

ORIGINAL ARTICLE

# Ocular Morbidity among Street Children in Kathmandu Valley

Mukund Pant, B.Optom, Gauri Shankar Shrestha, M.Optom, FIACLE, and Niraj Dev Joshi, B.Optom,

*BP Koirala Lions Centre for Ophthalmic Studies, Institute of Medicine, Tribhuvan University, Maharajgunj, Kathmandu, Nepal*

## ABSTRACT

**Purpose:** Prevalence of ocular morbidity among street children is largely unknown. The present study was carried out to determine the prevalence of ocular morbidity among street children in the Kathmandu Valley.

**Methods:** A cross-sectional study consisting of an eye examination program among 569 street children aged younger than 18 years was conducted from March 2013 to February 2014. Children were included from 11 safe houses of 6 non-governmental organizations and an independent eye camp. Eye examination included visual acuity testing, anterior segment and posterior segment examination, retinoscopy and refraction, cover test, convergence, accommodation and color vision tests. Chi-square test was used to analyze the association of ocular morbidity with age, sex and living conditions.

**Results:** The majority of children (43.8%) were in the age group of 12–15 years, and the male to female ratio was 3.9:1. Uncorrected and best-corrected visual acuity  $\geq 6/9$  in at least one eye was found in 89.8% and 99.4% of children, respectively. Total ocular morbidity was observed at 31.6%. The most common types of ocular morbidity were conjunctivitis (11.0%) and refractive error (11.6%). Ocular morbidity was more common in children over 15 years of age (40.9%;  $p < 0.01$ ; odds ratio 1.8).

**Conclusions:** Ocular infection and refractive error represent the most common ocular morbidities in street children in the Kathmandu Valley.

**Keywords:** Conjunctivitis, Kathmandu, ocular morbidity, refractive error, street children

## INTRODUCTION

The United Nations Children's Fund (UNICEF) describes a street child as "any girl or boy who has not reached adulthood for whom the street (in the broadest sense of the word, including unoccupied dwellings, wasteland, etc.) has become his or her habitual abode and/or source of livelihood, and who is inadequately protected, supervised or directed by responsible adults".<sup>1,2</sup> UNICEF classifies street children into four categories: child of the street, child on the street, child of a street family and child in institutional care.<sup>3</sup> In 1989, UNICEF estimated that 100 million children were growing up on urban streets around the world.<sup>4</sup>

There have been no reliable statistics about street children living in Nepal. The total estimated number is 40,000, and there are an estimated 900–1200 street children in the Kathmandu Valley.<sup>5,6</sup>

Studies on the prevalence of ocular morbidity have so far been conducted in different groups of children in Nepal,<sup>7–12</sup> however, prevalence of ocular morbidity among street children is largely unknown. Street children are basically deprived of parental love, care and understanding. They have been shown to exhibit growth and developmental delay along with several types of health problems.<sup>2,13–15</sup> They are among the most deprived, and they usually have no access to healthcare and education. Due to poor hygienic behavior, poor nutritional status and drug abuse

among street children, ocular problems may be more prevalent. This highlights a cause for concern in this population. In order to understand ocular health in street children, an eye screening program was initiated and risk factors were assessed. Early detection of such problems may save them from irreversible damage and improve quality of life.

## MATERIALS AND METHODS

This was a cross-sectional community-based study conducted among street children aged younger than 18 years in the Kathmandu Valley, from March 2013 to February 2014.<sup>16</sup> The fluid and mobile nature of street children made exact estimation of composition and size of the target population difficult, so a purposive sampling method was adopted to enroll the maximum number of children. A total of 569 street children were enrolled from 11 safe houses of 6 non-governmental organizations (NGOs) that sheltered street children in different places in the Kathmandu Valley, and a separate eye camp to enroll those children who were not in contact with an NGO (Table 1). Total attendance of the children was 77.9%. The institutional review board at the Institute of Medicine, Tribhuvan University, approved the study protocol, and the study followed the tenets of the Declaration of Helsinki. Informed consent was obtained from both the administrator of the NGOs and from the children themselves.

The examination team was composed of an ophthalmologist, two optometrists, two to four optometry students and an ancillary staff member. An interview related to cause of living on the street, daily activities/working conditions, duration of living on the street, previous eye examinations and previous use of glasses was conducted.

Unaided, presenting and best-corrected distance visual acuity of each eye was assessed with a Snellen multiple E-chart at 6 m distance under normal illumination. A cover test was performed with a cover paddle to check for strabismus. In uncooperative children, a Hirschberg test was carried out. Convergence and amplitude of accommodation were

assessed using a Royal Air Force ruler (Clement Clarke International, Harlow, Essex UK). Dry retinoscopy and subjective refraction was performed in each child. Cycloplegic refraction was performed in children with hypermetropia, strabismus, and visual acuity worse than 6/6, using 0.5% cyclopentolate eye drops instilled twice with a 5-min interval and retinoscopy performed 30 min after the instillation of the last drop. Detailed anterior segment evaluation was performed with a hand-held slit lamp and a torch light. Posterior segment evaluation was performed with direct ophthalmoscope. Fundus evaluation under mydriasis was carried out with 0.5% tropicamide in cases with media opacities.

