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PREVALENCE AND CAUSE OF CHILDHOOD BLINDNESS: A SYSTEMATIC REVIEW

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Abstract

Childhood blindness is defined as a group of eye diseases occurring in childhood or early adolescence. Good parental knowledge of childhood blindness is important for early detection and management of the lifelong burden. The aim: This study aims to provide an explanation and prevent children with blindness and visual impairment Methods: By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done. Result: In the PubMed database, the results of our search brought up 1751 articles, whereas the results of our search on SagePub brought up 120 articles. The results of the search conducted for the last year of 2013 yielded a total of 11 articles for PubMed and 8 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria. Conclusion: The causes of childhood blindness from the available blind school studies revealed that causes of childhood blindness have mainly shifted from corneal causes to whole globe abnormalities.

Keywords: Children Blindness, Prevalence, Cause

Introduction

Childhood blindness (CHB) is a public health concern across the world. Global estimates on childhood blindness show that around 1.42 million and 17.52 million children are suffering from blindness and moderate to severe visual impairment, respectively. Almost three-quarters of these live in low–middle-income countries where the prevalence is reported to be as high as 1.5 per 1000 children in contrast to high-income countries where the prevalence is 0.3 per 1000 (Wadhwani et al., 2021).

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Blindness refers to a lack of vision which may happen suddenly or over some time due to many reasons while WHO defined blindness as presenting visual acuity worse than 3/60 in the better eye. Its causes vary from region to region and from country to country. The causes of blindness have been either avoidable with prevention and treatment or unavoidable. However, the highest percentage of avoidable blindness has been corresponding to low-income and middle-income countries like Ethiopia. So, timely information is crucial to design strategies that address the life quality of sightless individuals (Markos, Kefyalew, & Tesfaye, 2022).

Blindness in children leads to a deep impact on the psychological, emotional, and socioeconomic growth of the family. A child with blindness is more likely to have delays in developmental milestones, be more frequently hospitalized, and die during childhood than a sighted child. Such severe vision loss also adversely affects educational activities, orientation, and mobility from the early stage of life resulting in a lack of employment privilege. These differential characteristics between a sighted and nonsighted child are more obvious in developing countries. Moreover, the disability-adjusted life years (DALY) loss in a blind child is far more than that of adults with blindness (Gudlavalleti, 2017).

Childhood blindness has a great impact at the individual level, with a negative effect on personal development and educational performance, placing an economic burden on the family and the country at large (Assefa, Tolessa, & Ferede, 2020). According to the primary health care strategy of the WHO, the first aim is health promotion by providing health education targeting mothers and women of childbearing age, teachers, and religious and community leaders. Adequate early childhood interventions are essential for detecting eye health problems in children and providing timely treatment to prevent the consequence of the development of amblyopia and irreversible lifelong blindness (Borrel, Dabideen, Mekonen, & Overland, 2013).

In most of the initiatives aiming to prevent childhood blindness, information regarding the knowledge held by parents and caregivers about childhood blindness is essential (Pawar et al., 2023). Since children, especially preverbal ones, cannot complain of poor vision, it is up to the parents and caregivers to detect it and ensure that children receive the help they need (Ramai & Pulisetty, 2013).

Even though childhood blindness is considered a priority in the WHO there have been limited studies conducted regarding childhood blindness in the study area. By considering the critical role of parents and caregivers in the early detection of childhood blindness, studies should be conducted to assess the level of knowledge of childhood blindness. Therefore, this study aimed to estimate the level of parents' or guardians' knowledge of childhood blindness. The results may be beneficial to health authorities to enable them to plan strategies for the prevention of childhood blindness.

Research Methods

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For this literature review, we compare and contrast the prevalence and cases of childhood blindness. This is done to provide an explanation and improve the handling of treatment and the prevention of blindness in childhood. The main purpose of this paper is to show the relevance of the difficulties that have been identified as a whole.

