ORIGINAL ARTICLE

# Prevalence and Pattern of Ocular morbidity amongst school going children in rural and urban areas of Aligarh

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## Citation

Siddiqui Z, Singh N, Kahn AA, Abedi AJ, Siddiqui AJ, Zubair MY. Prevalence and Pattern of Ocular morbidity amongst school going children in rural and urban areas of Aligarh. Indian J Comm Health. 2023;35(3):270-275. https://doi.org/10.47203/IJCH.2023.v35i03.004

**Source of Funding:** Nil **Conflict of Interest:** None declared

## Article Cycle

**Received:** 07/02/2023; **Revision:** 15/07/2023; **Accepted:** 27/08/2023; **Published:** 30/09/2023



## Abstract

**Introduction:** Many ocular diseases have their origin in early childhood and if the morbidity goes unnoticed it may adversely affect the child's school performance and may also cause severe ocular disability in the later part of life. An early recognition and intervention leads to lifelong impact. **Objective:** To study the prevalence and pattern of various ocular morbidities in school going children of urban and rural areas of Aligarh. **Methods:** This was a cross-sectional study carried out from October 2017 to July 2019 in 10 schools in Aligarh, a district in North Western UP. Schools from urban and rural areas were listed and 5 urban and 5 rural schools were selected by lottery method. **Results:** Of the total 9982 students enrolled in study, 5742 children were from urban schools, and 4240 children were from rural schools. A total 2189 students were found to be suffering from various ocular morbidities, yielding an overall prevalence of ocular morbidity of 21.93%. The prevalence in urban and rural schools was 22.41% and 21.27% respectively (P=.286). Refractive error was found to be the most common ocular morbidity followed by Vitamin A Deficiency. **Conclusion:** Refractive errors and Vitamin A deficiency were the most common ocular disorders identified which are preventable and treatable causes of childhood blindness. These conditions can be easily identified by regular eye screening programs and promptly corrected. Awareness among school teachers should also be improved and they should play an active role in identifying the ocular problems and referring them for timely management.

## Keywords

Ocular Morbidity; School Going Children; Refractive Errors; Vitamin A Deficiency

## Introduction

Eye is the most important special sense organ in a human being. Normal vision is necessary for optimum physical, mental, and psychological development. Thus, childhood blindness accounts for one third of the economic cost of blindness, although it represents <4% of the overall magnitude.(1) Unfortunately, today, in the world, a child goes blind every minute.

Among the 1.4 million blind children worldwide, 73% live in low income countries.(2) Also 7 million children suffer from low vision, and approximately 10 million children have correctable refractive error causing visual impairment (visual acuity of <6/18 in the better eye).(3)

The control of blindness in children has been considered as a high priority within the "WHO's Vision 2020 The Right to Sight". Vision 2020: The Right to Sight has included the correction of refractive errors as a priority component within the planned areas of action.(4) Factors other than refractive errors such as amblyopia, strabismus, vitamin A deficiency, pediatric cataract, corneal opacities, lid abnormalities, and retinal diseases are largely unaccounted causes for ocular morbidity in children. The presence of any of these morbidities affects the learning ability of a child and also has an impact on adjustment in the school and personality development as a whole.

Children usually do not complain, and may not be even aware of defective vision. They try to acclimatize to the problem of defective vision by sitting in the front benches, holding the books close to their eyes, or squeezing the eyes. Many ocular diseases have their origin in early childhood and if the morbidity goes unnoticed it may adversely affect the child's school performance and may also cause severe ocular disability in the later part of life. An early recognition and intervention leads to lifelong impact. A big share of visual impairment is refractive error, which in these days has excellent treatment modalities which are effective, convenient, comfortable and within people's economic capabilities. Myopia is the commonest type of refractive error in school going children and its timely and proper correction with spectacle saves permanent ocular morbidity.(5)

A comprehensive data on causes and prevalence of ocular morbidity in children is essential for planning and evaluating, preventive and curative services for children in a given region. Unfortunately, there is paucity of data from Uttar Pradesh, especially in rural sector. So the present cross-sectional study was conducted to know the prevalence and pattern of various ocular morbidities in school going children of urban and rural areas of Aligarh.

## Aims & Objectives

1. To estimate the prevalence of ocular morbidity in school going children in rural and urban areas of Aligarh.
2. To study the pattern of various ocular morbidities in school going children in rural and urban areas of Aligarh.