Myopia was considered significant when spherical equivalent refraction was  $\geq -0.50$  diopters (D). Hypermetropia was considered significant when spherical equivalent refraction was  $\geq +1.00$ D. Astigmatism was considered significant for cylinder  $\geq 0.75$ D. A diagnosis of amblyopia was made if vision was 6/12 or worse after examination, including funduscopy through the dilated pupil and cycloplegic refraction.

All data were entered in SPSS version 20.0 (IBM Corp, Armonk, NY, USA) for analysis. A chi-square test was performed to analyze the comparison between different types of ocular morbidity. The associations of ocular morbidity with age, sex and living conditions were estimated by calculating odds ratios (ORs) and 95% confidence intervals (CIs). A  $p$ -value  $\leq 0.05$  was considered statistically significant.

## RESULTS

Among 569 street children, the majority were male ( $n=452$ , 79.4%). Mean age was  $12.9 \pm 2.9$  years (range 6–18 years), and the majority of children were in the age range of 12–15 years ( $n=303$ , 53.2%). Only 67 children (11.8%) had previously received an eye examination, mostly in free eye check-up camps. Only 12 children (2.1%) had glasses.

Uncorrected and best-corrected visual acuity  $\geq 6/9$  in at least one eye was found in 89.8% and 98.4% of children, respectively (Table 2). Even after best

TABLE 1. Number of street children examined from different locations, Kathmandu Valley.

Location	Sites, $n$	Children estimated to be present, $n$	Children examined, $n$ (%)	Children examined, %
Child Protection Centers and Services	4	195	138 (24.2)	70.8
Association for Protection of Children	2	130	122 (21.4)	93.8
Voice Of Children, Nepal	2	90	75 (13.2)	83.3
Child Watabaran Center Nepal	1	70	59 (10.4)	84.3
Kopila House	1	–	13 (2.3)	–
Hearth Beat Foundation, Kamalpokhari	1	25	13 (2.3)	52
Help for Street children, Eye Camp, Basantapur	1	200	149 (26.2)	74.5
Total	12	730	569 (100)	77.9

refractive correction, 9 children (1.6%) had visual acuity worse than 6/12.

Refractive error was found to be the second most common type of ocular morbidity, present in 66 children (11.6%, Table 3). Myopia ( $\geq -0.50\text{D}$ ) was the most common type of refractive error, present in 43 children (7.6%). Mean spherical equivalent refraction for myopia was  $-1.23 \pm 0.69\text{D}$  (range  $-0.50$  to  $-2.75\text{D}$ ) and for hypermetropia was  $+2.67 \pm 3.14\text{D}$  (range  $+1.00$  to  $+14.00\text{D}$ ). Mean spherical equivalent refractive errors for right eyes ( $-0.20 \pm 2.42\text{D}$ ) and left eyes ( $-0.13 \pm 2.13\text{D}$ ) were found to be significantly correlated ( $r=0.6$ ,  $p<0.01$ ).

Ocular morbidity including refractive error, was present in 180 children (31.6%). Bilateral ocular morbidity was present in 93.3%, and 2 or more types of ocular morbidity were present in 33.3% of children. Conjunctiva and lid-related ocular morbidity represented the major sites of ocular conditions in 11.9% and 9.6% of children, respectively (Table 4). Ocular morbidity was more commonly associated with children over 15 years of age ( $p<0.01$ , OR 1.8, 95% CI 1.3–2.6; Table 5). Strabismus was present in 17 children (3.0%), of which 23.5% was unilateral and 76.5% alternating, and 11.8% had esotropia and 88.8% had exotropia. Amblyopia was present in 14 children (2.5%), of which 78.6% had functional amblyopia and 21.4% had organic amblyopia.

Management of children with ocular problems was attempted to the best possibility. Children diagnosed with ocular surface infections were distributed free medicine. All children requiring refractive corrections were prescribed glasses. One case with congenital cataract was advised to attend at BP Koirala Lions Centre for Ophthalmic Studies for cataract surgery.

## DISCUSSION

Living on the street with no supervision, protection and guidance, often makes street children vulnerable to a wide range of health-related problems.<sup>4,13,15,17</sup> This is the first study to estimate the prevalence of ocular morbidity among street children in the Kathmandu Valley, Nepal. This study represents ocular morbidity in 180 (31.6%) children. Ocular morbidity in children has been found to range from 9.8% to 33.7% in different studies.<sup>8,9,18–24</sup> Ocular morbidity was significantly more common in older children over 15 years of age (Table 5). Only a minority of these children (11.6%) had received an eye check-up at free eye-screening camps. Living conditions on the street represent their striking inaccessibility to education, health services, social justice and parental care.<sup>6,13,25</sup> Usually, the higher prevalence of ocular morbidity among street children

TABLE 2. Uncorrected, presenting and best-corrected visual acuity among street children, Kathmandu Valley.

