Research Article

# Prevalence of eye problems among primary schoolboys in Jeddah, Saudi Arabia: a survey study

Raed Abdulaziz Abu Al-Aadel[1], Ali Ahmed Al-Zahrani[1], Ashjan Abdulraouf Rahim Jan[2], Reham Hamed Al-Saidlani[3]

[1]Department of Ophthalmology, Jeddah Eye Hospital, Jeddah, Saudi Arabia.
[2]Faculty of Medicine, Taif University, Taif, Saudi Arabia.
[3]Faculty of Medicine, Ibn Sina University, Jeddah, Saudi Arabia.
Correspondence to: Raed Abdulaziz Abu Al-Aadel, E-mail: raed.abu.al3adel@me.com

Received January 28, 2016. Accepted February 9, 2016

**Abstract**

**Background:** Refractive error—at all ages—is one of the most common causes of visual impairment around the world and the second leading cause of treatable blindness. Most of children with uncorrected refractive error are asymptomatic and thus screening helps in early detection and timely interventions.

**Objective:** To estimate the prevalence of eye problems and the related factors among male students in primary schools in Jeddah.

**Materials and Methods:** A multistage cluster sampling technique was adopted where three schools were randomly chosen from three districts of the city (poor, medium, and wealthy districts). A specially designed questionnaire was filled by the students followed by their eye examination at school.

**Result:** The chief complaints were eye itching (8.1%) and lacrimation (6.6%). The eye examination findings were allergic conjunctivitis (14%). From a total of 184 students, 23.9% were suffering of visual acuity less than 6/6 in either one or both eyes. Logistic regression models showed that the presence of a vision problem in father and/or mother was a highly significant predicting factor (adjusted odds ratio [OR] = 2.2) followed by the low-standard school district (adjusted OR = 1.8).

**Conclusion:** This study showed that the prevalence of eye problems and refractive errors among primary schoolboys in Jeddah is high and it presents a challenge to family and public health. This situation necessitates the implementation of repeated regular vision screening programs in primary schools and preferably in the preschool age also.

**KEY WORDS:** Eye problems, refractive error, primary school students

## Introduction

A global coalition of nongovernmental organizations and the World Health Organization launched the "Vision 2020: The Right to Sight" initiative. Refractive errors correction is considered as the main step for the elimination of preventable visual impairment and blindness. Vision 2020 initiative has given high priority to the correction of refractive errors and has placed it within the category of "childhood blindness."[1] Refractive error—at all ages—is one of the most common causes of visual impairment around the world and the second leading cause of treatable blindness. Most of the children with uncorrected refractive errors are asymptomatic and thus screening helps in the early detection and timely interventions.[2]

A series of population-based surveys of refractive error and visual impairment in school-age children were conducted worldwide in populations with different ethnicity and cultural backgrounds,[3] a rural district in eastern Nepal,[4] an urban area in Santiago, Chile,[5] a rural district near Hyderabad, India,[6] and a semi-urban area in Egypt.[7]

In Saudi Arabia, a study that was done in Al Baha region in 1990,[8] involving primary schoolboys of five villages (3,590 schoolboys from 15 schools) showed that the main causes of visual impairment were refractive error (7.2%) and amblyopia (1.6%). Seventeen (0.5%) boys had strabismus. Eye allergy

| Access this article online | |
|---|---|
| Website: http://www.ijmsph.com | Quick Response Code: |
| DOI: 10.5455/ijmsph.2016.28012016346 | |

was found in 204 students (5.7%). Four hundred and forty-nine students (26.4%) had nonspecific conjunctivitis, 173 (4.8%) had bacterial conjunctivitis, and 28 (0.8%) had blepharitis. In Quassim region, a study in 2014 on 5,176 children (mean age 9.5 ± 1.8 years) showed that the overall prevalence of refractive errors in the better eye was 18.6% ($n$ = 963), and the prevalence of uncorrected errors was 16.3% ($n$ = 846).[9] Another study involved a total of 2,246 Saudi primary school children of both genders aged 6 to14 years, who were selected using a multistage sampling method from 30 primary schools located in three different areas of Al Hassa. Of the screened school children ($N$ = 2,002), the overall prevalence of refractive errors was 13.7% ($n$ = 274), higher among females (odds ratio [OR] = 1.39, $p$ = 0.012) and significantly more among students of rural residence (OR = 2.40, $p$ = 0.001).[10]

