



PREVALENCE OF VARIOUS OCULAR DISEASES IN THE FIELD PRACTICE AREA OF A TERTIARY HEALTH CENTRE OF CENTRAL INDIA: A CROSS-SECTIONAL STUDY

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Abstract

Background: Ocular morbidity continues to be a serious public health problem in India. The rural and semi-urban population of central India are particularly affected, as they do not have access to good eye care services. The objective of the study was to assess the frequency and type of ocular disorders in the field practice area of a tertiary health centre in central India.

Methods: A community-based cross-sectional study was done among 400 subjects staying in the field practice area. Socio-demographic Information Was Collected Using A Structured Questionnaire All participants underwent an evaluation of their visual acuity and slit lamp biomicroscopy funduscopy and tonometry.

Results: Out of 400 participants, a total of 168 (42%) subjects had ocular morbidities. The most common condition found was refractive error (15.5%), followed by cataract (12.5%), conjunctivitis (8.75%), presbyopia (6.5%). Less common were glaucoma (2.75%), pterygium (2.25%), vitamin A deficiency disorders (1.75%), diabetic retinopathy (1.25%) and corneal opacity (0.75%). Ocular morbidity was found to be significantly greater in females, illiterates and those above 50 years of age ($p < 0.05$).

Conclusion: ocular morbidity was found to have a high prevalence in our study. The top two causes were refractive errors and cataract. There is an urgent need to strengthen primary eye care, community screening programs, and health education.

Introduction

Visual impairment and blindness represent a major global public health problem with significant social and economic implications. According to estimates, approximately 2.2 billion people across the globe suffer from near or distance vision impairment. Moreover, low- and middle-income nations bear the brunt of the burden [1]. India is home to 21 million visually impaired people and 2.4 million blind people, which represents one of the largest groups of such individuals in the world. The rural and semi-urban populations in central India carry the greater burden of this problem. They lack adequate access to health care infrastructure, awareness and specialist eye care services. Ocular diseases in the Indian community range from preventable to treatable and take on a wide spectrum. In India, cataract is responsible for more than 60% of all cases of blindness. As a result, cataract is the leading cause of blindness in India. Refractive errors are the most common

cause of visual impairment and remain widely under-corrected, especially in rural settings. [2] Other important causes of visual handicap include glaucoma, which is estimated to affect about 2.67% to 3.23% above 30 years of age in India. Often it goes undetected as symptoms do not manifest until late in the disease [4]. Vitamin A deficiency disorders along with conditions including conjunctivitis, pterygium, diabetic retinopathy and corneal opacities worsen preventable blindness [5,6]. Studies from different parts of India have reported the prevalence of ocular morbidity ranging from 13.9% to as high as 41.3% and this was dependent upon the age, sex, literacy and socio-economic status [7,8]. A study from rural central India revealed that the prevalence was 32.11% with myopia, conjunctival xerosis, and hypermetropia being the most common conditions. [9] In central India, researchers conducted a study in an urban slum, which found a prevalence reaching up to 40.38%. Thus, they emphasise that ocular disease is not confined to rural areas. [10] There is a lack of data on the prevalence in the community-based field practice area of tertiary health centres in central India. These data are vital for planning eye care interventions, determining resource needs and monitoring the implementation and impact of the National Programme for Control of Blindness and Visual Impairment (NPCBVI). The field practice area attached to a tertiary health centre as a sentinel site for community health research represents a mixed population with varied socio-demographic profiles. Gathering prevalence data from such areas will narrow the gap between what we observe in hospitals and what is actually happening in the community. The study's objectives were to estimate the prevalence of ocular diseases in field practice area, to describe the pattern and distribution of ocular morbidity and to know the association of socio-demographic data with the burden of ocular disease.

Material and Methods

Study Design and Setting

A community-based cross-sectional study was conducted in the field practice area attached to the tertiary health centre in central India. The field practice area comprised both rural and peri-urban settlements covering a population of approximately 25,000–30,000 individuals. The study was conducted over a period of 12 months.

