent use of such protective devices due to discomfort, cost, and lack of perceived necessity.Evidence from community-based outreach initiatives in India demonstrates that decentralized service delivery models—such as eye camps, vision centers, and the involvement of trained field workers—can effectively reduce access barriers and improve early detection of visual impairment (Rashmi and Datti, 2015). Comparative economic evidence from similar agrarian contexts further suggests that untreated visual impairment negatively affects farm productivity, reinforcing the economic rationale for targeted eye-care interventions (Sagemüller et al., 2022).

Sr. No.	Study Title	Study Design / Literature Type	Source / Journal	Author (s)	Year	Key Findings and Relevance
1	Facilitators and barriers to protective eyewear acceptance among Indian farmers: A qualitative study	Qualitative research	BMC Public Health	Not specified	2025	Explores farmers' perceptions of occupational eye hazards and identifies practical, behavioral, and cultural barriers to the use of protective eyewear, highlighting gaps in preventive eye health practices.
2	Evaluation of a community outreach program for detection of prevalence and causes of visual impairment in East Uttar Pradesh region	Cross-sectional study and program evaluation	International Journal of Community Medicine and Public Health	Dixit, K. K., Sharma, S., and Bharadwaj, R.	2025	Demonstrates the effectiveness of mobile eye camps in identifying cataract and refractive errors in rural populations, emphasizing outreach as a key strategy to improve access.
3	Why rural communities in India delay seeking eye care	Cross-sectional survey	International Journal of Community Medicine and Public Health	Nicholson, M. D., Krishnan, R., and Rogye, A.	2025	Identifies socio-cultural, demographic, and behavioral factors—such as fear of surgery, lack of perceived need, and competing livelihood priorities—that delay eye-care utilization.
4	A study on eye health-seeking behaviour among rural communities	Cross-sectional research	International Journal of Communit	Vishwakarma, P. et al.	2025	Documents high prevalence of barriers including financial constraints, low awareness, and poor accessibility,

	in India		y Medicine and Public Health			reinforcing inequities in rural eye-care utilization.
5	Barriers to accessing eye care services among visually impaired populations in rural South India	Population-based survey	Indian Journal of Ophthalmology	Kovai, V. et al.	1998	Provides foundational evidence on personal, economic, and social barriers to eye-care access, many of which remain relevant decades later.
6	Occupational hazards, associated ocular morbidities and impact of refractive safety eyewear among agriculture workers in India	Cross-sectional observational study	Indian Journal of Occupational and Environmental Medicine	Not specified	2024	Documents high levels of ocular injuries among agricultural workers and highlights the protective benefits of refractive safety eyewear.
7	The effect of poor vision on economic farm performance: Evidence from rural Cambodia	Quantitative economic analysis	PLoS ONE	Sagemüller, F., Bruns, S., and Mußhoff, O.	2022	Provides economic evidence linking poor vision to reduced farm productivity, offering comparative insights relevant to the Indian farming context.
8	Prevalence of severe visual impairment and barriers to access eye care services in the Udupi district	Cross-sectional study	Asian Journal of Ophthalmology	Rao, L., Sharma, D., Bhandary, S., et al.	2021	Reports high prevalence of visual impairment and persistent access barriers in a rural Indian district, reinforcing regional inequities.
9	Eye health in farmers: The impact of environmental and occupational factors	Observational research	PLoS ONE	Alawneh, A., Fraiwan, M., and Almomani, F.	2025	Highlights environmental and occupational risks—such as dust, sunlight, and chemical exposure—that contribute to eye health problems among farmers.
10	Role of efficient field workers in prevention of cataract blindness through community outreach programmes	Program evaluation	International Journal of Health Sciences and Research	Rashmi, N. R., and Datti, N. P.	2015	Demonstrates the effectiveness of trained field workers and outreach programs in improving cataract detection and facilitating treatment in underserved rural areas.

Overall, the literature reveals persistent visual health inequities among small-scale farmers, shaped by structural barriers, occupational risks, and limited access to preventive and curative eye-care services. These findings underscore the need for systematic synthesis and context-specific strategies to address unmet eye-care needs within India's farming communities.

Narrative Elaboration of the Literature Review:-

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constraints as major barriers to accessing eye-care services—barriers that continue to persist in more recent studies (Kovai et al., 1998).Recent cross-sectional and program evaluation studies conducted across various regions of India reaffirm that rural populations, including small-scale farmers, experience delayed or inadequate utilization of eye-care services despite the availability of effective treatments (Dixit et al., 2025; Vishwakarma et al., 2025). Sociocultural beliefs, fear of surgery, and the prioritization of daily agricultural work over health care remain dominant factors influencing care-seeking behavior (Nicholson et al., 2025).