The aim of this study was to have a firsthand screening of the prevalence of different eye problems among male students in primary schools in Jeddah city, Saudi Arabia and the relation, if any, of the revealed defective vision acuity with some demographic and socioeconomic conditions to help in preventing these problems through designing the needed preventive health services.

## Materials and Methods

This study was a cross-sectional study conducted in primary schools in Jeddah City. Jeddah is one of the modern cities of Saudi Arabia, with a substantial share in the economy of the country and had, in the early modern history of the country, a considerable influx of immigrants from many regions of the world. The city might be considered as the second capital of the country with a population of nearly 4.8 million people. However, as in most highly active economic cities some poor areas are also present. The governmental schools are only for Saudi nationals.

In this study, we opted for a vision screening rather than a comprehensive eye examination for many reasons. Apart from the logistic reasons, the other reasons included anticipation of refusal of many parents' of boys and schools administrators to break the scholar day to undergo a complete eye examination besides the difficulty in providing a place for this procedure, the use of ophthalmoplegics, and the hazards of letting a boy with a defective vision for a couple of hours afterward. Moreover, it was found that only approximately 2% to 4% of children of that age have an eye problem that requires treatment, so it is neither practical nor cost-effective to perform a comprehensive eye examination on every child.[11] Surveys involving vision screening are more efficient and cost-effective (which allows many more children to be examined) than a complete examination on every child.[12] In addition, some problems are missed on a one-time comprehensive eye examination, so it is preferable to have several screenings performed over time.

The sample size was calculated to be approximately 400 students, for an expected percentage of 50% with a margin of error 5% and a confidence level of 95%.[13] The sampling technique used was the multistage cluster sampling technique where three schools were randomly chosen from three districts of the city (poor, medium, and wealthy districts) to include a random number of 30 classes (10 from each school). It was decided to increase the number to 800 students to make up for the clustering effect, possible absenteeism, and refusal to share.

All students of the class accepting to participate according to the applied ethics procedures were included. After the approval of the Directorate of Education in Jeddah, an arrangement with the selected schools was made and a letter was sent to the parents explaining the simple procedure to be adopted and asking to fill the questionnaire and to sign the approval form. The whole procedure was revised by the ethics committee of the faculty of medicine of King Abdulaziz University (KAU) and its clearance was obtained before starting the field study in schools. A structured questionnaire was specially designed comprising socioeconomic data, eye complaints, and past history of diseases or injuries, medications, and surgeries relevant to eye problems. The questionnaire was filled by the parents at home and in rare occasions the parents phoned to the first author (a senior ophthalmology resident) asking some specific questions related to some items. The process of eye examination was conducted according to the screening process of the American Association of Family Physicians[14] and comprised assessment of the visual acuity performed using Snellen chart at 6 m in good lighting room, which was provided by the schools visited for the examination. This was followed by performing the pinhole acuities.

Ocular motility was assessed by asking the student to follow a pen with both eyes as it is moved in each of the eight cardinal directions of gaze. The external examination of the eyes consisted of inspection of the eyelids, surrounding tissues, and palpebral fissure. The conjunctivae and sclera were examined by having the student look upward and shining a light while retracting the upper or lower eyelid. Strabismus was screened by Hirschberg test and the red reflex was performed using an ophthalmoscope in a dimly lit room. All the eye examinations were uniquely performed by the first author. If a child has known risk factors for eye disease or there is a family history of pediatric eye disease, or if a child has signs or symptoms suspicious for a vision problem, a comprehensive eye examination was arranged in the eye hospital. The study took place in the months of February, March, and April 2015.

