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PATTERN AND PREVALENCE OF OCULAR MORBIDITY IN SCHOOL CHILDREN: A CROSS-SECTIONAL STATISTICAL STUDY IN DISTRICT HARIPUR, PAKISTAN

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Abstract

Background: *The spectrum of eye disease can be termed as 'ocular morbidity,' affects several people in developing counties, especially children worldwide. Childhood ocular morbidity critically impacts not only affect mental development, education, but also the quality of life of a child.*

Objective: *This study aimed to find out the frequency and causes of ocular morbidity among the school-going children of district Haripur, Khyber Pakhtunkhwa province of Pakistan.*

Method: *A cross sectional study was conducted in district Haripur from 2017-2018, for which a total of 1521 school-going children were screened. Sample size was calculated using formula* $n = Z^2PQ/D^2$. *The data was collected on a questionnaire from seven public schools of district Haripur, Pakistan. Data were then analyzed by statistical analysis using a statistical tool, SPSS version 16.*

Results: *Results from the study indicates that the overall frequency of ocular morbidity observed in 616 (40.50%) children, among which 525 (38.80%) belongs to a rural area and 91(44.20%) to urban.30.4% of children were affected with mild, 8.9% moderate, and 1.1% with severe ocular morbidity. Ocular diseases and refractive errors were also observed more frequently in children, as 9.9% and 9.1%, respectively. Myopia was observed in 4.9% and Blepharitis, with a frequency of 5.5%. Cataract was found in about 0.3% of children, Squint in 1.5% of children, Amblyopia 1.2%, Convergence Insufficiency 1.6%, Corneal Opacity 0.2% and Vitamin A deficiency was recorded as 0.9%. Some other ocular conditions such as Ptosis were 0.3% and Nystagmus, Keratoconus and Chalazion were found 0.4% collectively. The frequency of computer vision*

*syndrome was in about 27.4% of children. Spearman correlation coefficients rho (R) showed a strong positive correlation between refractive error with squint and Amblyopia with ρ-value of 0.095** and ρ-value of 0.313**, respectively. Similar results obtained when squint correlated with Amblyopia and Convergence Insufficiency with spearman's correlation coefficients of p-value of 0.332** and ρ-value of 0.537**.*

Conclusion: *It can be concluded that the frequency of ocular morbidity was found higher in children of urban areas as compared to the ruler area. Several conditions result in ocular morbidity, mare affecting the vision, and eventually decreasing the intelligence level and intellectual activities of children. Proper attention and management may be required to overcome the burden of ocular morbidity in the study area.*

INTRODUCTION

Ocular morbidity is the spectrum of eye disorders that contain both visually impairing and non-visually impairing conditions of the eye and one of the significant public health problems experienced by the population (Mahesh et al., 2012).According to WHO, around nineteen (19) million of school going children having impaired vision because of Refractive error. It makes the world more worried that in this developing world currently, a child goes blind every minute. An estimated 1.4 million are effected with irreversible blindness and additionally seven (7) million having low vision are required access to the vision rehabilitation services to optimize functioning and reduce visual disability (Bourne et al., 2017). It is also estimated that more than 90% of the blind children are not learning schooling and still unable to establish their complete potential. So the childhood blindness remains one-third of the total economic cost of blindness, although it accounts less than 4% of the overall burden. The blindness in children remains the 2nd largest cause of overall blindness after cataract. An estimated there is 1.4 million of blind children worldwide, wherein 73% of them live in low-income countries (WHO Global Data 2010-12).

The prevalence of moderate and severe visual-impairment in older adults was highest in South Asia 23.6% (19.4-29.4%) and in the Middle East 4.6% (3.5%-5.8%) with 95% confidence interval (Bourne et al., 2017). In China, ocular morbidity was about 18.36% (Lu et al., 2008), and in Iran, the prevalence of Refractive was about 73.1%, including Myopia 14.9%, Hypermetropia 12.9% and Astigmatism 45.3% (Norouzirad et al.,2015). The ocular morbidity was about 31.6% in Kathmandu valley of Nepal (Pant et al., 2014.).In India the ocular morbidity prevalence was found 29.35%, including 30.05% in rural and 28.65% in urban schools. Their results showed that the refractive-error was (17.36), convergence insufficiency was (2.79%), Vitamin A deficiency (2.09%), Blepharitis was (2.11%), Bacterial Conjunctivitis was (0.95%), Allergic Conjunctivitis was (1.92%), Amblyopia was found (0.41%), Stye was (0.31%), Squint was (0.27%) and Chalazion (0.27%) (Singh et al., 2017).

