

EYE PROFILE OF CHILDREN AGES 3-5 YEARS OLD IN A DAY-CARE CENTER IN BRGY. BATIS, SAN JUAN

Kristine Inopia, MD

Carlos Chua, MD, FPAO
Co-Author

Our Lady of Lourdes Hospital
Institutional Affiliation

ABSTRACT

OBJECTIVE: To determine the eye profile of children ages 3-5 years old in a day-care center in Brgy. Batis.

DESIGN: Cross-sectional descriptive study.

METHODS: Visual screening was conducted in 89 preschool children aged 3 to 5 years. The screening involved two basic procedures; the distant visual acuity test and structural eye exam. Those who failed the examination were referred to an ophthalmologist for further examination.

RESULTS: The prevalence of visual impairment was 5.6%. Of the 89 preschool children screened, 4 of them failed the distant visual acuity test. One had strabismus. Refractive errors were the most common cause of visual impairment. Hyperopic astigmatism was the most common type of refractive error seen in these age groups.

CONCLUSIONS: The study is a small but important step in the effort to understand the problem of visual impairment among our preschool children. Although results were low, the mere presence of visual disorders in this study is an important confirmation that there is a need for preventive ophthalmologic examination in these age groups.

KEYWORDS: Preschool children, Eye screening, Prevalence, Visual impairment, Distant visual acuity, Strabismus, Amblyopia

INTRODUCTION

The human eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any other four senses.¹

Good vision is essential for proper physical development and educational progress in growing children.² Vision is an important requirement for learning and plays a critical role in the development of a child during the first three years of life. Children use their sight to strengthen motor functions, establish parent-child bonding, build picture perception and gain their balance.³ However, visual system in the young child is not fully mature. Equal input from both eyes is required for proper development of the visual centres in the brain. If a growing child's eye does not provide a clear focused image to the developing brain, then permanent irreversible loss of vision may result. Early detection provides the best opportunity for effective, inexpensive treatment.²

The American Academy of Ophthalmology and the American Association for Paediatric Ophthalmology and Strabismus recommend timely screening for the early detection and treatment of eye and vision problems in America's children. This policy includes institution of rigorous vision screening during preschool years wherein common conditions such as reduced vision in one or both eyes from amblyopia, uncorrected refractive errors or misalignment of the eyes (strabismus) can be detected. However, in the Philippines, there is no policy yet established.

REVIEW OF RELATED LITERATURE

In 1899, Connecticut instituted the first state-supported school vision screening test, setting an important precedent despite problems with poorly standardized testing conditions and insufficient funds for following up those who failed the vision screening. Over 100 years later, rates of vision screening among school-aged children remain relatively low, in part because of the controversy over the effectiveness of screening techniques as compared with examinations based on symptoms, and the unclear relationship between undiagnosed visual impairment and academic performance. While some studies have linked undetected or uncorrected visual impairment to poor academic performance, high school dropout rates, and even juvenile delinquency, others have argued that there is little evidence to support such a link. What is irrefutable is that undetected amblyopia, strabismus, and significant refractive errors can have significant long-term effects on visual function and in some patients can cause permanent unilateral or bilateral vision loss.⁴

Amblyopia and amblyogenic factors like strabismus and refractive errors are the most common vision disorders in children.⁵

Amblyopia is a reversible visual deficit that develops during the maturation of the visual system. Amblyopia affects 5% of the preschool children and is potentially treatable. The two common causes of amblyopia are strabismus and refractive errors. Early detection of amblyopia is necessary to avoid permanent

visual deficit by allowing treatment to be undertaken within the sensitive period of neuroplasticity (growth and change) in the visual system, thus, increasing the likelihood of successful treatment. Preschool screening programs may result in better visual outcome than screening at school entry.⁶

Preschool screening programmes for amblyopia were developed in response to experimental data in animals which suggested that early treatment of conditions analogous to human amblyopia is more effective than treatment later in life.⁷

In a systematic review done by Christine Schmucker et al regarding the Effectiveness of screening preschool children for amblyopia, three studies suggested that screening is associated with an absolute reduction in the prevalence of amblyopia between 0.9% and 1.6% (relative reduction: between 45% and 62%).⁵

Furthermore, in the retrospective cohort study of Eibschitz-Tsimhoni et al 2000 (the only study which compared screening versus no screening without implementing a current screening programme), it was observed that the frequency of severe amblyopia (visual acuity $\leq 5/15$) was reduced by a factor 17 in the screening group ($p < 0.001$).⁸ Williams et al in 2002 and 2003 also reported that mean visual acuity in the worse eye was better for children who had been treated for amblyopia in the intervention group than for similar children in the control group.⁹

OBJECTIVES

General Objective:

To determine the eye profile of children ages 3-5 years old in a day-care center in Brgy. Batis.

