A Survey of the Prevalence of Refractive Errors among Children in Lower Primary Schools in Darnah City, Libya

Abstract

Introduction: Refractive error is a one of the most common problem among children which may lead to blindness. Refractive errors cannot be prevented, but they can be diagnosed early by a routine eye examination and treated with corrective glasses, contact lenses or refractive surgery.

Objective: To determine the prevalence of refractive errors among school children attending lower primary school in Darnah city eastern part of Libya and the frequency of the various types of refractive errors, and their associated to selected demographic variables among school children.

Materials and Methods: The research design adopted for this study was non-experimental Descriptive in terms of analysis and Cross Sectional in terms of time frame. The study was conducted at selected school with 10 samples. The samples who met the inclusion criteria were selected by using convenient sampling technique. The tool used for the study was demographic variable and checklist to assess the factors associated with refractive error.

Result: A total of 1000 children from 10 schools were randomly selected. However 920 were examined. Mean age of the students was 9.53±1.5. Refractive error was associated with female sex (107) one hundred seven children had a significant refractive error of ±0.50 or worse in one or both eyes, giving a prevalence of 11.6% and the commonest refractive error was hypermetropia which accounted for (57) 53.2% of all errors. This was followed by astigmatism with 34 (31.7%) children and myopia with 16 (14.9%).

Conclusion: Refractive error needs careful evaluation and preventive care for children which leads to impaired quality of life and interfere with their daily lifestyle. Assessing the risk factor will help us to prevent and control the problem of refractive error in future generation which is helpful for the students to live a life problem free life.

Keywords: Refractive error; Spectacles; School children; Hypermetropia; Libya

Research Article

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Background

Although vision has been declared as a basic human right, and the world health organization (WHO) has always been conscious of the fact that blindness, and visual disability are public health problems, still there are 161 million visually disabled worldwide, out of these 37 millions blind people, and 124 visually impaired. It is estimated that the number of blind will double roughly by the year 2020 Refractive error is a state in which optical system of the eye fails to adjust to bring parallel rays of light to focus on proper place (fovea). It is obvious that "without appropriate optical correction, millions of children are losing educational opportunities and adults are excluded from productive working lives, facing severe economic and social consequences. Individuals and families are pushed into a cycle of deepening poverty because of this health problem [1,2].

The most surprising finding of recent studies is that refractive error is responsible for one quarter of blindness and half of low vision. Recent data suggest that a large number of people are blind in different parts of the world due to high refractive error because they are not using appropriate refractive correction. Refractive error as a cause of blindness has been recognized only recently with the increasing use of presenting visual acuity for defining blindness. In addition to blindness due to naturally occurring high refractive error, inadequate refractive correction of a phakia after cataract surgery is also a significant cause of blindness in developing countries.

Blindness due to refractive error in any population suggests that eye care services in general in that population are inadequate since treatment of refractive error is perhaps the simplest and most effective form of eye care [3] visual acuity of less than 6/12 has a profound impact on the quality, and length of life Even this mild loss of vision is associated with a doubling of mortality, morbidity, and social isolation 4, Many experts believe 80% of learning is done through a child's eyes. A child's eyes are always use in the classroom for Reading, computer usage and chalkboard work. Therefore, education has increased visual requirements especially in children's which disturbs their vision, when a child's vision is not clear it affects mobility, learning, classroom participation and restrict access to information. Most refractive error can be managed by early refractive correction. If it cannot

treated in childhood may come up with amblyopia, resulting in blindness. In Libya, like in many developing countries, there is no established vision-screening programmed for children in general and on commencement of school, such that those with early onset of such errors will have many years of poor vision. Over all, there is limited information on refractive errors among children in Libya.

