

Irreversible Blindness in Rural Pakistan: A Descriptive Analysis of Contributing Factors

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Abstract

Background: Visual impairment is on the rise in Pakistan. By focusing on the leading causes, effective prevention and treatment strategies can be developed to improve global eye health.

Objective: To determine the frequency of irreversible blindness and its contributing factors in rural Pakistan.

Material and Method: A cross-sectional study was conducted. In this study, 73 Participants were included. Participants were those who visited primary and secondary healthcare facilities in the surrounding rural areas between January 2022 and July 2023 to obtain a certification of blindness for legal or other purposes. Declarations of blindness met the standards established by the World Health Organization (WHO). Every participant underwent a thorough ocular examination to determine the cause of blindness, with bilateral blindness being the inclusion criterion. **Results:** In a study of 73 patients, 58.9% were male and 41.1% were female. There were 39.7% congenital cases and 60.3% acquired cases. In congenital cases, 51.7% were male and 48.3% were female; in acquired cases, 63.6% were male and 36.4% were female. There were, 87.7% illiterate, and 12.3% were literate. The leading causes of acquired blindness were diabetic retinopathy (31.8%) and glaucoma (68.2%). For congenital cases, the leading causes included retinitis pigmentosa (27.6%) and congenital glaucoma (31.0%). **Conclusion:** Males are disproportionately affected by irreversible blindness, often linked to lower literacy rates. Glaucoma is one of the leading causes of irreversible blindness.

Key Words: Glaucoma, Blindness, Diabetic Retinopathy, Congenital, Acquired.

INTRODUCTION

It is reported that globally, 2.2 billion people have some visual impairment (VI) ⁽¹⁾. Glaucoma, diabetic retinopathy (DR), age-related macular degeneration (ARMD), corneal opacities, uncorrected refractive errors, and trachoma leading to amblyopia are the leading causes of VI worldwide⁽²⁾. Glaucoma, DR, and ARMD are the principal reasons for irreversible blindness. VI, a state of physiological or pathological disorders of vision, burdens human activities⁽³⁾.

Recently, advanced treatments have developed in ophthalmology, like glaucoma-related gene therapy and stem cell transplantation, to generate new retinal pigment epithelial cells for degenerative retinal diseases. These

treatments are groundbreaking advancements in correcting or reversing hereditary or acquired blindness ^(4, 5). Blindness is a significant public health issue and a social and economic concern. Numerous factors contribute to irreversible blindness, including geography, educational status, hereditary tendencies, and socioeconomic factors. Variation in the etiology of blindness between countries has been seen⁽⁶⁾. This may be due to variations in the awareness of seeking medical help and accurate diagnosis in different geographical regions. Regional studies are needed to identify the cause and magnitude of irreversible blindness. Thus, regional data on the causes of irreversible blindness would help allocate resources more effectively and plan public health care more appropriately. There are several effective ways to address or prevent irreversible blindness. These include conducting awareness programs within communities, implementing screening programs for specific hereditary diseases, and ensuring early detection of conditions like glaucoma and diabetic retinopathy⁽⁷⁾.

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Increasing awareness about seeking medical help and obtaining accurate diagnoses can significantly enhance health outcomes and well-being. The proper delivery of healthcare sources to prevent irreversible blindness is urgently needed in developing countries. There is a spectrum of etiologies of blindness in developing countries, and data on all the related causes of irreversible blindness is significantly low. Hence, regional etiological studies identifying the community's common causes will help the health department properly plan the resources to deliver healthcare and preventive measures. This study aimed to determine the prevalence and contributing factors of irreversible blindness among Pakistan's rural population.

MATERIAL AND METHOD

This cross-sectional study was conducted between January 2022 to July 2023 in primary and secondary healthcare centers to ascertain the etiology of bilateral blindness in district Kasur, Lahore, Pakistan. The sampling technique was purposive. Patients of any age were intended to be included, with their permission or with the consent of their guardians in cases of minors. The remaining inclusion criteria were bilateral blindness, which is irreversible through treatment. According to WHO criteria, blindness is declared if visual acuity is worse than 3/60 on Snellen's eye chart and severely impaired vision if visual acuity is between 6/60-and 3/60. Irreversible blindness means that one would not get back the vision that is better than the blindness criteria of the WHO⁽⁸⁾. Reversible causes, such as cataracts, refractive errors, recent vitreous hemorrhage, recent macular edema, early hereditary retinal/macular disease, operable retinopathy, unilateral cases, and blindness not meeting WHO criteria, were excluded. All patients underwent complete ophthalmological examination to reach out the apparent cause of blindness, including visual acuity through Snellen's chart method, slit lamp examination, applanation tonometry, fundus examination, B-Scan, and rest related to extraocular muscle movements. Most patients were referred to get a blindness certificate for legal documentation, and very few came in for their routine checkup to address any current

symptoms, such as irritation or pain. The nature of ocular disease was recorded, and in cases where more than one ocular condition led to blindness, the condition causing the most damage was noted. The glaucomatous cause was determined based on typical disc cupping, medical history, and previous records, including intraocular pressure (IOP) records, perimetry, and optical coherence tomography (OCT) of the optic nerve head.