Specific Objectives:

1. To screen children ages 3-5 years old for visual disorders.
2. To assess visual profile of each child in terms of: eye structure, visual acuity, eye alignment and refraction.
3. To analyze the prevalence of various visual disorders such as amblyopia, strabismus, reduced visual acuity, refractive errors and severe visual impairment in these age groups.

Operational Definition

Amblyopia: poor vision in an otherwise normal appearing eye occurs when the brain does not recognize the sight from that eye. Two common causes are strabismus and a difference in the refractive error. If untreated, it can cause irreversible visual loss. The best time for treatment is in the preschool years. Improvement of vision after the child is 8 or 9 years of age is rarely achieved.

Strabismus: misalignment of the eyes in any direction. It may develop when the eyes do not align. If early detection is followed by effective treatment, excellent vision may be restored.

Refractive errors: decreased vision, visual discomfort (“eye strain”). The most common form is nearsightedness (poor distance vision) is usually seen in school-age children and is treated effectively, in most cases, with glasses. Farsightedness can cause problems with focusing at near and may be treated with glasses. Astigmatism (imperfect curvature of the front surface of the eye) also requires corrective lenses if it produces blurred vision or discomfort. Uncorrected refractive errors can cause amblyopia particularly if they are severe or are different between the two eyes.

Visual Acuity: The clinical method for using a mathematical fraction that expresses the ratio of two distances, which is also the ratio of one’s visual acuity to that of a normal person.⁷
 *Distance of visual acuity should be tested at 6 meters (20 ft) or 3 meters (10 ft) and at reading distance 30-40 cm from child under good illumination.

**** Normal Visual Acuity:**

3 years old: 20/50 and below

4 years old: 20/40 and below

5 years old: 20/30 and below

METHODS

The Eye Profile screening protocol was approved by the hospital Ethics committee and the Department of Pediatrics. The study was conducted with a written informed consent obtained from parents of all participants.

Design and sample

The eye profile screening was a cross-sectional descriptive study involving 89 pre-school children ages 3-5 years old in a daycare center in baranggay batis. Baranggay batis has a population of approximately 1,100 children ages 3-5 years old. The preschool students of the daycare center were chosen as the representative population. A total of 100 preschool students were enrolled at the daycare center. However, only 89 students were able to participate. Sample size was calculated from an expected prevalence rate of 10%.

Site inspection and informed consent

After identification of the preschool children, the respective baranggay health officers and preschool teacher were approached and informed about the study. Upon approval, the day-care centre was inspected for the suitability of the screening process. A place is considered suitable if there is a room with more than 4 meter long which is free from distractions. The light level should be adequate (at least 300 lux in the room and test chart illumination of about 500 lux). Consent forms and information sheets were distributed to the parents one week before the screening procedure. The consent forms and information sheets were written in two major languages (English, Filipino). On the day of screening, the consent forms were collected. Children whose parents gave their written consent to participate in this study were included in the eye screening.

Vision screening

All 89 preschool children underwent two basic screening procedures which included structural eye exam and distant visual acuity test. Measurement of the distant visual acuity was performed using the Allen picture chart. The tests were performed by 3 resident physicians. The children were subjected to structural eye exam first followed by distant visual acuity test. The structural eye exam included inspection for any eye structural abnormalities. This included the cover test to check for alignment disorders. The distant visual acuity test was measured monocularly at a distance of 6 meter. The right eye was tested first before the left eye. The test results of both the eyes were recorded separately. Results were recorded as “pass” if the child can identify the figures in the chart correctly and “fail” if the child was unable to locate the pictures. Children who failed the procedure were referred to a pediatric ophthalmologist for a detailed eye examination.

Referral and further evaluation

Children who failed the eye exam were given a referral letter for a comprehensive eye examination. Examination was performed by a trained ophthalmologist. The examinations included..... Children with underlying refractive errors were prescribed glasses.

Statistical Analysis

Data was analyzed using Stata version 10 software. Descriptive statistics entailed use of means and standard deviation for quantitative variables and counts and proportions for qualitative variables.

Results and Interpretation

A total of 89 children aged 3-5 years old from a day-care center in Barangay Batis underwent screening for visual disorders. Majority were males (56%) and belonged to the 3-year old age group (53%) (Figure 1).