The collected data were validated and entered in an SPSS program, version 20, for statistical processing. The bivariate analyses were performed as a first step and later the significant variables were entered in several models of logistic regression analyses. The significance level adopted was $p < 0.05$.

## Result

The response rate was 96.13% (769 students). The mean and median ages of the studied sample of students were 9.5 and 9 years, respectively, with a standard deviation of 1.86 years. The minimum and maximum ages were 5 and 15 years, respectively.

Table 1 shows the results of some indicators of the socioeconomic and demographic factors of the studied group of students. The number of students coming from high-standard home or high-standard school districts represented the lowest percentages (7.4% and 25.6%, respectively). About one-third of the students came from families gaining less than 5000 Saudi riyal (SR)/month. The majority of the fathers had governmental jobs (46.6%) whereas working mothers were 25% of the studied group.

Table 2 describes the frequencies and types of eye complaints and findings. It shows that 107 students (13.9%) (95% confidence interval [CI]: 11.57–16.59) suffered from vision complaints and half of them (57 students) were actually wearing glasses either some time or all the time. The chief complaints on eye examination findings were eye itching (8.6%) and lacrimation (6.6%). Double vision (diplopia) was complained by 12 students (1.6% [95% CI: 0.85–2.70]). Strabismus was found in 32 students (4.2% [95% CI: 2.91–5.89]) and amblyopia was detected in 22 students (2.9% [95% CI: [1.84–4.37]). A total of 184 students (23.9% [95% CI: 21.0–27.1]) were suffering from visual acuity of less than 6/6 in either one or both eyes.

Table 3 shows the results of the bivariate analysis between the students with defective visual acuity as the dependent factor and some selected demographic and socioeconomic factors as the independent factors. It shows that the visual acuity is significantly abnormal in students studying in low-standard district schools (OR = 1.75, 95% CI: 1.15–2.67) and in students belonging to the families where the father and/or mother have vision problems (OR = 2.24, 95% CI: 1.58–3.16) as well as in students with a brother and/or sister having vision problem (OR = 1.70, 95% CI: 1.16–2.49).

**Table 1:** Sociodemographic factors of the studied sample of students

| Sociodemographic factors | Number of students (*n* = 769) | Percentage (%) |
|---|---|---|
| School district | | |
| High standard | 197 | 25.6 |
| Medium standard | 294 | 38.2 |
| Low standard | 278 | 36.2 |
| Home district | | |
| High standard | 57 | 7.4 |
| Medium standard | 417 | 54.2 |
| Low standard | 295 | 38.4 |
| Home type (*n* = 687) | | |
| Owned | 376 | 54.7 |
| Rented | 311 | 45.3 |
| Income/month (Saudi riyal [SR]) | | |
| Less than 5000 SR | 235 | 30.6 |
| More than 5000 SR | 534 | 69.4 |
| Family member with vision problem | | |
| Father | 294 | 38.2 |
| Mother | 185 | 24.1 |
| Sister | 108 | 14.0 |
| Brother | 102 | 13.3 |
| Father's job | | |
| Government sector | 358 | 46.6 |
| Private sector | 280 | 36.4 |
| Other (retired, not working, deceased) | 131 | 17.0 |
| Mother's job | | |
| Government sector | 139 | 18.1 |
| Private sector | 52 | 6.8 |
| Other (retired, not working, deceased) | 578 | 75.1 |