Geographical Background

Libyan is situated on the north coast of Africa along the Mediterranean Sea. The country is semi-square with an area of 1759 sq.km, making it the fourth largest country in Africa. The largest geophysical region comprises of vast expanses of steppe and desert and occupies four-fifths of the total area of the country, the population density 2.6 per sq.km. The Mediterranean forma its northern border, and the coast is approximately 1900 km in length, Tunisia and Algeria lie on the west, while Egypt and Sudan are on the east and south - east . The southern boundary is formed by Niger and Chad. The area suitable for human habitation has been estimated to occupy not more than 8 percent of the total area. The bulk of the population has settled in small portions of land namely the costal belt, the highlands in the eastern and western regions and a few scattered oases in the southern region. The economic performance of the Libya is closely tied to the oil industry; Libya is a major energy exporter. Has a population of 5.882.667 million, male 2.969.562 (50,82%) and female 2.913.105(49.18%), the percentage populations below 15 years of age were 46% and from15-59 years of age were 50% and above 60 years were 4%. In 2005, it was estimated that 82% of the total male adult population and 74% of the female adult population were literate. Darnah City in northeastern Libya with 120,000 inhabitants, 50% Male and 50% female (2005 estimate), on the Mediterranean Sea. Darnah is along the eastern ridge of the Green Mountains (Jabal Akhdar) in the river valley of Darnah. Darnah has a diverse economy, of which agriculture is a central part. Sponge-fishing is still an important activity. Manufacturing includes the production of garments. Darnah is a popular destination for national tourism (Figure 1).



Figure 1: Derna City in northeastern Libya.

Rationale

In the absence of reliable population based data, there is no population survey done before in eastern part of Libya regarding to prevalence of refractive error among school children. The results of this survey will provide baseline data regarding prevalence refractive error in a particular situation in Libya. This will give Health authorities in Libya an indication of the magnitude of the problem and the need to realize the global blindness prevention goals of Vision 2020 and help for making an action to improve the eye care services in the country specially the peripheral towns and also can help for making an action plan for human resources development and provision of technological infrastructure to eliminate blindness. In the other way it will give information about the backlog of low vision in the area and make a plan to further intervention to address this enormous public health problems and there for to get the required reliable information for the intervention of comprehensive eye care program . This survey also will remain as scientific paper which can help for more prevalence studies, and can provide baseline data for further analytical study in this field that can provide some statistical information support (Figure 2).



Figure 2: Work shop for planning 5years prevention of blindness in Libya.
Dr. Khalid Elmajri, Libya
Prof. Daud Khan, IAPP
Dr. Mansor Jenif, Libya
Prof. Para Seregram, WHO

Main Outcome Measure

A refractive error which cause a visual acuity of less than 6/6 in at least one eye, in case of deferent type of refractive error in both eye, take that refractive which lead to more defect in visual acuity. The influence of, sex, selected demographic variables was assessed using multiple logistic regressions.

Objective

To determine the prevalence of refractive errors among school children attending lower primary school in Darnah city; the frequency of the various types of refractive errors. To associate the selected demographic variables with factors associated with refractive error among school children.

Design

Descriptive in terms of analysis and Cross Sectional in terms of time frame.

Setting

Darnah city, Libya

Patients

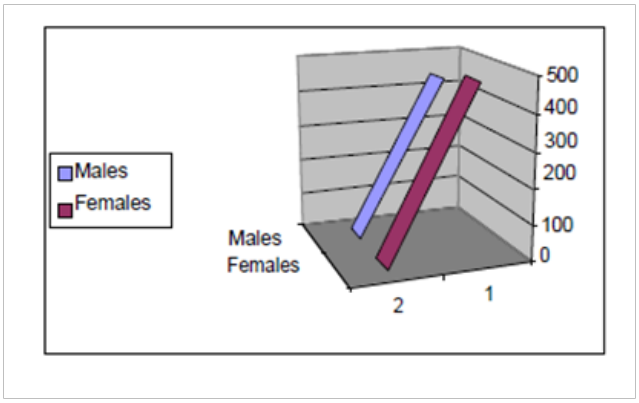
A total of 1000 children aged between 6 and 11 years 920 had a visual acuity testing done at school using the same protocol; of these 442 (45.7%) were boys and 478 (51.9%) girls and 80 absent (8%).