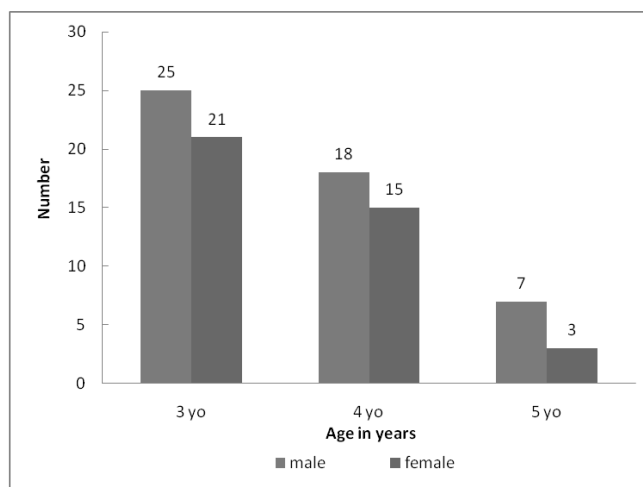


Figure 1: Age-Sex Distribution of Respondents

Visual acuity evaluation of 3-year olds was observed to vary predominantly between 20/20 to 20/30. Readings were consistently similar in both eyes in 80 to 100% of cases. There was one child noted to have a visual acuity of 20/70 and was referred for further evaluation (Table 1).

Table 1: Visual Acuity Profile of 3 year-olds

Visual Acuity, Left Eye	Visual Acuity, Right Eye						Total
	20/20	20/25	20/30	20/35	20/50	20/70	
20/20	8	2	0	0	0	0	10
20/25	0	13	1	0	0	0	14
20/30	0	1	17	0	0	0	18
20/35	0	0	0	1	0	0	1
20/50	1	0	0	0	1	0	2
20/70	0	0	0	0	0	1	1
Total	9	16	18	1	1	1	46

Visual acuity evaluation of 4-year olds was observed to vary predominantly between 20/20 to 20/25. There were two children noted to have a visual acuity above 20/40 and were referred for further evaluation (Table 2).

Table 2: Visual Acuity Profile of 4 year-olds

Visual Acuity, Left Eye	Visual Acuity, Right Eye					Total
	20/20	20/25	20/30	20/40	20/50	
20/20	10	0	0	0	0	10
20/25	3	14	0	0	0	17
20/30	0	0	4	0	0	4
20/50	0	0	0	1	1	2
Total	13	14	4	1	1	33

Visual acuity evaluation of 5-year olds was observed to vary predominantly between 20/25 to 20/30. There was one children noted to have a visual acuity above 20/30 and was referred for further evaluation (Table 3).

Table 3: Visual Acuity Profile of 5 year-olds

Visual Acuity, Left Eye	Visual Acuity, Right Eye				Total
	20/20	20/25	20/30	20/50	
20/25	1	4	2	0	7
20/30	0	0	2	0	2
20/40	0	0	0	1	1
Total	1	4	4	1	10

Out of 89 pre-schoolchildren who underwent evaluation for visual acuity, 96% passed and 4% were referred for further evaluation and management. The prevalence of visual acuity problems in this sample of pre-schoolers was 4%. Of these, 2 were males and 2 were females. Among males a 4-year old and 5 year-old with a visual acuity above 20/40 and 20/30, respectively. And among females, a 3-year old and a 4-year old with a visual acuity above 20/50 and 20/40, respectively (Table 4)

Table 4: Visual interpretation by Age and Gender

Gender-Age	Interpretation		Visual Acuity Defect	
	Passed No. (%)	Referred No.(%)	Left Eye	Right Eye
Male				
3	25 (100.0)	0		
4	17 (94.4)	1 (5.6)	20/50	20/50
5	6 (85.7)	1 (14.3)	20/40	20/50
Female				
3	20 (95.2)	1 (4.8)	20/70	20/70
4	14 (93.3)	1 (6.7)	20/50	20/40
5	3 (100.0)	0		
Total	85 (96.0)	4 (4.0)		

Of the total sample of pre-schoolchildren who underwent ophthalmologic screening, one had an eye structure problem. This was a 3-year old male evaluated to have strabismus. The prevalence of eye structure problems in this sample of pre-school children was 1% (Table 5).

Table 5: Eye structure profile by age and gender

Gender-Age	Normal	Abnormal
Male		
3	24	1
4	18	0
5	7	0
Female		
3	21	0
4	15	0
5	3	0
Total	88 (98.9)	1 (1.1)

Half of those with visual acuity problems were assessed to have hyperopia and astigmatism. This was a 4-year old female prescribed corrective lenses and a 4-year old male who did not require glasses and was advised close follow-up. The other half failed to follow-up (Table 6).