Condition	Prevalence (%
Overall Ocular Morbidity	29.35
Rural Schools	30.05
Urban Schools	28.65
Refractive Error	17.36
Convergence Insufficiency	2.79
Vitamin A Deficiency	2.09
Blepharitis	2.11
Bacterial Conjunctivitis	0.95
Allergic Conjunctivitis	1.92
Amblyopia	0.41
Stye	0.31
Squint	0.27
Chalazion	0.27

Pakistan is the sixth most populous and developing country located in the worlds' eastern Mediterranean region. The national blindness and visual impairment survey of Pakistan conducted in 2006, in which a total of 16,507 adults were examined. Prevalence of blindness was 2.7%higher in Punjab and Baluchistan province of Pakistan and found higher in rural areas compared to urban, 3.8% and 2.5%, respectively. In contrast study in the Battagram District of Hazara division showed that the prevalence of refractive error in school going children was about 4.58% (Hussain et al. 2014). Similarly, another study on Madrassa students of District Haripur showed the prevalence of refractive error about 41% (Atta et al., 2015).

However, there are no standardized techniques or methodologies for the collection of comprehensive information on ocular morbidity in children and the ability to undertake epidemiological and health economic analysis in details. The Updated information about the causes and prevalence of blindness and visual impairment in children is needed, for which proper planning, evaluating preventive and curative measures for children with ocular morbidity must be done on priority so that there will be no child misses the happiness, beauty of nature and specially the opportunities that current world is providing to them that's why the current study aimed to find the prevalence an causes of ocular morbidity in school-going children with age group from 6 to 15 years to in District Haripur, Khyber-Pakhtunkhwa Pakistan.

Material and Methods

Study Design

Across-sectional study in school (public sector) going children of age 6-15 years of district Haripur, Khyber Pakhtunkhwa province, Pakistan, was conducted. The study was started from October 2017 to August 2018, during this period a total of 1521 children of 7 public schools were screened. According to census result 2017 report that, district Haripur is a developing city and is on the top in literacy (93%) all over Pakistan. In district Haripur, only 12.65% of the population is living in urban areas and 88.3% living in rural areas

(district wise census 2017). The total number of children in primary, middle, and high schools of district Haripur was 146,818of age group 6-15 years. Sample size was calculated by using online sample calculator through formula $N= Z^2PQ/D^2$while Z= 2.4 at 95% confidence level, P=reported prevalence 20.86 %(0.2086), Q (1-P) = 79.14% (0.7914) and D=precision=2.5%. The reliability of the data was checked by calculating Cronbach's alpha; the value of Cronbach's alpha was about 0.70, as shown in table 1.The calculated sample size is 1521, which includes 168 (11%) from an urban area and 1353(89%) from rural areas. The SPSS checked the normality of the data, and the Shapiro-Wilk test showed a value of 0.00, i.e., less than 0.05.These data selected through the stratified sampling technique based on data provided by the Education Department, which showed that about 11% of students were studying in urban while 89% of students studying in rural areas, as shown in figure1.Thirty questionnaires were used for pilot testing conducted at school study before a comprehensive study.

A reliability study was set up to assess the inter examiner reliability of the questionnaires and clinical measurements. The data collection procedure includes personal interviews, objective and subjective ocular examination and a proper questionnaire. During the data collection, a proper authority letter was taken from the head of the public health department and supervisor and was provided to the district education officers, male and female. A total of seven schools were randomly selected for the study, including three high schools, two middle schools, and two primary schools equally from urban/ rural and male/ female according to the sample size. Before the examination process, written consent has taken from the parents, head of school, and responsible teacher. Children of age group other than 6-15 years, mentally disabled children, and not willing to participate in the study were excluded from the study.