## Material & Methods

The present study was a cross-sectional study carried out from October 2017 to July 2019 in 10 schools (5 urban and 5 rural) in Aligarh, a district in North Western Uttar Pradesh. Schools from urban and rural areas were listed and 5 urban and 5 rural schools were selected. The sampling design was two stage cluster sampling, in the first stage schools were randomly selected by lottery method and in the second stage classes within the schools were randomly selected, again by lottery method. All the students in selected classes who met the inclusion and exclusion criteria were enrolled in the study.

A total of 9982 school children aged 5-15 years were studied.

**Equipments used in examination:**

- Torch
- Magnifying loupe
- Visual acuity measurement chart (Non-illuminated) for distance and near
- Trial set and trial frame
- Ishihara's chart
- Direct ophthalmoscope
- Streak retinoscope

**Ocular Examination:** After the assessment of Visual acuity, all children underwent comprehensive ocular examination (including detailed history of present and past ocular problems, along with relevant family history).

The findings, both normal and abnormal were documented in the proforma. Those detected with stye, blepharitis and conjunctivitis were advised appropriate treatment following ocular examination at school and were asked to follow-up in Out Patient Department (OPD) of Jawahar Lal Nehru Medical College (JNMC) AMU, Aligarh. Vitamin A Deficiency was diagnosed based on presence of Bitot's spot, conjunctival and corneal xerosis and night blindness. Strabismus was diagnosed by recording Hirschberg corneal light reflex combined with extra ocular movements and cover -uncover tests. A probable diagnosis of amblyopia was made if the vision was <6/9, not improving with pin hole and no organic lesion was detected after complete ocular examination. Simultaneously, undilated fundus examination of these children was also performed using direct ophthalmoscope. The children who were found to have defective colour vision, were given a letter for their parents informing them about the condition and related counselling.

All students were educated regarding maintainance of good ocular health including information about early recognition of ocular symptoms and early seeking of care.

**Data Management:** Data was entered in Microsoft Excel and was imported to IBM®SPSS (version 20.0) for analysis. Chi square test was used to assess the statistical significance of differences in various groups.

**Ethical Approval:** Ethical clearance was obtained from the Institutional Ethics Committee, Jawaharlal Nehru Medical College, AMU, Aligarh. The school administration and Principal were informed about the study and formal permission was taken from the Principal of respective schools for examining their students. Also, an informed consent was obtained from the parents or guardians of the children through the school management.

## Results

Of the total 9982 students enrolled in study, 5742 children were from urban schools, and 4240 children were from rural schools. Out of total 5742 students from urban schools, there were 1520 students in the age group of 5-8 years, 2008 students in the age group of 9-12 years, and 2214 children in the age group of 13-15 years. Among 4240 rural school children, 653 students were in the age group of 5-8 years, 1907 students in the age group of 9-12 years, and 1680 students in the age group of 13-15 years (Table 1).

Out of the total 5742 students from urban schools, 3132 (54.55%) were male and 2610 (45.45%) were female, with a sex ratio of 1.2:1, while, out of 4240 children from rural schools, 2674 (63.07%) were male and 1566 (36.93%) were female, with sex ratio of 1.7:1. Thus, proportion of female students was significantly less in rural schools compared to urban schools (P<.001, Table 2).

Out of 9982 students examined, 2189 students were found to be suffering from various ocular morbidities, giving an overall prevalence of ocular morbidity of 21.93%. Among urban schools, out of 5742 children examined, 1287 children were found to be suffering from various forms of ocular morbidities, giving a prevalence of 22.41%. While among 4240 rural school children examined, 902 children were found to be suffering from various forms of ocular morbidities, giving a prevalence of 21.27% (P = .286, Table 3)

There were 2057 (20.61%) students who were suffering from single type of ocular morbidity, while 132(1.32%) children were having two or more ocular morbidities.

***Pattern of Ocular Morbidities:*** Refractive error was found to be the most common ocular morbidity, affecting 1504 (15.07%) school children with ocular morbidity, followed by Vitamin A Deficiency 267 (2.67%), Infective Conjunctivitis 210 (2.10%), Blepharitis 66 (0.66%), 52 (0.52%) cases of Vernal keratoconjunctivitis (VKC), 40 (0.40%) cases of stye, 24 (0.24%) cases of Squint, 10 (0.10%) cases of Chalazion, 5 (0.05%) students each had defective Colour vision and Ptosis. Corneal opacity was seen in 3 (0.03%) cases, coloboma in 2 (0.02%) cases, with artificial eye being worn by 1 (0.01%) student (Table 4).