**Table 2:** Percentages and 95% confidence intervals of the various eye complaints among the students sample

| Complaints | Number of students (*n* = 769) | Percentage (%) | 95% CI |
|---|---|---|---|
| Vision complaints | 107 | 13.9 | 11.57–16.59 |
| Students wearing glasses | 59 | 7.7 | 5.94–9.84 |
| Eye complaints: | | | |
| Itching | 62 | 8.1 | 6.32–10.30 |
| Lacrimation | 51 | 6.6 | 5.02–8.69 |
| Eye pain | 41 | 5.3 | 3.90–7.23 |
| Diplopia | 12 | 1.6 | 0.85–2.79 |
| Total | 166 | 21.6 | 17.26–23.04 |
| External eye examination | Number of students (*n* = 769) | Percentage (%) | CI 95% |
| Allergy | 106 | 13.8 | 11.47–16.46 |
| Strabismus | 32 | 4.2 | 2.91–5.89 |
| Amblyopia | 22 | 2.9 | 1.84–4.37 |
| Chalazion | 5 | 0.7 | 0.24–1.60 |
| Sty | 3 | 0.4 | 0.10–1.24 |
| Viral conjunctivitis | 3 | 0.4 | 0.10–1.24 |
| Macropthalmos | 1 | 0.1 | 0.01–0.84 |
| Total | 187 | 24.3 | 21.34–27.52 |
| Visual acuity less than 6/6 | | | |
| Right eye | 150 | 19.5 | |
| Left eye | 149 | 19.4 | |
| Either or both eyes | 184 | 23.9 | 20.96–27.11 |

**Table 3:** Results of the bivariate analysis of students' abnormal vision as the dependent factor and different independent factors (OR and 95% CI)

| Independent factors | Normal vision *N* (%) | Abnormal vision *N* (%) | OR (95% CI) |
|---|---|---|---|
| School district (low standard) | 427 (72.1) | 145 (81.9)* | 1.75 (1.15–2.67)* |
| Home district (low standard) | 217 (36.7) | 74 (44.1) | 1.36 (0.98–1.64) |
| Monthly income (less than 5.000 SR) | 175 (29.6) | 59 (33.3) | 1.19 (0.83–1.71) |
| Father/mother vision problems | 254 (42.9) | 111 (62.7)* | 2.24 (1.58–3.16)* |
| Sister/brother vision problems | 119 (20.1) | 53 (29.9)* | 1.70 (1.16–2.48)* |

OR, odds ratio; CI, confidence interval; SR, Saudi riyal.
*$p<0.05$

**Table 4 A:** Logistic regression model showing the adjusted OR and 95% CI of the dependent factors affecting vision defects of students

| Independent factors | *B* | Significance | Adjusted OR | 95% CI | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| Family income | –0.222 | 0.417 | 0.801 | 0.469 | 1.369 |
| Father/mother vision defect | 0.798 | 0.000 | 2.222 | 1.555 | 3.173* |
| Low-standard school district | 0.594 | 0.013 | 1.811 | 1.132 | 2.897* |
| Brother/sister vision defect | 0.319 | 0.032 | 1.376 | 1.027 | 1.843* |
| Low-standard home district | 0.291 | 0.278 | 1.338 | 0.791 | 2.264 |

OR, odds ratio; CI, confidence interval.
*$p < 0.05$.

**Table 4B:** Logistic regression model showing the adjusted OR and 95% CI of the dependent factors affecting vision defects of students after removal of some selected independent factors

| Independent factors | *B* | Significance | Adjusted OR | 95% CI | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| Father/mother vision defects | 0.854 | 0.000 | 2.348 | 1656 | 3.329* |
| Low-standard school district | 0.649 | 0.003 | 1.914 | 1.245 | 2.942* |

OR, odds ratio; CI, confidence interval.
*$p < 0.05$.

Table 4 (a) shows the results of a logistic regression model including all five relevant factors pertaining to the demographic factors studied in the bivariate analysis in relation to the presence of defective visual acuity as the dependent factor. All the independent variables were dichotomized into no or yes for the family member vision problems and high/medium or low-standard for the income, school, and home district. It shows that a father's and/or mother's vision problem was a highly significant predicting factor ($p < 0.001$), adjusted OR = 2.2, 95% CI: 1.5–3.2, followed by a low-standard school district ($p > 0.05$), adjusted OR = 1.8, 95% CI: 1.1–2.9. The presence of a brother and/or sister with defective visual acuity showed a significant adjusted OR of 1.4, 95% CI: 1.03–1.84, and $p < 0.05$.