Results

A total of 1000 children from 10 schools were selected. However 920 were examined. Mean age of the students was 9.53±1.5. Refractive error was associated with female sex one hundred seven children had a significant refractive error of±0.50 or worse in one or both eyes, giving a prevalence of 11.6% (Table 1). The commonest refractive error was hypermetropia which accounted for (57) 53.2% of all errors. This, was followed by astigmatism with 34 (31.7%) children, and myopia with 16 (14.9%). One had a corneal opacity and seven child were amblyopic had an average visual loss of approximately 60%. 2 had tropia, and 5 had anisometropic (Table 2). Out 920 child, 598(65%) of the children have the refractive error due to heredity; 322(35%) of the children are found their family education at primary level, 414(45%) secondary level, 184(20%) higher education. Refractive error with socio economic; 400 (43.4%) of the children have low class socio economic and 540 (58.6%) middle class socio economic. There is no significant association between the demographic variables and factors associated with refractive error

Table 1: Distribution of gender.

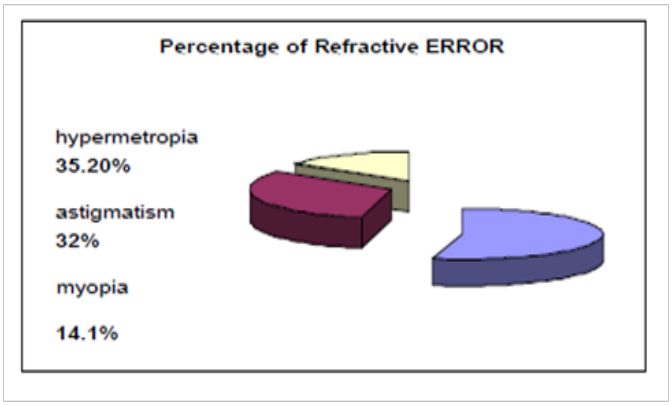
Sex	Freq	Percentage
Male	442	45.7%
Female	478	51.9%
Total	920	100%



Conclusion

Prevalence of Refractive error was 11.6%, females exceeded the males. The commonest refractive error was hypermetropia which accounted for (57) 53.2% of all errors. This, was followed by astigmatism with 34 (31.7%) children, and myopia with 16 (14.9%). increasing cost, inefficient referral system, services not available its might be associated with high risk of visual impairment. There is definite lack of ophthalmic services instruments for diagnoses, treatment and follow up of patients. Care and control of visual impairment in this city community is sub optimal.

Table 2: Percentage e of refractive erro.



There is a need for primary eye care staff to focus on evaluation of the accessibility and availability of eye care services and barriers to eye care utilization. Additional training and support for nursing staff and education for patients will be central to achieving this level of intervention. Very few schools in Darnah ensure that children are screened for visual disorders or disability before joining school. The problem is further compounded by the fact that there are few eye health care workers in Libya and these few are not equally distributed. The presence of a significant refractive error or other eye anomaly of vision will impair the visual and learning abilities of such a child. In the Global Initiative 2020 for the elimination of avoidable blindness, refractive errors have been emphasized together with other ocular disorders such as cataracts, trachoma and on chocerciasis [4,5]. The Refractive Error Study in Children (RESC) has been formed under this Initiative to try and assess the prevalence of refractive errors in children.

Materials and Methods

One thousand students were selected from different schools of Darnah adopting two stage sampling technique. List of schools was obtained from Board of Secondary Education and 10 schools were randomly selected from the list in the five Division of Darnah during that period. 100 students from each school were then selected adopting simple random technique

Sampling and sample size

Sample size was calculated using the Kish and Leslie's formula, using the expected prevalence of refractive errors of 18.5 [6,7] and allowing for an error of 5% at 95% confidence interval. The total sample size required was 1000. A census list for all the primary schools in Darnah city for the year 2008 enrolment was obtained from the city education office. The census list had divisions of the school which lies (Central, East, West, South and North) of city.

Study design

This was a cross-sectional descriptive study in which lower

primary school children were screened for refractive errors.