Tools and examination procedure

Materials used during the study were Snellen Visual Acuity charts, handheld torches, rechargeable handheld direct Ophthalmoscope, rechargeable handheld streak Retinoscope, trial Refraction lens box, handheld Occluders, head-mounted binomag loupe, Auto refractometer, and slit-lamp examination. School teachers were trained in primary eye care and were guided to ask some questions from children and recorded on a questionnaire. Proper visual acuity was taken with the Snellen visual acuity chart on both eyes separately unaided and with spectacle. Students were screened having visual acuity less than 6/9 in both eyes for detailed examination. A streak retinoscopy was used for quick observation of refractive error in young children below 10 years and who were not so cooperative. Pen torch and ophthalmoscope were used for papillary reaction checking and a thorough examination of external and internal structures of eye for any ocular abnormality. A pencil push procedure was used for identifying convergence insufficiency. Cover-uncover test was performed to observe any deviation of any eye. The isolated subjects were then examined in detail, and all the points were recorded on a questionnaire. For the suspected low myopic children and high refractive error, especially of having hypermetropic using accommodation were isolated for detailed examination. Cycloplegic refraction was then performed by using Cyclopentolate HCL1% eye drops, and glasses were then prescribed and noted on the questionnaire. Students having severe ocular conditions were referred to the hospital for detailed investigation and management. Almost all the students were presented in the hospital; the response ratio 99%.

Diagnostic Criteria

The diagnostic Criteria utilized for Refractive-error was -0.50-diopters or more for Myopia, for Hypetmetropia it is +1.00 diopter or more and ≥ -0.75 diopter cylinder for Astignatism. Presenting vision is characterized by the Visual Acuity (VA), in the better eye unaided or with currently using the best available refractive correction in spectacle wearers. Best corrected vision was noted as the visual acuity in the better eye accomplished by subjects used with refraction. Amblyopia finding was made whether the vision was 6/9 or worse with full visual correction and after the complete

eye examination including funduscopy through the dilated pupil and Cycloplegic-refraction. Ocular morbidity was graded as mild ocular morbidity it means that patient has only one ocular disorder, reduced ocular morbidity which means that patients have two ocular disorders and severe ocular morbidity which means that patients have more than two ocular disorder.

Statistical analysis

Statistical package for social sciences (SPSS) version 19 was used for the analyses of data. All the collected data were arranged on SPSS software and required analysis and tests as Reliability test shown in table 1, Normality test, Descriptive Statistics, Frequencies, Bivariate correlations, Chi-square test of independence and two independent variables analysis Mann-Whitney-U test was performed. Chi-square for refractive error, squint, amblyopia, and convergence insufficiency was determined. Mann-Whitney U test of ocular morbidity and school status (urban and rural), computer vision syndrome and electronic devices used within urban and rural areas. The p-value for a confidence interval of 95% was considered significant at the $p<0.05$ level for prevalence estimation.

Table 1: Reliability of the data set selected for the current study calculated using Cronbach's Alpha.

Cronbach's Alpha	N of Items
0.70	13

Cronbach's alpha, as 0.9 is considered as excellent, 0.8 good, 0.7 acceptable, 0.6 questionable, 0.5poor and less than 0.5 is considered as unacceptable.

Results

Total children examined during the study were 1521 in which 905(59.5%) of children appeared normal, and having no visible ocular morbidity, ocular morbidity was found in about 616(40.50%) of children. Cross-tabulation of ocular morbidity and school status highlighting that 905(59.50%), including 828(61.20%) rural and 77(45.88%) urban children, had no ocular morbidity. The overall ocular morbidity, including computer vision syndrome, was found in about 616 (40.50%), including 525 (38.80%) in rural and 91(44.20%) in urban children. Out of these, about 463(30.44%) had mild ocular morbidity, including 393(29%) rural and 70(41.66%) urban children. About 136(8.9%) had moderate ocular morbidity, including 117(8.65%) rural and 19(11.27%) urban children. Overall severe ocular morbidity was found in about 17(1.1%) of children, including 15 (1.15%) rural and2(1.19%) urban children. The data is showing that overall there is no significant difference in ocular morbidity among school-going children in rural and urban areas, as shown in table 2.