Table 4 (b) shows the results of the logistic regression model after removing the following insignificant factors: the family income and the home district standard. The presence of a brother and/or sister with defective visual acuity was also removed as it was assumed to bear considerable correlation to the father's and/or mother's vision problems. The model demonstrates that the two remaining significant factors for father's/mother's vision problems and for low-standard school district have a significant adjusted OR = 2.35, 95% CI: 1.66–3.33 and adjusted OR = 1.91, 95% CI: 1.25–2.94, respectively.

## Discussion

The school is the place where children need good vision as it is estimated that about 80% of the taught material is presented visually. According to the Center of Disease Control, impaired vision can affect a child's cognitive, emotional, neurologic, and physical development by potentially limiting the range of experiences and kinds of information to which the child is exposed.[15] Prevent Blindness America pointed that one in four children has a vision problem that, if left untreated, can affect learning. The most common vision problems among school-age children are refractive errors.[16]

The prevalence of defective vision (visual acuity less than 6/6) in this study was high (23.9%) when compared with the previous studies conducted in Saudi Arabia (7.2% in Al Baha and 18.6% in Qassim and 13.7% in Al Hassa) as mentioned earlier. Still considerable discrepancies in the prevalence of refractive errors were observed between these studies, which in our opinion cannot be accounted for solely by temporal variations in these studies. Our study also showed a higher rate of strabismus (4.2%) relative to 1.6% as seen in Al Baha study and a lower rate of amblyopia (2.9%) relative to the rate in the study involving Qassim region (3.9%).

We presume that the role of the demographic factors as well as the school environment was not sufficiently considered in those studies. This study has clearly revealed the role of genetics as a factor for refractive errors as it pointed out the relation in the role of vision problems in parents and siblings to that found in students suffering from these conditions. The ORs emerging from the logistic regression model point to a 2.35 risk (OR = 2.2, 95% CI: 1.66–3.33) of having vision defect when parents have vision problems. Similar findings were found in the case of brothers and sisters suffering from visual defects (OR = 1.4 95% CI: 1.02–1.84). In case of myopia, the genetic and environmental factors are suspected as contributors for the onset and progression of this condition. Thus, the twin studies have supported genetic factors and there are some evidences that the prevalence of myopia in children increased with the number of myopic parents from 7.6%, 14.9%, to 43.6% for none, one, or two myopic parents, respectively.[17] In a nontwin study, heritable factors accounted for 80% of juvenile myopia.[18]

On the other hand, environmental influences are supported by the rapid population changes in the prevalence rates of refractive errors.[19] Environmental factors—most of them are inherent in the school environment—include near work, education levels, urban compared to rural location, and time spent indoor and outdoor. Near work has been identified as a risk factor but with a weak association and it is difficult to quantify.[20] However, urbanization and educational achievements contributed toward the development of myopia but it could only be explained by a small proportion of the variance seen. Thus, the role of environmental factors is intensified by the observation of low heritability values in parent–siblings correlations when there has been rapid environmental change between generations.[21] It is our view that the school environment in many of the third world countries was not studied closely and sufficiently as a factor in visual disturbances.

The role of the school environment was apparent in this study as the logistic regression model showed that a poor school environment was associated with nearly double the risk for a student to have visual defects (OR = 1.91, 95% CI: 1.25–2.94). The main limitation of this study was that it was confined to male students because of some logistic and traditional social factors.

## Conclusion

This study showed that the prevalence of eye problems and refractive errors among primary schoolboys in Jeddah is high and presents a challenge to family and public health. This situation necessitates the implementation of regular repeated vision screening programs in primary schools and preferably also in the preschool age. Further research is needed to uncover the role of heredity as a potential risk factor and the role of environmental factors and equipment at schools to face and modify them by application of properly designed programs and methods.