Inclusion criteria

Primary school children aged 7 to 11 years whose parents had endorsed informed consent by signing a consent form.

Exclusion criteria

Children who were unwilling to undergo the examination due to fear, even through the parents had authorized the examination. Children who were sick or those who were on medication for some other ailment; some drugs have ocular effect.

Ethical issues

Permission to carry out this study was sought for, and obtained from, chair man of national comity of prevention of blindness. Each participating school was visited at least two weeks before the screening day, and permission to do the study sought from the headmaster/headmistress. In all the schools permission was readily granted. A letter explaining the purpose of the intended study, and what would actually be done was attached to parental informed consent form and given to each of the lower primary school children to take to their parents. Only children who returned duly signed consent forms, and who were willing to take part were recruited. Parents who required further explanation before consenting for their children to participate in the study were invited to attend the particular school on the screening day.

Data collection

Personal details of each participating child were recorded on a form by trained health worker at each selected school. The examination included visual acuity measurements. Myopia was defined as spherical equivalent refractive error of at least -0.50 D and hyperopia as +2.00 D or more, astigmatism -+1.00 or more. Then the referred child underwent a standard ophthalmic examination; ocular motility evaluation and examination of the anterior segment & media at arranged equipped point, and all findings recorded. Refraction was done using autorefractometer after 1% cyclopentolate eye drops had been instilled in the eyes at least half an hour previously. Only children who had a visual acuity of less than 6/6 in at least one eye referred and underwent autorefractometer.

Data analysis

Data was entered into a computerised database-using the CDC-WHO package EPI- INFO, and results of analysis are presented in the form of tables Results One thousand children aged between 7 and 11 were given consent forms to take to their parents. Out of these 920 returned signed consent forms, giving a response rate of 92%.

Discussion

However, refractive error was the first leading cause of low vision and fourth cause of blindness ,remains a major contributing cause of low vision all over the world , even though the treatment of refractive error is simple and successful, the condition is still responsible for a significant amount of visual impairment in both developing and developed countries, 8Unawareness, economics, the inability to cover the expense of private services which prevent people from correcting their refractive error. Efforts could be targeted at the training of optometrists and ophthalmic technicians, the conduct of regular vision-screening checks, and public education of the need for adequate corrective refractive devices to enhance optimal vision for activities of daily living. Effort must be done to make the services available.

The participation in this study was a high rate of 920 out of 1000, and a considerable percentage (96.8%), aged 6 to 11 years, had their refraction tested under cycloplegia. This is one of the strong points of the study. Prevalence of refractive error was 11.6 %, which higher than that in the countries in same region. An increased prevalence of refractive error was found in this study could be due to familial and/or heritability in this focus area specially the Marriage of relatives “Endogamy” is very common at culture of our study. Refraction is determined by means of the coordinated contributions of ocular biometric components, such as AL, anterior chamber depth, corneal curvature, and lens thickness. Separately, these components may be assessed as quantitative traits intimately related to the clinical phenotype of myopia. Multiple articles [8-10] have examined the familial aggregation and heritability of ocular components. Axial length is the largest contributor to the determination of refractive error. Several studies [11] have reported an inverse relationship of AL to refraction (Table 3).

Table 3: The number and percentage distribution of demographic variables of the children.

Demographic Variables	No	Percentage
Hereditary	598	65%
Family Education a)Primary education b) Secondary education c) Higher education	 322 414 184	 35% 45% 20%
Socio economic a) Low class b) Middle class	 400 540	43.47% 58.69%
Residency a) Urban b) Rural	513 407	55.7% 44.2%