Visual acuity	Uncorrected VA, <i>n</i> (%; 95% CI)	Wearing glasses <i>n</i> (%; 95% CI) <sup>a</sup>	Presenting VA, <i>n</i> (%; 95% CI)	Best corrected VA, <i>n</i> (%; 95% CI)
$\geq 6/9$ both eyes	497 (87.3; 84.6–90.1)	3 (0.6)	500 (87.9; 85.2–90.5)	547 (96.1; 94.5–97.7)
$\geq 6/9$ one eye only	14 (2.5; 1.2–3.7)	2 (14.3)	16 (2.8; 1.4–4.2)	13 (2.3; 1.1–3.5)
$\leq 6/12$ to $\geq 6/18$ better eye	37 (6.5; 4.5–8.5)	6 (16.2)	38 (6.7; 4.6–8.7)	6 (1.1; 0.2–1.9)
$\leq 6/24$ to $\geq 6/36$ better eye	12 (2.1; 0.9–3.2)	1 (8.3)	8 (1.4; 0.4–2.4)	3 (0.5; 0.1–1.1)
$\leq 6/60$ better eye	9 (1.6; 0.5–2.6)	–	7 (1.2; 0.3–2.1)	–
Total	569 (100)	12 (2.1)	569 (100)	569 (100)

VA, visual acuity; CI, confidence interval.

<sup>a</sup>Percentage of the number within each visual acuity category based on uncorrected vision.

TABLE 3. Prevalence of refractive error according to age and sex in street children, Kathmandu Valley.

Age, years and sex	Myopia, <i>n</i> (%)		Hypermetropia, <i>n</i> (%)		Astigmatism		Odds ratio (95% CI)	<i>p</i>
	$\leq -1.50\text{D}$	$> -1.50\text{D}$	$\leq +1.50\text{D}$	$> +1.50\text{D}$	$\leq 1.00\text{D}$	Absent, <i>n</i> (%) Present, <i>n</i> (%)		
6–8	2 (4.3)	1 (2.2)	1 (2.2)	1 (2.2)	–	41 (89.1) 5 (10.9)	0.9 (0.3–2.4)	0.87
9–11	3 (2.7)	2 (1.7)	2 (1.7)	4 (3.5)	1 (0.8)	103 (89.6) 12 (10.4)	0.9 (0.4–1.7)	0.19
12–14	14 (6.0)	4 (1.7)	8 (3.5)	2 (0.9)	1 (0.4)	203 (87.5) 29 (12.5)	1.2 (0.7–1.9)	0.31
$\geq 15$	13 (7.4)	4 (2.3)	1 (0.6)	–	2 (1.1)	156 (88.6) 20 (11.4)	1.0 (0.6–1.7)	0.01
Male	21 (4.6)	9 (2.0)	9 (2.0)	6 (1.3)	3 (0.7)	405 (89.4) 48 (10.6)	0.6 (0.4–1.2)	0.14
Female	11 (9.5)	2 (1.7)	3 (2.6)	1 (0.9)	1 (0.9)	98 (84.5) 18 (15.5)	1.5 (0.9–2.8)	0.14
Total	32 (5.6)	11 (2.0)	12 (2.1)	7 (1.2)	4 (0.7)	503 (88.4) 66 (11.6)		

CI, confidence interval; D, diopters.

TABLE 4. Ocular morbidities by anatomic site in street children, Kathmandu Valley.

Anatomic site	Morbidity	Frequency, <i>n</i> (%)	Total, <i>n</i> (%)
Lid related	Blepharitis	33 (5.8)	55 (9.6)
	Stye and chalazion	8 (1.4)	
	Meibomitis	12 (2.1)	
	Ptosis	2 (0.3)	
Conjunctiva related	Infective conjunctivitis	41 (7.2)	68 (11.9)
	Allergic conjunctivitis	22 (3.8)	
	Pingueculitis	5 (0.9)	
Cornea related	Corneal opacity	6 (1.1)	7 (1.3)
	Corneal ulcer	1 (0.2)	
Lens related	Cataract	4 (0.7)	6 (1.1)
	Pseudophakia	1 (0.2)	
	Aphakia	1 (0.2)	
Retina related	Disc coloboma	1 (0.2)	3 (0.5)
	Macular scar	2 (0.3)	

TABLE 5. Prevalence of ocular morbidity according to age and sex in street children, Kathmandu Valley.