For researchers to take part in the study, they needed to fulfill the following requirements: 1) The paper needs to be written in English. For the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a Digital Object Identifier (DOI), review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "prevalence childhood blindness"; "cause of childhood blindness" as keywords. The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: ("epidemiology"[MeSH Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms] OR "prevalence"[All Fields] OR "prevalences"[All Fields] OR "prevalence s"[All Fields] OR "prevalent"[All Fields] OR "prevalently"[All Fields] OR "prevalent"[All Fields]) AND ("childhood"[All Fields] OR "childhoods"[All Fields]) AND ("blindness"[MeSH Terms] OR "blindness"[All Fields] OR "blindnesses"[All Fields]) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers examined to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilize as sources for their article and selected those studies. After looking at several different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't be seen anywhere else.

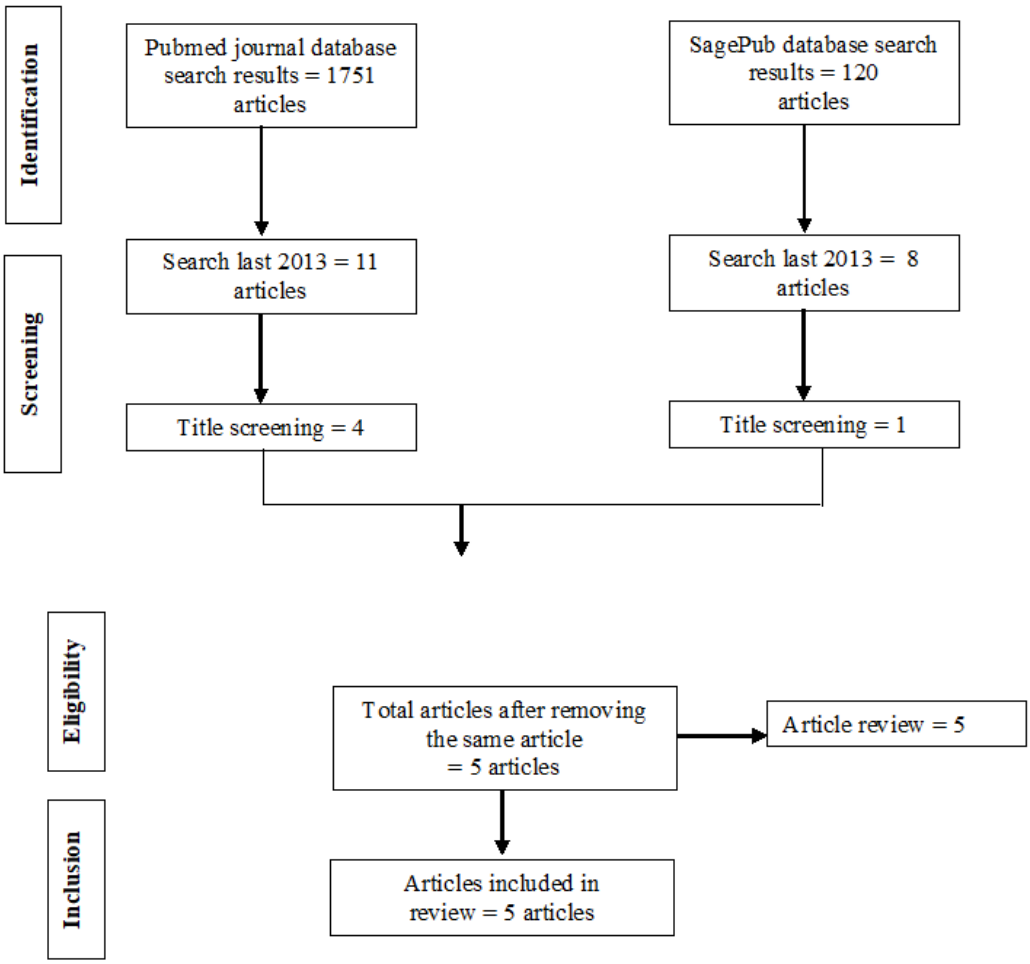

Figure 1 Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analyzed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their study on the research that was included in the publication's title and abstract before deciding on which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered.