About 565(64.2%) male children including 521 (66.5%) rural and 44 (45.4%) were normal and 315(35.8%) of male children including 262(33.5%) rural and 53(54.6%) had ocular morbidity. 641 were female, which consists of 570 rural and 71 children from urban areas. It was found that a total of 340 (53%) of female children, including 307 (53.9%) rural and 33 (46.5%) urban were normal and healthy with no symptoms of ocular morbidity. 301 (47%) of female children, including 263 (46.1%) from rural and 38 (53.5%) from urban areas, were positive for ocular morbidity as shown in table 2. The results showed that the frequency of ocular morbidity was almost similar in female children when compared with male children, as shown in table 3. Age of children was analyzed to determine the descriptive such as maximum and the minimum number of age group, the table is showing that children with 12-13 years of age are higher in number 528 (34.7%), and 150(9.8%) were children with age group I (6-8 years) as shown in table 2.

Table 2: Age, gender, Electronic device user and Severity of disease (Ocular Morbidity), with respect to area of school going children.

Variables		Total Number (N)	Frequency %	Area of School			
				Rural area	%	Urban area	%
Gender	Male	880	58.8	783	89	97	11
	Female	641	42.1	570	88.9	71	11.1
Age (years)	6-8	150	9.8	107	71.33	43	28.67
	9-11	424	27.8	367	86.55	57	13.45
	12-13	528	34.7	494	93.56	34	6.44
	14-15	419	27.5	386	92.1	33	7.9
Electronic device user	No electronic user	608	39.9	553	87.7	55	12.3
	1 device	473	31.1%	412	87.1	61	12.9
	2 devices	278	18.3%	241	86.7	37	13.3
	>2 devices	162	10.7%	148	91.3	14	8.7
Time spending on electronic devices using	non user	609	40.0	556	91.3	53	8.7
	<2 hour	527	34.6	433	82.2	93	17.8
	2 hour	321	21.1	301	93.8	20	6.2
	>2 hour	64	4.2	63	98.4	1	1.6
Severity of Ocular Morbidity	No	905	59.5	828	61.2	77	45.8
	Mild	463	30.4	394	29.0	69	41.6
	Moderate	136	8.9	117	8.6	19	11.27
	Severe	17	1.1	15	1.15	2	1.19

Electronic Devices user

A total of 913(60%) children were using electronic devices, as shown in table 5. 473(31.1%) were using only a single electronic device (television). 278(18.3%) of children were using two electronic devices, mostly were using television and smartphones, and 162(10.7%) were using more than two electronic devices, which were television, smartphones, computer, laptop, tablets, and video games as shown in table 2. Children were spending much time on electronic devices, about 527(34.6%) of children were using for less than 2 hours, 321(21.1%) of children were spending two hours daily, and 64(4.2) of children were using electronic devices for more than two hours as shown in table 2. Mann-Whitney U test showed that ocular morbidity is more in urban areas (861.85) than in rural areas (748.48) and electronic devices users more in urban (797.16) than rural (756.51) as shown in table 3.

Table 3: Mann-Whitney U test of ocular morbidity, number of electronic devices daily use and computer vision syndrome

Variables	School. Status	N	Mean Rank	Sum of Ranks
Ocular Morbidity	Rural	1353	748.48	1012690.50
	Urban	168	861.85	144790.50
Number of Electronic Devices use daily	Rural	1353	756.51	1023558.50
	Urban	168	797.16	133922.50
Computer Vision Syndrome symptoms	Rural	1353	759.67	1027829.50
	Urban	168	771.74	129651.50

N number of school-going children,

Conditions of Ocular Morbidity

Refractive Error

Refractive error was found in bout 138(9.1%) of children, in which myopia was about 74(4.9%), hypermetropia 30(2%), and astigmatism 34(2.2%). It shows that the myopia is widespread among school-going children of district Haripur as shown in table 4.

Squint (Strabismus)

Squint was present in 23(1.5%) of children, esotropiain9(0.6%), exotropia 12(0.8%), and hypertropia were found in about 2(0.1%) of children as shown in figure 1.