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Challenges and barriers in Addressing Visual Health Inequities Among Small-Scale Farmers in India:-

Despite the availability of effective and affordable interventions for preventing and treating visual impairment, multiple challenges and threats continue to hinder equitable eye-care access among small-scale farmers in India. These challenges operate at individual, community, health-system, and policy levels, collectively perpetuating visual health inequities.

Structural and Geographic Barriers:-

One of the most persistent challenges is the geographic inaccessibility of eye-care services in rural and remote farming areas. Specialized eye-care facilities are often concentrated in urban centers, requiring farmers to travel long distances to seek diagnosis and treatment. Inadequate transportation infrastructure and limited public transport options further exacerbate this challenge, particularly for elderly farmers or those with mobility limitations. Seasonal agricultural demands also restrict farmers' ability to travel during peak farming periods, resulting in delayed or foregone care.

Economic Constraints and Opportunity Costs:-

Although cataract surgery and spectacles are relatively low-cost interventions, economic barriers remain a significant threat to service uptake. Small-scale farmers often operate with limited and irregular incomes, making out-of-pocket health expenditures difficult to prioritize. In addition to direct medical costs, indirect costs—such as loss of daily wages, travel expenses, and the need for accompanying family members—create substantial opportunity costs. These financial pressures frequently lead farmers to postpone treatment until vision loss becomes severe.

Low Awareness and Health-Seeking Behavior:-

Limited awareness of eye diseases, available treatments, and the benefits of early intervention continues to challenge effective eye-care utilization. Many farmers perceive gradual vision loss as a normal part of aging rather than a treatable condition. Misinformation, fear of surgery, and misconceptions about treatment outcomes further discourage timely care-seeking. These behavioral barriers are often reinforced by low levels of health literacy and limited exposure to preventive health messaging in rural settings.

Socio-cultural Beliefs and Gender Inequities:-

Socio-cultural norms and beliefs play a critical role in shaping eye-care utilization. In some rural communities, reliance on traditional remedies or local healers may delay engagement with formal health services. Gender-based inequities also pose a significant threat, as women farmers and elderly dependents may face additional restrictions related to mobility, decision-making autonomy, and access to financial resources. Such inequities result in differential access to eye care within farming households.

Occupational Exposure and Environmental Risks:-
Small-scale farmers are routinely exposed to environmental and occupational hazards, including dust, ultraviolet radiation, chemical pesticides, and mechanical injuries. While protective eyewear can reduce ocular injuries, its adoption remains limited due to discomfort, cost, and lack of perceived necessity. Continued exposure without adequate preventive measures increases the risk of both acute injuries and long-term ocular morbidity, posing an ongoing threat to visual health.

Health System Limitations:-
Health system constraints, including shortages of trained eye-care professionals, inadequate infrastructure at primary health centers, and inconsistent referral mechanisms, limit the reach and sustainability of rural eye-care services. Outreach programs such as eye camps, while effective in case detection, often face challenges related to follow-up care, continuity of treatment, and long-term monitoring. Dependence on periodic camps rather than integrated services may result in fragmented care delivery.

Program Sustainability and Policy Gaps:-
Many community-based eye-care initiatives rely on external funding or non-governmental organizations, raising concerns about long-term sustainability. Limited integration of eye health into broader rural health and agricultural development policies further threatens the scalability of successful interventions. Without consistent policy support, financing mechanisms, and intersectoral collaboration, efforts to address visual health inequities among small-scale farmers may remain sporadic and uneven.

Evidence Gaps and Research Limitations:-
A major threat identified through the systematic review is the lack of farmer-specific and productivity-focused research within the Indian context. Many studies focus on general rural populations rather than explicitly examining small-scale farmers. Additionally, limited longitudinal evidence and inconsistent outcome measures constrain the ability to assess long-term impacts of interventions on productivity and quality of life. These evidence gaps hinder informed policy-making and program design.