This criterion is utilized in the process of selecting papers for further assessment. to simplify the process as much as feasible when selecting papers to evaluate. Which

earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

Results and Discussion

In the PubMed database, the results of our search brought up 1751 articles, whereas the results of our search on SagePub brought up 120 articles. The results of the search conducted for the last year of 2013 yielded a total of 11 articles for PubMed and 8 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria.

Yahalom, (2022) showed that the leading cause of childhood visual impairment and blindness was Inflammatory Eye Disease (IED). Analyses of the literature from the last two decades show that IEDs are a major cause of SVI/childhood blindness in other developed countries as well. Updated patterns of global childhood blindness may suggest a need for a new approach to screening programs and modern tactics for prevention.

Cherinet, (2018) showed that low vision and blindness found in this study were high. Age, cataracts, glaucoma, and age-related macular degeneration were significantly associated with low vision and blindness. This amount of magnitude will be reduced if prevention, early diagnosis, and management are targeted toward avoidable causes of visual impairment. Wadhwani, (2021) showed that optic nerve abnormalities were the most important cause of blindness in children. Refractive error is the most important cause of visual impairment amongst children and needs to be addressed (Philip et al., 2021).

Table 1. The literature included in this study

Author	Origin	Method	Sample	Result
Yahalom (2022)	Israel	Retrospective study	1393	A total of 1393 children aged 0–18 years were included in the study. Moderate visual impairment was seen in 1025 (73.6%) and SVI/blindness in 368 (26.4%) of the studied children. Among blind children, IED accounted for at least 51% of all diagnoses, including mainly albinism and retinal dystrophies. IED prevalence was equally high in both main ethnic groups (Jewish and Arab Muslims). Non-IED (22.6%) included mainly patients with cerebral visual impairment and retinopathy of prematurity.
Cherinet, (2018)	Ethiopia	Retrospective study	881 patients	A total of 881 subjects with a response rate of 97.4% were selected. The mean age of the study subjects was 44.53(SD: ± 21.85) with a range of 1–100 years. The prevalence of low vision and blindness was 91 (10.3% (95% CI: 8.2, 12.3)), and 64 (7.3 95%CI: 5.7, 9.0)) respectively. Age (p-value < 0.001), cataract (p-value = 0.002), glaucoma (p-value = 0.002), and age-related macular degeneration (p-value < 0.001) were

				significantly associated with low vision and blindness.
Wadhwani (2021)	North India	Cross-Sectional Study	789 patients	Amongst 20,955 children examined for visual acuity, a total of 789 children were referred to the central clinic for detailed ophthalmic examination. Of these referred children, a total of 124 had presented visual acuity <6/18 in the better eye. The prevalence of visual impairment (VI) was 5.92 per thousand (95% CI: 4.96-7.05). The prevalence of moderate to severe visual impairment was maximum in the age group of 11 to 15 years. The main cause of avoidable VI in these children was a refractive error (75.7%). The prevalence of blindness was 0.42 per thousand.
Hashemi (2018)	Iran	Cross-Sectional Study	3132 patients	Of the 4453 selected persons, 3132 (70.4%) participated in the study. The prevalence of visual impairment based on presenting vision and best-corrected vision was 3.95% (95% confidence interval [CI]: 3.13–4.77) and 2.23 (95% CI: 1.54–2.91), respectively. The prevalence of presenting visual impairment increased from 1.59% in children under 5 years of age to 43.59% in people older than 65 years of age; these figures were respectively 1.59% and 42.31% based on corrected visual acuity. In the logistic regression model, older age (OR = 1.06, 95% CI: 1.04–1.07, $P < 0.001$), higher education (OR = 0.16, 95% CI: 0.06–0.38, $P < 0.001$), and low income (OR = 1.36, 95% CI: 1.21–1.72, $P < 0.001$) correlated with impaired sight. Based on presenting vision and best-corrected vision, the prevalence of blindness was 0.86% (95% CI: 0.51–1.22) and 0.32% (95% CI: 0.1–0.55). The most common causes of visual impairment were uncorrected refractive error (41.8%) and cataracts (20%).
Heijthuijsen, (2013)	Rep of Suriname	Cross-Sectional Study	4610 patients	65 children were identified with SVI/BL, 58.5% were blind and 41.5% were severely visually impaired (SVI). The major anatomical site of SVI/BL was the retina at 33.8%, the lens at 15.4%, and the normal-appearing globe at 15.4%. The major underlying etiology of SVI/BL was undetermined in 56.9% (mainly cataract and abnormality since birth) and perinatal factors in 21.5% (mainly retinopathy of prematurity (ROP)). Avoidable causes of SVI/BL accounted for 40% of cases; 7.7% were preventable and 32.3% were treatable with cataracts and ROP the most common causes (15.4% and 12.3%, respectively).