Table 6: Ophthalmologic Assessment and Intervention of Children referred for Visual Acuity Problems

	Visual Acuity Defect		Ophthalmologic Assessment	Intervention
	Left Eye	Right Eye		
Male				
4	20/50	20/50	Hyperopia/Astigmatism	No need for glasses; Close follow-up advised
5	20/40	20/50	Failed to follow-up	-
Female				
3	20/70	20/70	Failed to follow-up	-
4	20/50	20/40	Hyperopia/Astigmatism	Corrective lenses

DISCUSSION

The prevalence of visual disorders conducted in this study was 5% mostly due to refractive errors (4%). These results were comparable with the study done by Premseenthil et al. regarding visual impairment in preschool children in Malaysia wherein visual screening was conducted in 400 preschool children aged 4 to 6 years. The prevalence of visual impairment was 5%, mostly due to refractive errors.⁶ A similar study done by Jamali et al. regarding refractive errors and amblyopia in children in Iran reported that about 6.3% of the children entering school were at risk of amblyopia; mostly due to refractive errors.¹⁰ In a study done in Hongkong by Fans et.al regarding the change in vision disorders among preschoolers, about 4.4% of preschool children had either reduced visual acuity or strabismus.¹¹ In this study, strabismus was seen in 1% of the population. This was a 3 year old male who was referred for further evaluation but was lost to follow-up. Refractive errors were noted in 4% of the population which prompted referral to an ophthalmologist. However, only 2% followed-up. Hyperopia with astigmatism was the type of refractive error seen in two 4-year old pre-schoolers. Significant refractive errors were not observed.

LIMITATION

This study has the inherent weakness of a cross-sectional study. The data collection was restricted to one baranggay. Data regarding the developmental milestone and nutritional status of the children were not collected.

The presence of developmental delay and malnutrition may indicate the presence of associated visual impairment. In addition, the children were only tested for visual acuity and structural eye exam. Comprehensive eye examinations were only offered to those who failed the screening tests.

CONCLUSION AND RECOMMENDATION

The study is a small but important step in the effort to understand the problem of visual impairment among the preschool children. Although results were low, the mere presence of visual disorders in this study is an important confirmation that there is a need for preventive ophthalmologic examination in these age groups. Identification of vision impairment before school entry could help identify children who may benefit from early interventions to correct or improve vision.

BIBLIOGRAPHY

1. Anatomy, Physiology and Pathology of the Human Eye. Ted M. Montgomery O.D. 1998-2003.
2. American Academy of Ophthalmology. Policy statement: Vision Screening for Infants and Children. March 2007
3. Prechtl HF, Cioni G, Einspieler C, Bos AF, Ferrari F: Role of vision on early motor development: lessons from the blind. *Dev Med Child Neurol* 2001, 43(3):198–201.

4. Elias I. Traboulsi, et al: Vision First, A Program to Detect and Treat Eye Diseases in Young Children: The First Four Years. December 2008.
5. Effectiveness of screening preschool children for amblyopia: a systematic review. Department of Medical Biometry and Statistics (German Cochrane Center), Institute of Medical Biometry and Medical Informatics, University Medical Center, Freiburg, Germany. 2009
6. The screening of visual impairment among preschool children in an urban population in Malaysia; the Kuching pediatric eye study: a cross sectional study Mallika Premasenthil¹, Rose Manju², Asokumaran Thanaraj³, Syed Alwi Syed Abdul Rahman⁴ and Tan Aik Kah^{1*})
7. Wiesel TN: Postnatal development of the visual cortex and the influence of environment. *Nature* 1982, 299:583-591)
8. Eibschitz-Tsimhoni M, Friedman T, Naor J, Eibschitz N, Friedman Z: Early screening for amblyogenic risk factors lowers the prevalence and severity of amblyopia. *Journal of AAPOS* 2000, 4:194-199
9. Williams C, Harrad RA, Harvey I, Sparrow JM, ALSPAC Study Team: Screening for amblyopia in preschool children: results of a population-based, randomised controlled trial. ALSPAC Study Team. *Avon Longitudinal Study of Pregnancy and Childhood. Ophthalmic Epidemiol* 2001
10. Jamali P, Fotouhi A, Hashemi H, Younesian M, Jafari A: Refractive errors and amblyopia in children entering school: Shahrood, Iran. *Optom Vis Sci* 2009, 86(4):364-369.
11. Fan DS, Lai C, Lau HH, Cheung EY, Lam DS: Change in vision disorders among Hong Kong preschoolers in 10 years. *Clin Experiment Ophthalmol* 2011, 39(5):398-403.