The steeper the corneal curvature, the more likely that the resulting refractive error is myopic; eyes with hyperopia are more likely to have flatter corneal curvature readings by means of keratometry [12-14]. Heritability estimates for corneal curvature range from 60% to 92%. [15,16]. The Sardinian family study17 noted evidence of modest linkage between corneal curvature and chromosomes 2p25, 3p26, and 7q22, with LOD scores ranging

from 2.34 to 2.50. There is a need of periodical eye examination, preferably while entering and leaving the school Therefore, there is a need to have regular and simple vision testing in primary school children at least at the commencement of school so as to defect those who may suffer from these disabilities. The prevalence rate of a significant refractive error of 11.6% in this study is lower than that obtained by Chen et al. [17] carried out on 6 and 7 year olds, which was 18.5. This could be due to possible racial differences in the two study groups. However, the prevalence of 11.6 of this study makes interesting comparison with the studies of Proslan et al. [18] in Baltimore, USA and Kazuhiro in Japan, where the respective prevalence were 8.2 and 10.4 [19].

Hypermetropia was the most frequent refractive error, accounting for 53% of all the errors, followed by astigmatism, then with myopia as the least frequent refractive error. Some authors point to geographical factors as potential determinants of ametropias, such as location and type of residence. They defend that greater levels of hyperopia may be found in people who live in rural areas and in houses, because they do more outdoor activities. Regarding outdoor activities, spending more time outdoors was associated with slightly more hyperopic refractions [20]. The role of light intensity must also be considered. Since light is usually of greater intensity outdoors, eye exposure results in a more constricted pupil, increasing the depth of focus and leading to a less unfocused image [21].In addition, dopamine released by light stimulus on the retina can contribute directly to inhibiting ocular growth [21,22].

These finding same with results done elsewhere, for example Kalikivayi et al. [23] found that among Indian children hypermetropia was the commonest refractive error, and it accounted for 23% of all errors. Astigmatism was cause number two, followed by myopia. In Kazuhiro's study myopia was the commonest refractive error among Japanes children and it accounted for 58% of all errors followed by astigmatism (26%), with hypermetropia as the least common (13%). Other studies done elsewhere showed that there might be substantial variability in the relationship between refractive error and distance vision. There were patients with normal uncorrected vision but substantial refractive error, and other cases with little refractive error but reduced vision that improved with corrections [24-26].

While some of this difference may be due to the sampling method or even the method used for cycloplegic refraction, we believe lifestyle changes can be responsible for reduced rates of hyperopia, and increased prevalence of myopia. In recent years, the younger generation is commonly using computers, which causes them to accommodate more than before. This leads to increased axial length of the eye, decreased hyperopia, and a shift of refractive error towards myopia Comparatively low rates of myopia the same were found in both rural Nepal and rural India-underdeveloped areas where children are not faced with the same emphasis on schooling and frequently withdraw from school at an early age-which is also consistent with the schooling-intensity hypothesis [27,28]. Any attribution of myopia to schooling intensity must be made with caution, however, because it is not possible to separate such environmental influences on myopia from those with a genetic basis. Indeed, if parents with higher levels of education generally had myopia, the observed association could be primarily one of genetic origin [29,30].

Although worldwide geographic and ethnic differences in the prevalence of childhood refractive error are well recognized [31-37], meaningful comparisons between reports in the literature are problematic. The difficulty arises because of different or inadequately described survey and examination methods (such as whether cycloplegia was used), unclear or no uniform definitions for hyperopia and myopia, and differences underlying the age and gender mix of the populations studied. One child who had corneal opacity and seven children were amblyopic had an average visual loss of approximately 60% [38]. They were referred to ophthalmology department for start curative measurements" visual training therapy". This study has clearly illustrated the need to screen young children regularly or at least on first attending school. This will enable identification of those with refractive error or visual impairments, so that corrective measures may be recommended at the earliest time possible [Table 4].

Table 4: Global estimate of visual impairment by WHO region (million) 2002. 1.