Hashemi, et al8 (2018) showed that the prevalence of visual impairment was intermediate in comparison with other studies. The prevalence of visual impairment in

our study was similar to the global average; however, it was markedly high at older ages. Nonetheless, refractive errors and cataracts remain the main causes of impaired vision and blindness in this population, while these two conditions are easily treatable with correction or surgery.

Heijthuijsen, (2013) showed that more than a third of the SVI/BL causes are potentially avoidable, with childhood cataracts and ROP the leading causes. Corneal scarring from vitamin A deficiency does not seem to be a continuing issue in Suriname.

Discussion

Globally, an estimated 36 million people live with blindness. In terms of the prevalence of blindness by age distribution, around 1.4 million children aged 0–14 years are currently living with blindness, whereas approximately 17.5 million are at risk of developing low vision. The estimated burden associated with blindness among children is 70 million blind person-years. Although the actual number of blind children is much lower than that of blind adults, the number of blind years resulting from blindness is alarmingly high in children, and this has an immense social and economic impact (Bourne et al., 2017).

The magnitude and causes of visual impairment and blindness vary by region, owing to socio-developmental diversification. Analyses of global data showed that around 90% of blind people reside in developing countries. Few population-based studies in recent times have investigated the prevalence as well as factors responsible for childhood blindness in the context of developing countries.

However, it has been observed that the burden of childhood blindness is higher in the African and Asian regions, predominantly because of inaccessibility to primary healthcare services. A majority of the causes of childhood blindness are avoidable even in the minimal resource settings of developing countries (Alswailmi, 2018).

Although WHO uses the definition of best-corrected vision of <3/60 in the better eye for defining blindness and a best-corrected vision of <6/18 to define visual impairment, this tends to ignore uncorrected refractive errors as an important cause of visual impairment in children. Due to this, WHO has changed the definitions to presenting visual acuity instead of best corrected to define visual impairment and blindness with the same cutoffs.

However, studies targeted towards refractive error have suggested that presenting visual acuity of <6/12 in the better eye may be a more appropriate criterion for defining visual impairment in children as good vision in a child is essential for learning and sports (Saxena, Vashist, Singh, & Tandon, 2015). Childhood blindness can be categorized as preventable and curable. Preventable causes include corneal scars due to vitamin A deficiency, injuries, etc., while curable causes include pediatric cataracts, glaucoma, retinopathy of prematurity (ROP), refractive errors, etc. ABC includes both preventable and curable causes.

Dandona et al. showed that treatable refractive error caused 33.3% of blindness, followed by 16.6% due to preventable causes (8.3% each due to vitamin A deficiency and

amblyopia after cataract surgery). The important causes of visual disability in children have shown a shift over the past two decades and interventions like the provision of good nutrition, vitamin supplementation, and universal immunization have led to a reduction in the incidence of keratomalacia, measles infection, trachoma, pediatric corneal infections, and conditions amenable to primary prevention.