Amblyopic (Lazy Eye)

Amblyopic (lazy eye) was detected in about 18(1.2%) children, and it was observed that the amblyopia ratio was more in school-going children, as shown in table 4.

Convergence Insufficiency

Convergence insufficiency was observed in about 25(1.6%) of children, and it shows that convergence insufficiency ratio was more in school-going children, as shown in table 4. Spearman's correlation coefficients rho (R) showed a strong positive correlation between refractive error with squint and amblyopia with ρ 0.095** and ρ 0.313**, respectively. Similar results obtained when squint correlated with amblyopia and convergence insufficiency with Spearman's correlation coefficients of ρ 0.332** and ρ 0.537**, as shown in table 5.

Other Ocular Diseases

Cornea Opacity

Cornea opacity was detected in about 3 (0.2%) of children, central corneal opacity was observed in 2 children, and peripheral corneal opacity was found in only one child as shown in table 3.

Cataract

Cataract was also detected in about 5 (0.3%) children, 3(0.2%) have congenital/developmental cataracts, and 1+1(0.1%) had traumatic and other types of cataracts as shown in table 3.

Vitamin "A" Deficiency

Vitamin a deficiency was found in 14(0.9%) of children as shown in table 4.

Ocular diseases

Ocular diseases were detected in about 171(9.9%), which include blepharitis 84(5.5%) the primary ocular infection shown in figure 1, others include vernal-kerato-conjunctivitis 60(3.9%), trachoma 2(0.1%) shown in figure 2, adenoviral conjunctivitis 3(0.2%), only 2(0.1%) children had both ocular diseases at the same times shown in table 3. There are some other ocular conditions examined and recorded during the study, and it shows that 10(0.7%) of children had other ocular disorder such as ptosis were found in 5(0.3%) of children shown in figure 1, Nystagmus, Keratoconus and Chalazion were found about 2, 1 and 1 (0.3%) respectively as shown in figure 2.

Figure 1: Eyes of school-going children showing different conditions of ocular morbidity

A) Ocular disease, Blepharitis was observed in the eyes of a child age 7 years. **B)** shows a child with ptosis, where the upper lid of a right eye is dropping. **C)** Right and left eyes showing early and late stage of vernal keratoconjunctivitis (VKV). **D)** Right eye of child showing Esotropia (Strabismus)