Discussion:-

This systematic review synthesizes evidence from Indian literature to examine visual health inequities among small-scale farmers, with a focus on prevalence, barriers to eye-care access, occupational implications, and intervention strategies. The findings highlight that visual impairment remains a significant yet largely preventable public health concern within farming communities, shaped by persistent structural, socioeconomic, and health system constraints.
A consistent finding across the reviewed studies is the high burden of avoidable visual impairment in rural and farming populations, primarily attributable to cataract and uncorrected refractive errors. Despite being treatable through well-established and cost-effective interventions, these conditions continue to contribute substantially to vision loss among small-scale farmers. This gap between availability of treatment and actual utilization underscores the presence of deep-rooted inequities in access rather than a lack of medical solutions.The review further reveals that barriers to eye-care utilization among small-scale farmers are multifaceted. Geographic inaccessibility, financial limitations, and indirect opportunity costs emerge as dominant constraints, particularly for farmers whose livelihoods depend on daily labor. These findings align with earlier Indian studies that emphasize how distance to facilities and wage loss discourage timely care-seeking, even when services are subsidized or free. Importantly, these barriers are compounded during peak agricultural seasons, when farmers are least able to travel for health care.
Sociocultural and behavioral factors also play a crucial role in shaping eye-care utilization patterns.

Low awareness of eye diseases, misconceptions about treatment—especially cataract surgery—and the normalization of vision loss as an inevitable part of aging contribute to delayed diagnosis and treatment. Gender-based inequities further exacerbate access challenges, as women farmers and elderly dependents often face restricted mobility and limited decision-making autonomy within households. These findings point to the need for interventions that address not only service availability but also community perceptions and health-seeking behavior.Occupational exposure to environmental hazards such as dust, ultraviolet radiation, agrochemicals, and mechanical injuries represents an additional and often overlooked dimension of visual health inequities among farmers. While studies highlight the protective role of safety eyewear, adoption remains low due to discomfort, cost, and lack of perceived necessity. This underscores a critical gap in preventive eye health strategies within agricultural settings and highlights the need for integrating occupational eye safety into rural health and agricultural extension programs.Encouragingly, the review identifies strong evidence supporting the effectiveness of community-based and

decentralized eye-care delivery models in India. Outreach eye camps, vision centers, and field worker–led initiatives have demonstrated success in improving case detection, raising awareness, and facilitating referrals for treatment. When designed in alignment with local contexts—such as agricultural calendars and community structures—these interventions can significantly reduce access barriers. However, challenges related to follow-up care, continuity of services, and long-term sustainability remain evident, particularly in programs dependent on external funding.

From a policy and systems perspective, the findings suggest that visual health inequities among small-scale farmers are closely linked to broader rural health system limitations. Insufficient integration of eye care into primary health services, shortages of trained personnel, and fragmented referral mechanisms hinder sustained impact. Moreover, the limited availability of farmer-specific and productivity-focused research restricts the ability to quantify the economic benefits of improved vision, which could otherwise strengthen advocacy for policy prioritization.Overall, this review highlights that addressing visual health inequities among small-scale farmers in India requires a comprehensive approach that combines accessible service delivery, behavioral change communication, occupational safety measures, and health system strengthening. The evidence underscores the importance of moving beyond episodic outreach toward integrated, sustainable eye-care models embedded within rural health and agricultural development frameworks.

Conclusion:-

This systematic review demonstrates that visual health inequities among small-scale farmers in India remain widespread and persistent, despite the availability of effective and affordable interventions for preventing and treating visual impairment. The burden of avoidable conditions such as cataract and uncorrected refractive errors continues to disproportionately affect farming communities, limiting productivity, increasing occupational risks, and diminishing quality of life.The evidence synthesized in this review highlights that inequities in eye-care access are driven by a combination of geographic, economic, sociocultural, and health system–related barriers. Small-scale farmers face unique challenges, including opportunity costs associated with lost work time, limited awareness of eye health, and occupational exposures that heighten visual risk. These factors collectively contribute to delayed care-seeking and unmet eye-care needs.

Community-based and decentralized eye-care interventions have shown considerable promise in reducing access barriers and improving early detection among rural populations. However, for these approaches to achieve sustained and equitable impact, they must be supported by robust health systems, effective referral mechanisms, and long-term policy commitment. Integrating eye care into primary health services, agricultural extension programs, and rural development initiatives may provide a viable pathway for addressing visual health inequities among farmers.

The findings of this review underscore the need for greater policy attention to farmer eye health as both a public health and economic priority. Future research should focus on farmer-specific outcomes, including productivity and livelihood impacts, and adopt longitudinal designs to assess the long-term effectiveness of interventions. Addressing visual health inequities among small-scale farmers is not only essential for improving individual well-being but also for strengthening agricultural productivity and rural resilience in India.

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