The newer challenges include adolescent refractive error, cataracts, ROP, and consequences of ocular trauma. Currently most interventions in controlling childhood blindness are hospital-based. More appropriate interventions would be ones targeted towards whole communities or children within the population so that the intervention yields results not only for an individual but for the whole community.

Studies have shown that childhood blindness is a greater concern in children in rural and less developed areas and children in urban slums where such targeted interventions can have a greater impact yet have poor healthcare infrastructure. In communities with high levels of childhood blindness due to preventable corneal scar, the focus should be to encourage the consumption of vitamin A-rich foods and 6 monthly vitamin A supplementation for all children between 9 months and 5 years of age and discourage traditional topical medicines and using medicines without proper prescription.

Encouraging SAFE strategy: This is part of the International Trachoma Initiative (ITI) that aims at the elimination of blinding trachoma, the most common cause of preventable blindness. It involves measures to improve personal hygiene, environmental sanitation, water supplies, availability of antibiotics to combat trachoma, and surgery for managing complications of trachoma.

There is a need to increase awareness in the population about ways to prevent children from ocular injuries. Provide education about risks in contact sports, especially with projectile games, for example, cricket, gulli danda, and BB guns, avoiding high-risk behavior in festivals that result in eye injuries from firecrackers, bow and arrows, holi balloons, and colors that cause chemical burns and ways to childproofing the home.**12**

Instead of having vertical eyecare programs under the National Programme for the Control of Blindness, they should be integrated with the existing Mother and Child Care and school health programs to increase coverage and acceptability. Incorporate the School Eye Screening Programme as a part of a comprehensive child care program that also targets the overall growth and development of a child.

This should focus on vision, hearing, nutrition, cleanliness, and hygiene along with encouraging sports and physical activity. The current focus of the school eye program on only refractive errors limits its utility. School-going children are very receptive in school and interacting with children in schools provides a unique opportunity for health education and to increase awareness about healthy lifestyles. It can have a positive impact on the child, his/her siblings, and parents at home.

Most services in the community are designed for adults and are extended to children. As a child is not a small adult, a holistic, child-centered approach involving the parents, caregivers, Anganwadi workers, and teachers is essential. As the prevalence of childhood blindness is low, plan services for a population of 10 million people to reduce

overall cost, and improve feasibility is very important to intervene early if the child has a preventable or treatable disease.

Delayed treatment is not only less effective, but also as the immature visual system of the child may develop permanent visual loss due to amblyopia, outcomes remain poor even though appropriate intervention is done at a later stage. Currently, the child accesses the health service when a problem is identified, parents/caregivers have time and resources to access a health facility and the accessible facility can cater to the need.

We have to be much more proactive in finding children who need treatment (e.g., by using local key informants). The services must be made affordable so that cost is not a barrier to early referral. Health education for mothers is crucial and they should know how to prevent potentially blinding conditions and where they should go if their child has a problem. It is important to educate and train medical undergraduates and allied medical professionals about preventable eye disorders and managing ocular emergencies.

Most residency programs for ophthalmology do not have a component of pediatric ophthalmology and developing and emphasizing this subspecialty and exposure to managing pediatric eye problems is essential. Information about preventing and managing eye disorders should be integral to any community medicine training and service delivery.

Conclusion

The causes of childhood blindness from the available blind school studies revealed that causes of childhood blindness have mainly shifted from corneal causes to whole globe abnormalities. In Indonesia, the cause of childhood blindness is mostly undetermined/unknown followed by hereditary factors.

BIBLIOGRAPHY

Alswailmi, Farhan Khashim. (2018). Global prevalence and causes of visual impairment with special reference to the general population of Saudi Arabia. *Pakistan Journal of Medical Sciences*, *34*(3), 751.

Assefa, Natnael Lakachew, Tolessa, Kalkidan Getahun, & Ferede, Ayanaw Tsega. (2020). Knowledge of childhood blindness and associated factors among parents or guardians in Maksegnit Town, Northwest Ethiopia. *Clinical Optometry*, 175–182.