Refractive error was more common in urban compared to rural school children (19.85% vs 8.58%, p<.001), while vitamin A deficiency (5.54% vs 0.56%, P<.001), Infective conjunctivitis (3.87% vs 0.80%, P<.001), Blepharitis (1.13% vs 0.31%, P=.003) and Vernal Keratoconjunctivitis (0.75% vs 0.35%, P=.005) were more prevalent in rural compared to urban school children.

**Age wise distribution of ocular morbidities:** Among 2189 students affected, 662 (30.46%) children belonged to the age group of 5-8 years, while 711 (18.16%) children were affected in the age group of 9-12 years, and 816 (20.95%) children were affected in the age group of 13-15 years.

Among 1287 students affected in urban areas, 408 (26.84%) children belonged to the age group of 5-8 years, while 419 (20.86%) children were affected in the age group of 9-12 years, and 460 (20.77%) children were affected in the age group of 13-15 years.

Among 945 students affected in rural area, 254 (38.90%) children belonged to the age group of 5-8 years, 292 (15.31%) children belonged to the age group 9-12 years, and 356 (21.19%) children belonged to the age group 13-15 years. Thus, in the 5-8 years age group ocular morbidity was more prevalent in rural school children while in 9-12 years it was more common in urban school children (Table 5).

Out of 2189 affected children, 1244 were male, and 945 were females with a prevalence of 21.43% and 22.63% in males and females respectively (P=.151, Table 6).

Amongst total 1287 affected children from urban schools, 712 were male, and 575 were females with a prevalence of 22.73%, and 22.03% respectively (P=.525).

Amongst total 945 affected children from rural schools, 532 were males, and 370 were females with a prevalence of 19.90%, and 23.63% respectively (P=.004).

## Discussion

It is urgent to treat childhood eye diseases because failure of development of normal visual system cannot be corrected in adult age. The causes of childhood blindness may vary from region to region, commonly determined by the socio-economic development and the availability of primary health and eye care services. Effective methods of eye screening in school children are useful in detecting causes of decreased vision which are correctable, especially refractive errors and in minimizing long-term visual disability. Schools are one of the best centers for effectively implementing the comprehensive eye healthcare program.

**Prevalence of ocular morbidities:** Out of 9982 students enrolled in our study, 2189 students were found to be suffering from various ocular morbidities with an overall prevalence of 21.93 %. In a similar cross-sectional study to screen school children from randomly selected schools in urban and rural areas of West Uttar Pradesh, Singh V. et al(6) reported an overall prevalence of ocular morbidity to be 29.35%. Reddy S et al(7) found a prevalence of 28.6% among primary school children of Delhi area. Gupta M. et al(8) in their study in government and private coeducational schools selected by stratified random sampling in Shimla reported a prevalence of ocular morbidity of 31.6% (CI=29.9-32.1%). Meundi AD et al.(9) in their study in 2014 in school children of South India found the prevalence of ocular morbidity to be 20.12%. Amol Bansal et al (10) in Kolar District, South India in 2012 found 13.32% prevalence of ocular morbidities. In the Kariapatti pediatric eye evaluation project initiated by Arvind Eye Hospitals, Nirmalan PK et al(11 )in 2007 found a prevalence of 13.6%. Harpal Singh(12) in Bhopal in 2007, found ocular morbidity of 14.5%. Prajapati et al(13) in 2009 in Gandhinagar reported a 13% prevalence.

We found a similar prevalence of ocular morbidity in urban school children and rural school children (22.41% and 21.27% respectively). Singh V. et al(6) found a prevalence of 28.65% in urban schools and 30.05% in rural schools.

Out of 2189 affected students, 2057 students were suffering from single type of ocular morbidity, while 119 children were having two different types of ocular morbidities, and 13 children were found to be suffering from three types of ocular morbidities.

Out of 2189 affected children, 1244 were male, and 945 were females with a prevalence of 21.43% and 22.63% in males and females respectively (P=.151).

Amongst total 1287 affected children from urban schools, 712 were male, and 575 were females with a prevalence of 22.73%, and 22.03% respectively (P=.525).