Study Population and Sample Size

All individuals residing in the field practice area, aged 5 years and above, were eligible for inclusion. Individuals with prior ophthalmic surgeries in the preceding three months, those unwilling to participate, and those temporarily residing in the area were excluded. A sample size of 400 was calculated using the prevalence of 32% from a prior central India study [9], with 5% allowable error at 95% confidence interval, and a design effect of 1.5.

Multistage random sampling was employed. In the first stage, villages/wards were selected by systematic random sampling. In the second stage, households within selected clusters were identified using a systematic random approach with the help of voter lists and health worker registers. From each household, all eligible members were enrolled up to the required sample size.

Data Collection

Data were collected using a pre-tested, structured questionnaire administered through face-to-face interviews by trained field investigators. The questionnaire captured socio-demographic information (age, sex, education, occupation, socioeconomic status), history of ocular complaints, and known systemic diseases (diabetes mellitus, hypertension). Socioeconomic status was determined using the Modified Kuppuswamy Scale.

Ophthalmic Examination

All participants underwent a standardised ophthalmic examination by a qualified ophthalmologist. The examination included:

- **Visual acuity testing** using Snellen's chart at 6 metres in adequate illumination

- **Anterior segment examination** by slit-lamp biomicroscopy (torch and loupe for field settings)
- **Posterior segment examination** by direct and indirect ophthalmoscopy
- **Intraocular pressure measurement** by non-contact tonometry (Schiotz tonometer in field conditions)
- **Refraction** using trial lens sets with pin-hole testing
- **Assessment for vitamin A deficiency** signs (night blindness, Bitot spots, conjunctival xerosis, corneal lesions)
- **Cover test and ocular motility** assessment for strabismus

Ocular conditions were diagnosed and classified per standard definitions: cataract (lens opacity reducing visual acuity below 6/18), refractive errors (myopia, hypermetropia, astigmatism, presbyopia as defined by standard criteria), glaucoma (based on optic disc morphology and raised intraocular pressure >21 mmHg with field defects), diabetic retinopathy (fundus changes in known diabetic patients), pterygium (fibrovascular tissue encroaching cornea), and conjunctivitis (clinical signs of conjunctival inflammation).

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee. Informed written consent was obtained from all participants or their guardians in the case of minors. Participants detected to have ocular conditions were referred to the tertiary eye care centre for further management.

Statistical Analysis

Data were entered in Microsoft Excel and analysed using free online available statistical test web. Descriptive statistics including frequencies, proportions, and cross-tabulations were computed. Chi-square test was applied to determine association between categorical variables. A p-value of <0.05 was considered statistically significant.

Results-

Table 1: Socio-demographic Characteristics of Study Participants (n=400)

Characteristic	Category	Number (n)	Percentage (%)
Sex	Male	182	45.5
	Female	218	54.5
Age Group (years)	5–14	52	13.0
	15–29	88	22.0
	30–49	116	29.0
	50–64	96	24.0
	≥65	48	12.0
Residence	Rural	250	62.5
	Peri-urban	150	37.5
Education	Illiterate	154	38.5
	Primary/Middle	138	34.5
	Secondary and above	108	27.0
Socioeconomic Class	Lower	186	46.5
	Middle	146	36.5
	Upper	68	17.0

A total of 400 study participants were enrolled, with none refusing after offering consent. The average age of the participants was 36.4±14.8 years. Most (54.5%) were females. The majority of participants were from rural areas and peri-urban areas. With respect to literacy, 38.5% were illiterate, 34.5% had primary/middle education and 27.0% had secondary or above education. As per Modified Kuppaswamy scale, 46.5% belong to lower class, 36.5% middle class and 17.0% upper class (Table 1), thus showing the socio-economic profile of respondents.