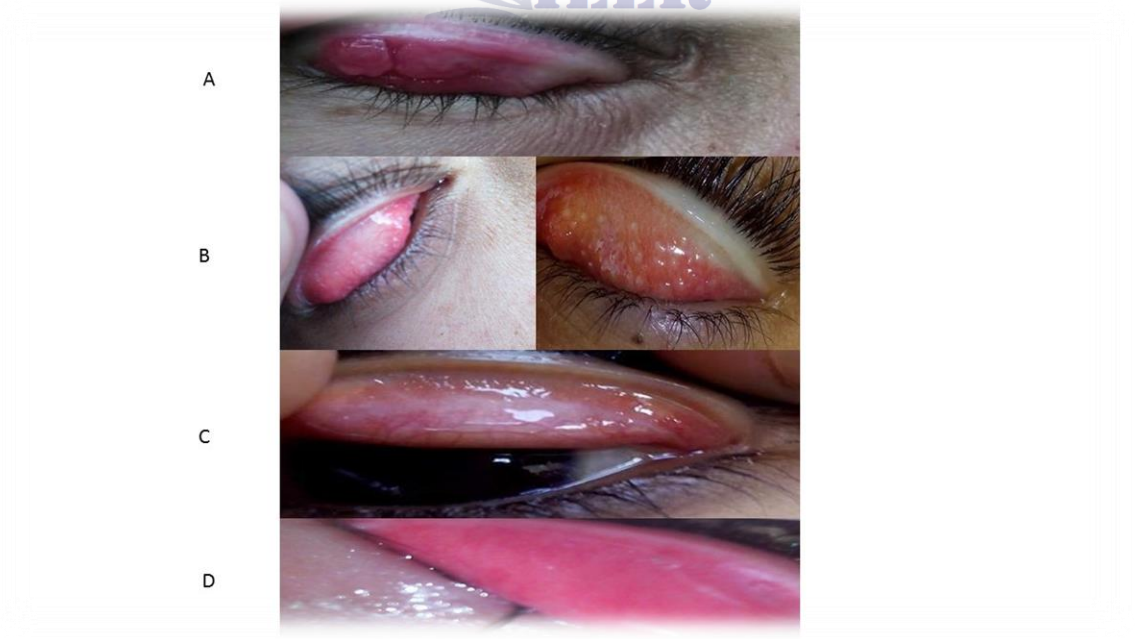

Figure 2: Eyes of school-going children showing different conditions of ocular morbidity

A) Ocular disease,giant papillary conjunctivitis (GPC) Acute stage of VCK, **B)** Trachoma (trachomatous follicles), **C)** Trachoma (trachomatous scarring),**D)** Trachoma (trachomatous inflammation).

Computer Vision Syndrome

A total of 27.4% of children were observed with computer vision syndrome. Headache was the most common symptom found in about 217(14.3%) of children, eyestrains 57(3.7%) and blurred vision 29(1.9%). Children had experienced more than one symptoms such as headache and eyestrains 63(4.2%), headache and blurred vision 17(1.1%), eyestrains and blurred vision 14(0.9%) and headache, eyestrains and blurred vision all these three symptoms were observed in about 20(1.3%) of children. Vitamin A deficiency was also observed in 14(0.9%) of children, as shown in table 4.

Table 4: Frequency and percentages of all conditions observed in study population.

S/no	Indicators	Frequency (N)	Percentage(%)
1	**Refractive error**	138	9.1%
2	**Ocular diseases**	171	9.9%
3	**Cataract**	5	0.3%
4	**Strabismus (squint)**	23	1.5%
5	**Amblyopic (lazy eye)**	18	1.2%
6	**Convergence insufficiency**	25	1.6%
7	**Cornea opacity**	3	0.2%
8	**Number of electronic devices user**	913	60%
9	**Computer vision syndrome**	417	27.4%
10	**Vitamin a deficiency**	14	0.9%
11	**Other ocular conditions**	10	0.7%

Correlation Analysis

Correlations have checked for some variables such as refractive error, ocular disease, squint, amblyopia and convergence insufficiency. The bivariate correlation, spearman test on SPSS were performed on all these variables, and it was found that refractive error, squint and amblyopia are strongly correlated with the p-value=0.00, ocular diseases were also correlated with refractive error with p-value=0.01, squint and convergence insufficiency was also correlated with Significant value 0.00, as shown in the table. So the results showed that all these variables were strongly correlated with each other with the p-value=<0.05 as shown table 5.

Table 5:Correlation between the Refractive Error, Ocular Diseases, Squint, Amblyopia and Convergence Insufficiency causing ocular morbidity in study population

Spearman's rho		Refractive. Error	Ocular. Diseases	Squint	Amblyopia	Convergence. Insufficiency
Refractive. Error	Correlation Coefficient	1	-.087**	.095**	.313**	-0.004
	Sig. (2-tailed)	.	0.001	0	0	0.865
Ocular. Diseases	Correlation Coefficient	-.087**	1	0.014	-0.036	-0.007
	Sig. (2-tailed)	0.001	.	0.587	0.157	0.798
Squint	Correlation Coefficient	.095**	0.014	1	.332**	.537**
	Sig. (2-tailed)	0	0.587	.	0	0
Amblyopia	Correlation Coefficient	.313**	-0.036	.332**	1	0.034
	Sig. (2-tailed)	0	0.157	0	.	0.189
Convergence. Insufficiency	Correlation Coefficient	-0.004	-0.007	.537**	0.034	1
	Sig. (2-tailed)	0.865	0.798	0	0.189	.

† Spearman correlation coefficients rho (ρ). * $p < 0.05$. p values were computed using Sig. (2-tailed).