Characteristic	Ocular morbidity		Odds ratio	95% CI	<i>p</i>
	Absent, <i>n</i> (%)	Present, <i>n</i> (%)			
Sex					
Male	308 (68.1)	144 (31.9)	1.1	0.7–1.6	0.82
Female	81 (69.2)	36 (30.8)	0.9	0.6–1.5	0.82
Age, years					
6–8	40 (86.9)	6 (15.1)	0.3	0.1–0.7	<0.01
9–11	91 (79.1)	24 (20.9)	0.5	0.3–0.8	<0.01
12–14	154 (66.4)	78 (33.6)	1.2	0.8–1.7	0.39
≥15	<b>104 (59.1)</b>	<b>72 (40.9)</b>	<b>1.8</b>	<b>1.3–2.6</b>	<b>&lt;0.01</b>
Total	389 (68.4)	180 (31.6)			

CI, confidence interval.

Bold values indicates that street children above 15 years of age are at greater risk of having ocular morbidity (ODD 1.8; *p* < 0.01; 95% CI, 1.3–2.6).

was expected to be due to poor hygienic behavior, lack of proper nutrition, drug abuse, continuous exposure to a dusty polluted environment, and working conditions and daily activities.<sup>1,2,13,26</sup>

Prevalence of uncorrected, aided and corrected visual acuity  $\geq 6/9$  in both eye were 87.3%, 87.9% and 96.1%, respectively. Nine children (1.6%) had best-corrected visual acuity  $< 6/12$  in the better eye. Our findings were comparable to a study by Shrestha et al.<sup>18</sup> which reported uncorrected, aided and corrected visual acuity  $\geq 6/9$  in both eye of 86.3%, 86.9% and 99.0%, respectively.

Refractive error (11.6%) was found to be the second most common ocular morbidity in our study. Similar result were shown in studies by Shrestha et al.,<sup>20</sup> Shrestha et al.,<sup>18</sup> and Nepal et al.<sup>9</sup> at 12.6%, 9.0%, and 8.1%, respectively. Refractive error was reported to be significantly higher in mentally retarded children in the Kathmandu Valley (67.9%)<sup>7</sup> and in school children in Shimla, India (22%)<sup>23</sup> and in the Kathmandu Valley (21.9%).<sup>8</sup> Low prevalence of refractive error was reported in urban slums non-schooled children in Ahmedabad city, India (3.3%).<sup>19</sup> Different diagnostic criteria used in different studies, ethnic variation, living conditions and demands of near work might

induce different prevalence rates.<sup>18</sup> As in the other studies, myopia (65.1%) was the predominant refractive condition in our study.<sup>9,12,24</sup> Refractive error can easily be tackled by dispensing spectacles. This issue has to be tackled early, and with provision of proper correction to prevent a child from developing visual impairment.

Conjunctiva and lid-related ocular conditions were the first (11.9%) and third (9.6%) most common ocular morbidities, respectively (Table 4). Prevalence of blepharitis in our study (5.8%) was similar to that of Shrestha et al.<sup>18</sup> at 5.4%. But this finding was higher than in the Talsania et al.<sup>19</sup> study (2.3%) and the Shrestha et al.<sup>20</sup> study (0.8%). In our study, prevalence of conjunctivitis (11.0%) was also similar to that of the Shrestha et al.<sup>18</sup> study finding of 11.2%. Conjunctivitis was reported to be as low as 0.6% to 8.2% in other studies.<sup>12,19,20,23</sup> In our study, these ocular surface disorders were relatively higher. The reason behind this finding could be due to poor hygiene and living condition of the street children.

In our study, amblyopia and strabismus were present in 2.5% and 3.0% of children, respectively. However, variable ranges of prevalence of amblyopia (between 0.2 and 2%)<sup>12,18,24</sup> as well as strabismus

(between 0.6 and 3%) have been reported in various studies.<sup>9,18,19,21,23</sup> Although these children with amblyopia and strabismus represent a small proportion of ocular morbidity, the consequences of these conditions can not be neglected. Thus, timely effective management has to be employed to tackle such problems and restore vision.

A limitation of the study was lack of exact enumeration of street children, making determination of sample size difficult, so randomization was lacking. Detailed history related to use of drugs, vulnerability of abuses, social context, belief, cultural practices, awareness related to health, psychological perspectives and detailed educational status could not be assessed.

Ocular infections and refractive error represent the most common ocular morbidities in street children. The majority of ocular disorders observed were either preventable or treatable.

The supporting organization during the eye examination program should organize regular eye check-up programs. They can collaborate with the nearest eye hospital to set up periodic eye examinations for street children targeting vision and ocular health screening, expand optometric services, and management of ocular infections and refractive correction. There should be community-based cost effective strategies and appropriate eye care programs targeting this vulnerable group of children.

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## DECLARATION OF INTEREST

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