Borrel, Annalies, Dabideen, Reshma, Mekonen, YEHUALASHET, & Overland, L. (2013). Child eye health in Africa. *The Status and Way Forward. The African Child Policy Forum Cape Town, South Africa: ORBIS Africa*.

Bourne, Rupert R. A., Flaxman, Seth R., Braithwaite, Tasanee, Cicinelli, Maria V, Das, Aditi, Jonas, Jost B., Keeffe, Jill, Kempen, John H., Leasher, Janet, & Limburg, Hans. (2017). Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *The Lancet Global Health*, *5*(9), e888–e897.

Cherinet, Fashe Markos, Tekalign, Sophia Yoseph, Anbesse, Dereje Hayilu, & Bizuneh, Zewdu Yenegeta. (2018). Prevalence and associated factors of low vision and blindness among patients attending St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. *BMC Ophthalmology*, *18*, 1–6.

Gudlavalleti, Venkata S. Murthy. (2017). Magnitude and temporal trends in avoidable blindness in children (ABC) in India. *The Indian Journal of Pediatrics*, *84*, 924–929.

Hashemi, Hassan, Khabazkhoob, Mehdi, Saatchi, Mohammad, Ostadimoghaddam, Hadi, & Yekta, Abbasali. (2018). Visual impairment and blindness in a population-based study of Mashhad, Iran. *Journal of Current Ophthalmology*, *30*(2), 161–168.

Heijthuijsen, Astrid Anna Maria, Beunders, Victoria Apollonia Annemarie, Jiawan, Dinesh, de Mesquita-Voigt, Anne Marie Bueno, Pawiroredjo, Jerrel, Mourits, Maarten, Tanck, Michael, Verhoeff, Joost, & Saeed, Peerooz. (2013). Causes of severe visual impairment and blindness in children in the Republic of Suriname. *British Journal of Ophthalmology*, *97*(7), 812–815.

Markos, Merkineh, Kefyalew, Biruktayit, & Tesfaye, Hana Belay. (2022). Pooled prevalence of blindness in Ethiopia: a systematic review and meta-analysis. *BMJ Open Ophthalmology*, *7*(1), e000949.

Pawar, Neelam, Ravindran, Meenakshi, Fathima, Allapitchai, Ramakrishnan, K., Chakrabarthy, Sabyasachi, Aparna, K., & Uduman, Mohammed Sithiq. (2023). Assessment of parental awareness about pediatric visual problems by Knowledge-Attitude-Practice survey in South India. *Indian Journal of Ophthalmology*, *71*(5), 2175–2180.

Philip, Krupa, Paudel, Prakash, Vincent, Jerry, Marmamula, Srinivas, Fricke, Timothy, & Sankaridurg, Padmaja. (2021). Refractive Error and School Eye Health. In *South-East Asia Eye Health: Systems, Practices, and Challenges* (pp. 145–168). Springer.

Ramai, D., & Pulisetty, T. (2013). Maternal and caregiver perceptions to childhood eye care in Ghana. *Internet Journal of Epidemiology*, *11*(1), 2–8.

Saxena, Rohit, Vashist, Praveen, Singh, Digvijay, & Tandon, Radhika. (2015). Preventing childhood blindness: Synergy between ophthalmology and community medicine. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, *40*(3), 149.

Wadhwani, Meenakshi, Vashist, Praveen, Senjam, Suraj Singh, Gupta, Vivek, Saxena, Rohit, & Tandon, Radhika. (2021). A population-based study on the prevalence and causes of childhood blindness and visual impairment in North India. *Indian Journal of Ophthalmology*, *69*(6), 1381.

Yahalom, Claudia, Braun, Ron, Patal, Rani, Saadeh, Ibrahim, Blumenfeld, Anat, Macarov, Michal, & Hendler, Karen. (2022). Childhood visual impairment and

blindness: 5-year data from a tertiary low vision center in Israel. *Eye*, *36*(10), 2052–2056.