DISCUSSION

Ocular morbidity or visual impairment is a significant global health problem faced by the children under the age of 17 years that has a tremendous impact on the economically backward society. The current study conducted among public school children of district Haripur, Pakistan. The overall frequency of ocular morbidity, including computer vision syndrome, was recorded as 616 (40.50%) in the studied population. Among which 525 (38.80%) of children were living in the rural area and 91(44.20%) in an urban area. Disease severity was also estimated, 30.4%mild,8.9% moderate, and 1.1% severe ocular morbidity. Ocular morbidity other than computer vision syndrome was recorded as 25.4%, wherein ocular diseases and refractive error was more frequent as 9.9% and 9.1% respectively, myopia 4.9 %, blepharitis 5.5%, cataract 0.3 %, squint 1.5%, amblyopia 1.2%, convergence insufficiency 1.6%, corneal opacity 0.2%, vitamin A deficiency 0.9% and some other ocular conditions such as ptosis 0.3% and other conditions as nystagmus, keratoconus and chalazion was about 0.4%. The current study showed that there was a strong correlation between refractive error, amblyopia, and squint. Results of current were contradictory to a study conducted on Madaras students for refractive error in district Haripur, Pakistan. The study showed that myopia is the most common refractive error and problem found in Madaras students. The output of this study was so high as compared to the current study, which was found in only 9.1% of children (Atta, et al., 2015).

Another study was conducted with a total of 25,437 schools going children from all schools/madaras of Lasbella region for study and found 20.86% of ocular morbidity in schools and 34.33% in Madaras. In the current study, the frequency of ocular morbidity was also estimated by about 25.4%, excluding computer vision syndrome in the selected population (Lakho et al., 2012).

The study in India showed similar results where the overall prevalence of ocular morbidity was 31.6%, refractive error constitutes 22% showing the highest of ocular morbidity, strabismus was 2.5 %, conjunctivitis 0.8%, and vitamin A deficiency was 1.8 (Gupta et al., 2004). Another study conducted in Kathmandu (Nepal) was in agreement with a current study where ocular morbidity was about 31.6%, and the most prominent causes of ocular morbidity were Refractive-Error (11.6%) and conjunctivitis (11%) (Pant et al., 2014). Refractive error, cataract, and some other ocular conditions are the most common causes of avoidable blindness among school-going children. In another study results were contradictory with a current study as the prevalence of myopia (14.9%), hypermetropia (12.9%), and astigmatism (45.3%) was very high as compared to the current study (Norouziradet al., 2015). The study conducted in India reported the prevalence of ocular morbidity was 29.35%, 28.65% in urban schools, and 30.05% in rural schools. Refractive error (17.36%), other causes such as convergence insufficiency (2.79%), vitamin A deficiency (2.09%), blepharitis (2.11%), bacterial conjunctivitis (0.95%), allergic conjunctivitis (1.92%), amblyopia (0.41%), stye (0.31%), squint (0.27%),and chalazion was estimated as 0.27% (Singh et al., 2017).A study conducted in India showed contradictory results as compared with the current study, where the prevalence of refractive error was 20.9%,among which 10.8% were males, and 10.1% were females. Results from the study showed that refractive error is the most common cause of avoidable blindness among school-going children and uncorrected refractive error is also affecting the learning abilities among school-going children, so early detection and management can improve children ability to learn tremendously during the developmental years (Prabha et al., 2016).

CONCLUSION

It was concluded that the frequency of ocular morbidity was high among school-going children of urban areas, Haripur Pakistan. Strong relationships were observed among different conditions such as refractive error, squint, amblyopia, convergence insufficiency, computer users, and computer vision syndrome. The study revealed that a higher number of children were using a computer; that's why computer vision syndrome was observed in a large number of children. The study showed that school-going children are at high risk regarding eye health; a fruitful step must be needed to overcome the issue, which leads to effect overall learning abilities of children.

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AUTHOR CONTRIBUTIONS

NU designed and conducted experimental work. NU and OC interpreted the results. NU, OC, MMK, JFW and IA guided the project and coordinated survey work. NU, OC and UH analyzed the data. NU and OC did manuscript writing while NU, OC and MMK collect literatures. The manuscript was finalized by all authors mostly by NU.

CONFLICT OF INTEREST (COI)

None declared.

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