## References


1. World Health Organization. Elimination of avoidable visual disability due to refractive errors: report of an informal planning meeting, Geneva, 3–5 July 2000. Geneva, Switzerland: World Health Organization, 2000. pp. 6–10.
2. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull World Health Organ 2008;86(1):63–70. doi:10.2471/BLT.07.041210.
3. Negrel AD, Maul E, Pokharel GP, Zhao J, Ellwein LB. Refractive error study in children: sampling and measurement methods for a multi-country survey. Am J Ophthalmol 2000;129(4):421–6. doi. 10.1016/S0002-9394(99)00455-9.
4. Pokharel GP, Negrel AD, Munoz SR, Ellwein LB. Refractive error study in children: results from Mechi Zone, Nepal. Am J Ophthalmol 2000;129(4):436–44. doi. 10.1016/S0002-9394(99)00453-5.
5. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: results from La Florida, Chile. Am J Ophthalmol 2000;129(4):445–54. doi. 10.1016/S0002-9394(99)00454-7.
6. Dandona, R, Dandona, L, Srinivas, M, Sahare P, Narsaiah S, Muñoz SR, et al. Refractive error study in children in a rural population in India. Invest Ophthalmol Vis Sci 2002;43(3):615–22.
7. Saad A, El-Bayomy BM. Environmental risk factors for refractive error among Egyptian schoolchildren. Eastern Mediterr Health J 2007;13(4):819–28.
8. Al Faran MF. Prevalence of ocular disorders among schoolboys in five villages in Al-Baha region. Ann Saudi Med 1992;12(1):3–7.
9. Aldebasi YH. Prevalence of correctable visual impairment in primary school children in Qassim Province, Saudi Arabia. J Optom 2014;7(3):168–76. doi: 10.1016/j.optom.2014.02.001.
10. Al Wadaani FA, Amin TT, Ali A, Khan AR. Prevalence and pattern of refractive errors among primary school children in Al Hassa, Saudi Arabia. Glob J Health Sci 2012;5(1):125–34. doi: 10.5539/gjhs.v (n1) p125.
11. American Association for Pediatric Ophthalmology and Strabismus. *Vision Screening*. Available at: www.aapos.org/terms/conditions/107 (last accessed on June 4, 2015).
12. Yawn BP, Lydick EG, Epstein R, Jacobsen SJ. Is school vision screening effective? J Sch Health 1996;66(5):171–5.
13. Online sample size calculator. Available at: http://www.raosoft.com/samplesize.html (last accessed on August 1, 2015).
14. American Family Physician. Childhood eye examination. Available at: http://www.aafp.org/aafp/2013/0815/p241.html (last accessed on September 12, 2014).
15. National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention. *What is Vision Impairment?* October 29, 2004. Available at: http://www.cdc.gov/ncbddd/dd/vision2.htm (last accessed on September 14, 2015).
16. Prevent Blindness America. Available at: http://documents.preventblindness.org/ publichealth/OurVisionforChildren_2010.pdf (last accessed on June 4, 2015).
17. Ip JM, Huynh SC, Robaei D, Rose KA, Morgan IG, Smith W, et al. Ethnic differences in the impact of parental myopia: findings from a population based study of 12-year-old Australian children. Invest Ophthalmol Vis Sci. 2007;48(6):2520–8.
18. Mutti DO, Mitchell GL, Moeschberger ML, Jones LA, Zadnik K. Parental myopia, near work, school achievement, and children's refractive error. Invest Ophthalmol Vis Sci 2002;43(12):3633–40.
19. Dandona R, Dandona L. Socioeconomic status and blindness. Br J Ophthalmology 2001;85(12):1484–8. doi: 10.1136/bjo.85.12.1484.
20. Zadnik K, Mutti DO. Prevalence of myopia. In: *Myopia and Near Work*, Rosenfield M, Gilmartin B (Eds.). Oxford: Butterworth/Heinemann, UK, 1998. pp. 13–30.
21. Morgan I, Rose K. How genetic is school myopia? Prog Retin Eye Res 2005;24(1):1–38. doi. 10.1016/j.preteyeres.2004.06.04.


**How to cite this article:** Al-Aadel RAA, Al-Zahrani AA, Jan AAR, Al-Saidlani RH. Prevalence of eye problems among primary schoolboys in Jeddah, Saudi Arabia: a survey stud. Int J Med Sci Public Health 2016;5:960-965

**Source of Support:** Nil, **Conflict of Interest:** None declared.