	African Region	Region of the America	Region of the Eastern Mediterranean	European Region	South East Asia Region	Western PacificM Region	Total
Population	672.2	852.6	502.8	877.9	1,590.80	1,717.50	6,213.90
No of blind	6.8	2.4	4	2.7	11.6	9.3	36.9
% of Total Blind	18%	7%	11%	7%	32%	25%	100%
No with Low Vision	20	13.1	12.4	12.8	33.5	32.5	124.3
No with Visual Impairment	26.8	15.5	16.5	15.5	45.1	41.8	161.2

Recommendations

i. Regular comprehensive eye examinations are essential to detect the conditions early. Best possible time is to examine at the time of entering school and when they are leaving which makes it at least twice, during their study period.

ii. Focus on public awareness and attitude on eye care services utilization ,Information on barriers

1. To accessibility and utilization of eye care services must be incorporated into the strategies of the

2. National prevention of blindness program.

iii. Strengthen the existing secondary eye care services to make the services more sustainable, accessible, and acceptable.

iv. Comprehensive planning of human resources for eye care to meet the goals of vision 2020 the right to sight.

v. Primary eye care should be integrated into primary health care.

vi. Strategies to motivate screening program to detect refractive error in the population and ensure good quality refractive error services.

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Figure 3: Acknowledgement.

References

1. (2004) 2002 Global update of available data on visual impairment: a compilation of population-based prevalence studies. Ophthalmic Epidemiology © Taylor & Francis Ltd. 11(2): pp. 67-115.

2. Pateras E (2012) Prevalence of refractive errors amongst adults, located at the north suburbs of Athens-Greece.

3. Weil LM, Van Newkirk MR, McCarty CA, Taylor HR (2000) Age-specific causes of bilateral vision impairment. Arch Ophthalmol 118(2): 264-269.

4. McCarty CA, Mukesh BN, Taylor HR (2001) Vision impairment predicts 5 year mortality. Br J Ophthalmol 85(3): 322-326.

5. World Health Organisations, Geneva (2000) Global Initiative for the Elimination of Avoidable Blindness. Geneva: WHO/PBL/97.61.

6. Negrel AD, Ellwein LB, RESC Study Group (2000) More Research needed to Assess the magnitude of Refractive Errors Worldwide. Journal of Community Ehe Health, Vision 13(33): 11-12.

7. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB (2000) Refractive Error Study in Children: Results from La florida. Am J Ophthalmol 129(4): 445-454.

8. Memon MS (1992) Prevalence and causes of blindness in Pakistan. JPMA 42: 196-198.

9. Hammond CJ, Snieder H, Gilbert CE, Spector TD (2001) Genes and environment in refractive error: the twin eye study. Invest Ophthalmol Vis Sci 42(6): 1232-1236.

10. Biino G, Palmas MA, Corona C, Prodi D, Fanciulli M, et al. (2005) Ocular refraction: heritability and genome-wide search for eye morphometry traits in an isolated Sardinian population. Hum Genet 116(3): 152-159.

11. Wong TY, Foster PJ, Ng PJ, Tielsch JM, Johnson GJ, et al. (2001) Variations in ocular biometry in an adult Chinese population in Singapore: the Tanjong Pagar Survey. Invest Ophthalmol Vis Sci 42(1): 73- 80.

12. Carney LG, Mainstone JC, Henderson BA (1997) Corneal topography and myopia: a cross-sectional study. Invest Ophthalmol Vis Sci 38(2): 311-320.

13. Grosvenor T, Goss DA (1998) Role of the cornea in emmetropia and myopia. Optom Vis Sci 75(2): 132-145.

14. Sheridan M, Douthwaite WA (1989) Corneal asphericity and refractive error. Ophthalmic Physiol Opt 9(3): 235- 238.

15. Lyhne N, Sjølie AK, Kyvik KO, Green A (2001) The importance of genes and environment for ocular refraction and its determiners: a population based study among 20-45 year old twins. Br J Ophthalmol 85(12): 1470-1476.

16. Biino G, Palmas MA, Corona C, Prodi D, Fanciulli M, et al. (2005) Ocular refraction: heritability and genome-wide search for eye morphometry traits in an isolated Sardinian population. Hum Genet 116(3): 152-159.

17. Chen P, Chnag RJ (1996) Restrospective study on prevalence of Refractive Errors in 6 and 7 year old in Santa Monic, USA. Opthalmol 103: 1661-1669.