Amongst total 945 affected children from rural schools, 532 were males, and 370 were females with a prevalence of 19.90%, and 23.63% respectively (P=.004). Thus, we found a significantly higher prevalence of ocular morbidity in female children in rural schools. Singh V. et al(6) reported a similar prevalence in males and females (30.04% and 30.07% respectively) of rural schools.

In urban schools, we found a prevalence of 26.84% in children aged 5-8 years, 20.86% in children aged 9-12 years, 20.77% children were affected in the age group of 13-15 years. In rural schools, 38.90% children belonged to the age group of 5-8 years, 15.31% children belonged to the age group 9-12 years, and 21.19% children belonged to the age group 13-15 years. In other studies Kumar et al(14) and Singh V. et al(6) have reported increasing prevalence with age. Desai et al.(15) reported a decreasing pattern with age. We did not find an increasing or decreasing pattern with age.

In the present study, refractive error was the most common cause of ocular morbidity with a prevalence of 15.07%. Gupta M et al(8) also found refractive error as the most common disorder, with a prevalence of 22%. Das et al(16) in Kolkata and Desai et al(15) in Jodhpur also reported a similar prevalence of 25.11% and 20.8%, respectively. Singh V. et al(6) also reported refractive error as the most common ocular morbidity with a prevalence of 17.36%. Shrestha et al(17,18 )in their study in 2006 and 2011 in Nepal reported a prevalence of refractive error to be 21.9% and 11.9% respectively. Lu et al(19) also found a comparable refractive error prevalence of 11.07% in Maqin county, China. Mallika MCV et al(20) showed that the leading cause of ocular morbidity was refractive error (17.9%) followed by Vitamin A deficiency (9.6%), Conjunctivitis (0.9%), Blepharitis (0.3%), Squint (0.1%), Colour blindness (0.1%) and Ptosis (0.01%). Pankaj Kumar et al(21) also reported that refractive error was the most common form of ocular morbidity (6.22%), followed by Vitamin A deficiency (2.77%), conjunctivitis (1.47%) and stye (1.12%). Rajesh Kumar et al(22) found refractive errors (5.4%) being most common form of ocular morbidity, followed by conjunctivitis (4.6%), trachoma (4.3%), xerophthalmia (4.1%), stye (1.3%) and others.

Higher prevalence of refractive errors could be due to defective reading habits, studying with books held very close to face, lying down posture, dim illumination, more indoor games and lack of awareness regarding their ocular condition. Also, increasing level of stress regarding education and prolong hours of continuous studies adds to the increasing prevalence of refractive errors with age. Refractive errors, though most common ocular morbidity in terms of prevalence, but they are the most manageable and avoidable ocular morbidities, with inexpensive, effective method in the form of corrective spectacles. This underscores the importance of early identification and correction for optimum growth and development in early childhood.

Vitamin A Deficiency (2.67%) was the second most common ocular morbidity in our study followed by Infective Conjunctivitis (2.10%), Blepharitis (0.66%) and Vernal keratoconjunctivitis (0.52%). Gupta M et al(8) and Desai et al(15) found Vitamin A deficiency prevalence of 1.8% and 5.39% respectively in their studies. Gupta M et al(8) reported bitot's spots in 0.90% children. Kumar et al. reported xerophthalmia in 4.1% children. A study by Wedner et al(23) in a rural area of Tanzania reported night blindness in 5.3%, bitot's spots in 0.6%, and corneal scars in 0.8% of children in their study. Another study by Nepal et al(24) reported xerophthalmia in 0.36% children. All these results are comparable with results from our study.

## Conclusion

Our study identified a considerably high prevalence of ocular morbidity among school going children in Aligarh district, UP. Refractive errors and Vitamin A deficiency were the most common ocular disorders identified which are preventable and treatable causes of childhood blindness. Both these ocular conditions can be easily identified by regular eye screening programmes and promptly corrected. Awareness among school teachers should also be improved and they should play an active role in identifying the ocular problems and referring them for timely management. The importance of wearing spectacles and the consequences of not using them should be explained to children. A strict implementation of school health programme should be ensured and suitable action needs to be taken.

## Recommendation

Early detection and timely intervention of ocular morbid conditions in children is of utmost importance with lifelong consequences. School eye health program needs to be strengthened for effective and timely screening of common ocular problems. Also, children and parents needs to be made aware of symptoms and seeking of care at appropriate health facility.

## Limitation of the study

Ocular examination including visual acuity assessment is ideally a dark room procedure, the same could not always be ensured in schools.