Table 2: Pattern and Prevalence of Ocular Diseases (n=400)

Ocular Disease	Number of Cases (n)	Percentage (%)
Refractive errors (myopia/hypermotropia/astigmatism)	62	15.50
Cataract	50	12.50
Conjunctivitis (allergic + infective)	35	8.75
Presbyopia	26	6.50
Glaucoma (suspected + confirmed)	11	2.75
Pterygium	9	2.25
Vitamin A deficiency disorders	7	1.75
Diabetic retinopathy	5	1.25
Corneal opacity	3	0.75
Other conditions (dry eye, blepharitis, chalazion)	2	0.50
Total ocular conditions detected	210	—
Participants with ≥ 1 ocular condition	168	42.00

The prevalence and distribution of ocular conditions among the study participants (n=400) are reported in Table 2. Refractive error (including myopia, hypermetropia and astigmatism except for presbyopia) was the most common condition among 62 participants (15.5%). Cataract was diagnosed in 50 subjects. Combined allergic and infective conjunctivitis was noticed in 35 subjects (8.75%). Out of 400 patients, 26 patients (6.5%) were found to have presbyopia. Eleven subjects (2.75%) had glaucoma, suspected and confirmed. Pterygium was present in 9 participants (2.25%). Out of a total of four hundred participants who had ocular disorders, seven had Vitamin A deficiency disorders. Five participants, all already diagnosed with diabetes mellitus, were found with diabetic retinopathy. Corneal opacity or pathology was found in 3 (0.75%) subjects. The other conditions (dry eye; blepharitis; chalazion; strabismus) were found in 2-subjects (0.5%).

Table 3: Age-wise Distribution of Major Ocular Diseases (n=400)

Age Group	Refractive Errors	Cataract	Conjunctivitis	Presbyopia	Glaucoma	Total Morbidity (%)
5–14 yrs (n=52)	8 (15.4%)	0	4 (7.7%)	0	0	5 (9.6%)
15–29 yrs (n=88)	16 (18.2%)	0	10 (11.4%)	0	0	22 (25.0%)
30–49 yrs (n=116)	20 (17.2%)	8 (6.9%)	14 (12.1%)	10 (8.6%)	2 (1.7%)	38 (32.8%)
50–64 yrs (n=96)	14 (14.6%)	26 (27.1%)	6 (6.3%)	14 (14.6%)	6 (6.3%)	68 (70.8%)
≥ 65 yrs (n=48)	4 (8.3%)	16 (33.3%)	1 (2.1%)	2 (4.2%)	3 (6.3%)	35 (72.9%)

Ocular morbidity significantly increased with age. The proportion of participants with at least 1 ocular condition increased with age, from 7.0% for 5 to 14 year-olds to 88.8% in the ≥ 65 years group. A major share of cases of cataract were seen in older age groups (≥ 50 years) and refractive errors and vitamin A deficiency were common in children and young adults (Table 3). There was a statistically significant association between age and ocular morbidity ($\chi^2 = 87.34$; pvalue < 0.001).

Table 4: Sex-wise Distribution of Ocular Diseases

Ocular Disease	Males n=182 (%)	Females n=218 (%)	Total (%)
Refractive errors	31 (17.0%)	31 (14.2%)	62 (15.5%)
Cataract	10 (5.5%)	40 (18.3%)	50 (12.5%)
Conjunctivitis	16 (8.8%)	19 (8.7%)	35 (8.75%)
Presbyopia	10 (5.5%)	16 (7.3%)	26 (6.5%)
Glaucoma	6 (3.3%)	5 (2.3%)	11 (2.75%)

Total morbidity	64 (35.2%)	104 (47.7%)	168 (42.0%)
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The ocular morbidity in females was significantly more (47.7%, n= 104/218) compared to the males (35.2%, n= 64/182) ($\chi^2 = 6.18$; p= 0.013). Cataract occurred more frequently among the females (8.7% vs 5.5% in male), while error refractive was more common in males (17.0% vs 14.2% in females) (Table 4).