RESULTS

The result is primarily organized into hereditary and non-hereditary causes. The epidemiological characteristics of the patients are as follows. The number of patients aged between 6 and 86 years enrolled was 73, with an average age of 33. Between the age group 20 and 60, there were 51 cases (69.86%), 5 cases more significant than 60 years (6.84%), and 18 cases less than 20 years (24.65%). Out of 73 patients, 43 (58.9%) were males and 30 (41.09%) females, with 29 (39.72%) congenital cases and 44 (60.27%) acquired causes of blindness. Among congenital cases, 15 (51.72%) were males, and 14 (48.27%) were females. Among acquired cases, 28 (63.63%) were males, and 16 (36.36%) were females.

Table 1: Distribution of patients according to gender.

	Congenital Cases	Acquired Cases
Male	15(51.72%)	28(63.63%)
Female	14(48.27%)	16 (36.36%)
Total	29(39.72%)	44(60.27%)

Considering the literacy rate, 64(87.67%) were illiterate, and 9(12.34%) were literate or students. Among illiterate 36(56.24%) were males and 28(43.75%) were females and among literate 7(77.77%) were males and 2(22.22%) were females.

Table 2: Distribution of patients according to literacy rate.

	Literate	Illiterate
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Male	7(77.77%)	36(56.24%)
Female	2(22.22%)	28(43.75%)
Total	9(12.34%)	64(87.67%)

The major causes of legal bilateral blindness in acquired cases were diabetic retinopathy 14 cases (31.81%), out of which eight males and six females and glaucoma, both primary and secondary 20 cases (45.45%), and 10(22.72%) cases of other causes like retinal detachment, trauma, corneal opacities, etc. with eight males and two females. For congenital cases, major causes were retinitis pigmentosa 8(27.58%) cases, out of which 3 cases were males and 5 were females, congenital anophthalmos or microphthalmos 9 cases (31.03%) out of which 4 were males and 5 were females, congenital glaucoma 9 cases(31.03%) out of which 5 were males, and 4 were females and 7 cases(24.13%) with other causes leading to congenital blindness(nystagmus, amblyopia etc).

Table 3: Distribution of patients according to cause of blindness.

Nature	Disease	Total
Acquired	Diabetic Retinopathy	14 (31.83%)
	Glaucoma (Primary/Secondary)	20 (45.45%)
	Retinal Detachment	5 (11.36%)
	Other (Trauma, Corneal Opacity etc)	5 (11.36%)
Congenital	Retinitis Pigmentosa	8 (27.58%)
	Anophthalmos/ Microphthalmos	9 (31.03%)
	Glaucoma	9 (31.03%)
	Others (Nystagmus, amblyopia etc.)	7 (24.13%)

DISCUSSION

About 2.2 billion people globally have some visual impairment. About 1.08% of the population of Pakistan is completely blind ⁽¹⁾. The present study indicates that acquired factors account for a greater proportion of

cases (60.27%) than congenital causes (39.72%). This result is consistent with the findings of another study, which found that acquired causes predominated at 91% and congenital causes at 6% ^(9, 10).

The correlation between literacy rates and blindness reveals a concerning trend. Since 86.77% of the patients lack literacy, there may be a connection between educational attainment and the probability of permanent blindness^(11, 12). The distribution of genders among the illiterate population implies that blindness disproportionately affects men. These findings are comparable to a cross-sectional study conducted by R. D. Thulasiraj et al., in which approximately one-third of the population surveyed did not have a minimum functional literacy level⁽¹³⁾.

According to this study, glaucoma is the most common condition, found in 38.67% of cases. This result aligns with the findings of a study that reported 40% of cases had glaucoma. On the other hand, findings by others indicated that glaucoma was the second most common cause⁽¹⁴⁾. Notably, studies by Dineen B et al. and Memon MS et al. identified glaucoma as the fourth most common cause of permanent blindness, with a lower prevalence of glaucoma at 7.1% and 3.9%, respectively^(15, 16). The differences in these findings could be explained by the fact that the sample sizes in those studies were significantly higher than ours⁽¹⁷⁾. In our study, 31.83% of the cases have diabetic retinopathy, which is consistent with the results of other studies^(18, 19).

Understanding the etiological spectrum of permanent blindness is crucial for allocating resources and preparing for public health initiatives. Age-specific therapies, gender-sensitive healthcare approaches, and educational initiatives are required to lower the prevalence of blindness. Targeted prevention and treatment efforts can also be guided by addressing the specific causes of blindness, with a focus on diabetic retinopathy and glaucoma in acquired cases, while retinitis pigmentosa, congenital anophthalmos or microphthalmos, and congenital glaucoma in congenital cases. Informed public health initiatives are based on a thorough investigation of the etiological spectrum of irreversible blindness. This ensures that treatments are tailored to meet

the diverse needs of affected communities. The limitation of the study is the small sample size.

CONCLUSION

The percentage of reported blindness cases is higher among males than females, likely due to a greater reporting ratio for males and a lower literacy rate among those reported. Acquired cases outnumber congenital cases, although the ratio of congenital cases is nearly equal between genders. Glaucoma is the leading cause of vision loss, followed by diabetic retinopathy. In younger individuals, leading causes of vision loss include amblyopia from uncorrected refractive errors, retinitis pigmentosa, microphthalmos, and corneal opacities.

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