## Relevance of the study

The study reports findings from rural and urban areas of western UP where no previous study on this magnitude was conducted. The latest findings from the study shall inform policy making regarding service delivery.

## Authors Contribution

All authors have contributed equally.

## Acknowledgement

The authors heartily thank the parents, the school management and the students for their active and voluntary participation and co-operation.

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## Tables

### TABLE 1: AGE DISTRIBUTION OF STUDY POPULATION

| Age Group (years) | Number of Students in Urban Schools (%) | Number of Student in Rural Schools (%) | Total (%) |
|---|---|---|---|
| **5 – 8** | 1520 (26.47) | 653 (15.40) | 2173 (21.77) |
| **9 – 12** | 2008 (34.97) | 1907 (44.98) | 3915 (39.22) |
| **13 – 15** | 2214 (38.56) | 1680 (39.62) | 3894 (39.01) |

### TABLE 2: GENDER WISE DISTRIBUTION OF CHILDREN IN RURAL AND URBAN SCHOOLS

| Gender | Urban School n (%) | Rural School n (%) | Significance |
|---|---|---|---|
| **Male** | 3132 (54.55%) | 2674 (63.07%) | P<.001 |
| **Female** | 2610 (45.45%) | 1566 (36.93%) | |

### TABLE 3: PREVALENCE OF OCULAR MORBIDITIES IN THE STUDY POPULATION

| | Urban Schools | Rural Schools | Total | p-value |
|---|---|---|---|---|
| **Total number of children with ocular morbidities** | 1287 | 902 | 2189 | 0.286 |
| **Number of Students examined** | 5742 | 4240 | 9982 | |
| **Prevalence of ocular morbidity** | 22.41% | 21.27% | 21.93% | |

### TABLE 4: PATTERN OF OCULAR MORBIDITIES IN THE STUDY POPULATION OF SCHOOL CHILDREN

| Ocular Morbidity | Urban n=1287 | Rural n=902 | Total n=2189 | *p* value |
|---|---|---|---|---|
| **Refractive errors** | 1140 (19.85%) | 364 (8.58%) | 1504 (15.07%) | <.001* |
| **Vitamin A deficiency** | 32 (0.56%) | 235 (5.54%) | 267 (2.67%) | <.001* |
| **Infective conjunctivitis** | 46 (0.80%) | 164 (3.87%) | 210 (2.10%) | <.001* |
| **Blepharitis** | 18 (0.31%) | 48 (1.13%) | 66 (0.66%) | 0.003* |
| **Vernal keratoconjunctivitis** | 20 (0.35%) | 32 (0.75%) | 52 (0.52%) | 0.005* |
| **Stye** | 12 (0.21%) | 28 (0.66%) | 40 (0.40%) | 0.115 |
| **Squint** | 8 (0.14%) | 16 (0.38%) | 24 (0.24%) | 0.016* |
| **Chalazion** | 2 (0.03%) | 8 (0.19%) | 10 (0.10%) | 0.016* |
| **Defective colour vision** | 3 (0.05%) | 2 (0.05%) | 5 (0.05%) | 0.910 |
| **Ptosis** | 2 (0.03%) | 3 (0.07%) | 5 (0.05%) | 0.427 |
| **Corneal opacity** | 2 (0.03%) | 1 (0.02%) | 3 (0.03%) | 0.748 |
| **Coloboma** | 1 (0.077%) | 1 (0.11%) | 2 (0.09%) | 0.829 |
| **Artificial eye** | 1 (0.077%) | 0(0.00%) | 1 (0.04%) | |

### TABLE 5: AGE-WISE DISTRIBUTION OF OCULAR MORBIDITIES

| Age Group (Years) | Urban (n=1287) | Rural (n=945) | Total Children (n=2189) |
|---|---|---|---|
| **5 - 8** | 408 (26.84%) | 254 (38.90%) | 662 (30.46%) |
| **9- 12** | 419 (20.86%) | 292 (15.31%) | 711 (18.16%) |
| **13–15** | 460 (20.77%) | 356 (21.19%) | 816 (20.95%) |

### TABLE 6: GENDER WISE DISTRIBUTION OF OCULAR MORBIDITIES

| | Male | Female | Significance |
|---|---|---|---|
| Urban | 712 (22.73%) | 575 (22.03%) | P=.525 |
| Rural | 532 (19.90%) | 370 (23.63%) | P=.004* |
| Total | 1244 (21.43%) | 945 (22.63%) | P=.151 |