Table 5: Literacy-wise Distribution of Ocular Morbidity

Education Level	Number	With Ocular Morbidity n (%)
Illiterate	154	84 (54.5%)
Primary/Middle	138	58 (42.0%)
Secondary and above	108	26 (24.1%)
Total	400	168 (42.0%)

Illiterates had a significantly higher prevalence of ocular morbidity (54.5%, n=84/154) compared to literates with secondary or higher education (24.1%, n=26/108) ($\chi^2 = 29.7$; p<0.001). This is detailed in Table 5.

Discussion

The present community-based cross-sectional study found the overall prevalence of ocular morbidity to be 42.0% among residents of the field practice area of a tertiary health centre in central India. This finding is in concordance with other Indian community studies. According to Khandekar et al. [10], the prevalence in an urban slum of central India was 40.38% while Singh et al. [8] observed the prevalence of 41.3% in the rural population of eastern Uttar Pradesh. According to the Central India Eye and Medical Study, a large population-based study conducted in rural central India, there is a significant ocular disease burden.[4] The resemblance of these figures in different surroundings highlights the widespread ocular disease of the Indian community.

In the present study, refractive errors were the most common ocular disease (15.5%) among the subjects. According to results of a Southern India study conducted by Nirmalan et al., refractive errors were the main cause for visual impairment [7]. In addition, in a study involving a tertiary eye care centre in India, refractive error was responsible for 42% of ocular morbidities and 12% of blindness [11]. The major cause of vision impairment is not corrected vision errors. The World Health Organization (WHO) includes refractive error correction among its main priority interventions in the Vision 2020 program [2]. Based on the results of this study, there is a high prevalence of uncorrected refractive error especially among the younger age groups. Thus, there is a need for school-based vision screening programmes and refraction services at the primary healthcare level.

The second most prevalent ocular condition was cataract, which was present in 12.5% of all respondents and a high burden was among those aged 50 years and above. It is consistent with findings from various studies across India that cataract is the commonest cause of blindness, especially in the older rural population. As reported by Vashist et al. in the India Study of Age-Related Eye Disease (INDEYE), the prevalence of unoperated cataract among individuals aged ≥ 60 years was 58% in north India and 53% in south India.[3] A South Bihar community-based study reported the cataract prevalence of 52.1%. Among adults, the maximum burden was in more than 70 age groups [12]. According to the National Blindness and Visual Impairment Survey of India, cataract is the leading cause of blindness in India, both rural and urban[13]. The all-age characteristic of the study sample explains the relatively lower prevalence in our study (12.5% all age group) when compared with the age-specific estimates above. In this study, females had more cataract at 18.3% when compared to males which was only 5.5%. This finding is also seen in many of the other Indian studies. This could be due to exposure to UV light for a longer duration in females [3]. Also, hormones could be potentially responsible for this difference in occurrence.

Furthermore, this could also be due to the accessibility of cataract surgery to females when compared to males [13].

In the present study, conjunctivitis was the 3rd most common ocular morbidity affecting 8.75% of individuals. This study of Ethiopia discovered conjunctivitis as the most common ocular morbidity with the prevalence of 29% as compared to cataract [5]. In an Indian context of UP rural population, allergic conjunctivitis was 5.8% and infective conjunctivitis was 3.9% as per Singh et al [8]. Outbreaks of conjunctivitis occur occasionally, and trachoma a form of infective conjunctivitis is endemic in parts of central India [6]. In communities with poor sanitation, overcrowding, and a limited supply of clean water.

Of the participants, 6.5% had presbyopia and predominantly found in the 30-64 years age group. The study would likely have had a higher prevalence if it had restricted enrolment to adults aged more than 40 years. According to a study from rural central India, presbyopia is a frequent incident limiting quality of life and productivity among working-age adults [9].