18. Proslan MW, Novak A (1996) The Baltimore Vision Screening Project. Ophthalmology 103(1): 105-109.

19. Kazuhiro H (1978) Refractive Errors among Japanese School children XXIII Cong. Ophthalmol 25: 1207-1211.

20. Ip JM, Saw SM, Rose KA, Morgan IG, Kifley A, et al. (2008) Role of near work in myopia: findings in a sample of Australian school children. Invest Ophthalmol Vis Sci 49(7): 2903-2910.

21. Rose KA, Morgan IG, Ip J, Kifley A, Huynh S, et al. (2008) Smith W, Mitchell P. Outdoor activity reduces the prevalence of myopia in children. Ophthalmology 115(8): 1279-1285.

22. McCarthy CS, Megaw P, Devadas M, Morgan IG (2007) Dopaminergic agents affect the ability of brief periods of normal vision to prevent form-deprivation myopia. Exp Eye Res 84(1): 100-107.

23. Kalikivayi et al., author Determination of the Prevalence of Visual Impairment due to Refractive Errors and other ocular. Diseases in Lower middle class School.

24. Negrel AD, Naul L, pokharel GP, Zhao J, Ellwein LB (2000) Refractive error study I children: sampling and measuring methods for a multi-county Survey. Am J Ophthalmol 129(4): 421-426.

25. Gilbert E, Anderson L, Dandona L, Foster A (1999) prevalence of visual impairment in children a review of available data. Ophthalmol Epidemiol 6(1): 73-82.

26. Pokharel GP, Regmi G, Shrestha SK, Negrel AD, Euwein LB (1998) Prevalence of blindness and cataract surgery in Nepal. Br J Ophthalmol 82(6): 600-605.

27. Angle J, Wissmann DA (1980) The epidemiology of myopia. Am J pidemiol 111(2): 220-228.

28. Hung GK, Ciuffreda KJ (2001) The effect of near work on transient and permanent myopia [ARVO Abstract]. Invest Ophthalmol Vis Sci 42(4): S392.

29. Mutti DO, Zadnik K, Adams AJ (1996) Myopia: the nature versus nurture debate goes on. Invest Ophthalmol Vis Sci 37(6): 952-957.

30. Zadnik K, Mutti DO, Mitchell GL, Jones LA, Moeschberger ML, et al. (2001) The association between parental myopia, near work, and children's refractive error. Optometry & Vision Science 77(12): 26.

31. Garner LF, Meng CK, Grosvenor TP, Mohiden N (1995) Ocular dimensions and refractive power in Malay and Melanesian children. Ophthalmic Physiol Opt 10(3): 234-238.

32. Turacli ME, Aktan SG, Duruk K (1995) Ophthalmic screening of school children in Ankara. Eur J Ophthalmol 5(3): 181-186.

33. Lithander J (1999) Prevalence of myopia in school children in the Sultanate of Oman: a nation-wide study of 6292 randomly selected children. Acta Ophthalmol Scand 77(3): 306-309.

34. Garner LF, Owens H, Kinnear RF, Frith MJ (1999) Prevalence of myopia in Sherpa and Tibetan children in Nepal. Optom Vis Sci 76(5): 282-285.

35. Edwards MH (1999) The development of myopia in Hong Kong children between the ages of 7 and 12 years: a five-year longitudinal study. Ophthalmic Physiol Opt 19(4): 286-294.

36. Lin LL, Shih YF, Tsai CB, Chen CJ, Lee LA, et al. (1999) Epidemiologic study of ocular refraction among schoolchildren in Taiwan in 1995. Optom Vis Sci 76(5): 275-281.

37. Matsumura H, Hirai H (1999) Prevalence of myopia and refractive changes in students from 3 to 17 years of age. Surv Ophthalmol 44(Suppl 1): S109-S115.

38. Saw SM, Katz J, Schein OD, Chew SJ, Chan TK (1996) Epidemiology of myopia. Epidemiol Rev 18: 175-187.

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