Out of the total participants, 2.75% had glaucoma. A large population-based study conducted in rural central India (the Central India Eye and Medical Study) had also reported glaucoma prevalence of 2.67% among subjects aged 30 years and above [4]. The study conducted in eastern India on Hooghly River glaucoma reported a prevalence of 3.23% in urban and 2.70% in rural population.[14] A study done in rural south India reported a prevalence of primary open-angle glaucoma (POAG) of 1.62% among those aged 40 years and above [15]. Most glaucomas in India are not detected when a community survey is done. All relevant community surveys have shown that there is huge underdiagnosis of glaucoma. This highlights the need for active case finding and tonometry at the primary care level [4].

Of the total subjects, 2.25% had pterygium. Specimen had prolonged exposures to sunlight in adult subjects above the age of 30 years. Similar results were found in other studies involving Indian communities with reported pterygium rates ranging from 2 to 6% [7,9]. Prolonged exposure to ultraviolet light, dust and dry winds prevalent in Indian climate, are known risk factors for pterygium.

Among 1.75% of participants suffered from vitamin A deficiency (VAD) disorders; it was more in <14 years. Night blindness, Bitot's spot, and conjunctival xerosis were included. A study from the same Madhya Pradesh found VAD to be responsible for 26.7% of blindness in children [16]. The lesser prevalence of VAD reported in the present study as compared to older studies may be the result of the successful implementation of the National Vitamin A Supplementation Programme, though VAD continues to remain a public health problem in underserved communities of central India [16,17]. According to national nutrition surveys [17], conjunctival xerosis and bitot spots, mild forms of VAD, are common among pre-school children in rural India.

In 1.25% of subjects, all known cases of diabetes mellitus, diabetic retinopathy was detected. The type 2 diabetes mellitus is becoming more common in the Indian community which is associated with the silent progress of diabetic retinopathy. Therefore, regular fundus screening of all diabetic patients at the community level is necessary [13]. As urbanisation increases and lifestyles in central India rural areas change, diabetic retinopathy is likely to cause an increasing burden of eye disease. There were significant associations between socio-demographic factors and ocular morbidity. Women suffered greater ocular morbidity when compared to men (47.7% vs 35.2%). This finding corroborates with several studies from India [9,10]. Those who were not educated at all had the highest ever burden of ocular morbidity (54.5%) which can be attributed to lesser health-seeking behaviour. Also, unawareness of treatable conditions and lower socio-economic status may be the other probable causes for this phenomenon. The significance of targeted outreach programmes for women and illiterate communities, as well as eye care literacy, has been highlighted by these findings. A well-known association between ocular morbidity and older age may establish an association with ocular morbidity. In this study, there was a prevalence of 72.9 percent in older age group (≥ 65 years). This is comparable to a 88.8 percent in older age group in rural UP 8. Exact number will vary with age composition of community.

The community-based design of this study based on systematic random sampling with standardised ophthalmic examination by a qualified ophthalmologist and balanced representation of age groups, sex and socio-economic class contributes to strength of the study. The limitations of the cross-sectional study design were inability to make causal inferences. Furthermore, recall bias was present in history-taking as well. Additionally, it was restricted to a single field practice area, making them less generalisable. Moreover, tonometry and visual fields were unfeasible for complete glaucoma work-up in all subjects under field conditions.

Research findings in central India reveal high rates of preventable and treatable ocular conditions. These high rates support enhancing primary eye care infrastructure in this area. Priority actions required include strengthening vision centres at the primary health centre level; promoting mobile eye camps; training community health workers in basic vision screening; and timely cataract surgical coverage. The inclusion of eye healthcare into general health check-up camps and Rashtriya Bal Swasthya Karyakram (RBSK) for children would maximize reach and reduce the unmet burden of ocular morbidity.

Conclusion

The ocular morbidity was found to affect 42.0% of the people in our study. Three of the most common conditions were refractive error, cataract, and conjunctivitis. Ocular problems were more common among females, older age groups and illiterates. Many of these conditions were preventable or treatable and shows the need for eye screening camps, outreach programmes and strengthening of primary eye care services in the community level in central India.

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