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Compliance of spectacle wear among adolescents in a tertiary care hospital

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Abstract

Context: Unaddressed refractive errors account for a large proportion of ocular morbidities among adolescents and can hamper their overall development. Hence, compliance with the use of visual aids should be ensured.

Aim: To evaluate the degree of spectacle compliance and to assess the principle determinants for non-compliance among adolescents in a tertiary care hospital.

Settings and Design: Hospital based, prospective observational study.

Methods and Material: A prospective observational study was conducted over 2 years. 365 adolescents (10-19 years) attending ophthalmology OPD were observed and interviewed using questionnaire and possible causes associated with non-compliance identified.

Results: Out of 365 adolescents, 190 (52.05 %) were females and 175 (47.95 %) males. Overall compliance rate was 47.12 %. Compliance was more with urban residence (p value 0.014), father's education (p value 0.022), myopia (p value 0.001) and poor uncorrected visual acuity in better eye (p value 0.0015). The common causes for not wearing spectacles were peer pressure (17.62 %), parental disapproval (15.03 %), broken spectacles (13.47 %), dislike spectacles (11.92%), social stigma/misconceptions (10.87%), occasional use (8.81 %), forgetfulness (7.25 %), lost spectacles (6.22%), headache due to spectacles (5.18 %) and discomfort due to spectacles (3.63 %).

Conclusion: Proper counselling of adolescents and their parents regarding importance of using spectacles is essential at the time of prescribing spectacles and it can improve spectacle compliance and visual outcome.

Keywords: refractive errors - spectacle wear - compliance - adolescents

Introduction

Vision, our most dominant sense, plays a critical role in every aspect and stage of our lives^[1]. Vision is an integral part of effective communication and educational attainment since the beginning of childhood. Vision contributes to the development of social skills and is vital for participation in sports and social events that are essential to the physical health, mental health and socialization^[2].

Eye conditions responsible for visual impairment like cataract and refractive errors are the main focus of preventive eye care programs and strategies. The prevalence of refractive errors varies across geographic location, gender, age, race and amount of near work. Though mild to moderate degree of hypermetropia can be overcome by accommodation in younger age groups, myopia of any degree leads to blurring of distant images. Myopia has been found to be the most common visually significant refractive error among adolescents and school-aged children, with considerable economic and educational consequences.

According to WHO 2019 worldwide, around 2.2 billion people are suffering due to visual impairment. The available data suggests that out of these, an estimate of around 1 billion people have moderate to severe distance visual impairment which could have been prevented. It includes those with visual impairment/blindness due to uncorrected refractive errors (UREs) (123.7 million)^[1]. Globally, the cost of the coverage gap for uncorrected refractive errors and cataract is estimated to be \$14.3 billion US dollars^[1].

The uncorrected refractive errors may have an impact to a great extent on the learning capabilities and potential of the students. However; the extent of refractive error is not precisely known in all the age groups, especially the prevalence and the insight of refractive errors in adolescents of the rural regions. Early detection and timely intervention can tremendously improve an adolescent's potential during the formative years.

Refractive errors are the simply remediated reason of visual impairment as it can be easily

and cheaply corrected by a simple pair of spectacles, but only when they are worn. Though spectacles are low-cost and effective, this straight easy key has not been efficiently applied in numerous parts of the world, with children bearing notable visual burden as suggested by studies conducted in China^[3, 4], Tanzania^[5], suburban Chile^[6] and Mexico^[7]. Despite inherent merits such as improved vision related quality of life and control over their use, spectacles do pose some significant challenges. For example, spectacles are not readily affordable by many who require them and can be a source of ocular discomfort especially when incorrectly prescribed. Peer pressure, spectacle loss or breakage, parental disapproval, forgetfulness and misconceptions about spectacle wear have been documented as the causes of non-wear. If the adolescents do not wear spectacles, the efforts to correct refractive errors are ineffective. Hence, efforts should be made to remove obstacles to spectacle availability and wear.

There are only a few studies regarding the compliance of spectacle wear in adolescents. Analysing these factors is important to ensure better compliance and to achieve optimal vision.

Material and Methods

Study Design: Hospital based prospective observational study

Sample Size: 365 cases

Study Period: August 2018 to December 2020

Ethical committee approval: Approval of the institutional ethics committee (IEC) was taken prior to initiating the study.

Consent: Informed consent was taken from the patients who satisfy the inclusion criteria. In case of younger children, consent was obtained from the parents/guardian.

Sample size: From previous studies^[8]:

$$\begin{aligned} p &= 61\% \text{ proportion of non-compliance among spectacle wearers} \\ q &= 39\% \text{ i.e. } 1-p \\ l &= 5\% \\ n &= \frac{3.84 * p * q}{l^2} = 365 \end{aligned}$$

Inclusion criteria

1. Spectacle wearers in the age group 10-19 years
2. Adolescents with uncorrected visual acuity less than or equal to 6/9 in any eye

Exclusion criteria

1. Age<10 years and >19 years
2. Children with other ocular morbidities

Methodology

The study was conducted in the Ophthalmology outpatient department (OPD) of a tertiary care centre from August 2018 to December 2020. 365 adolescents with refractive errors were recruited.

A detailed history, including demographic indices (age, gender, address, parental education and occupation), ocular history, relevant personal history and family history was obtained.

Unaided distance visual acuity estimated using the Snellen's chart at a distance of 6 meters. For those who are not able to read the English alphabets, Snellen's Illiterate 'E' chart or Landolt's ring test used. If uncorrected vision was less than or equal to 6/9 in either eye, the adolescent was said to have defective vision.

Detailed ophthalmic evaluation of those with defective vision or asthenopic symptoms was done for ocular alignment, slit lamp examination, autorefractometry, objective refraction using streak retinoscopy and dilated fundus examination.

In cases where cycloplegic refraction required, cycloplegia and dilation were induced using cyclopentolate hydrochloride, 1% and streak retinoscopy performed. It was followed by post mydriatic test (PMT).

Spectacles were prescribed and the adolescents and parents were motivated to buy them through their own sources. Proper counseling of patients and parents was done regarding importance of spectacle wear and regular follow up visits. Parents were guided regarding the material, type, size of spectacles, duration of spectacle wear and the disadvantages of not wearing spectacles.

At the time of follow up after 6 months, a detailed questionnaire was administered to collect the information regarding compliance for spectacle wear.

The study participants who were wearing spectacles at the time of administration of the questionnaire and gave history of regular use of spectacles were considered compliant. The study subjects who were not wearing spectacles and gave history of irregular use were considered non-compliant and were asked to choose from the given reasons for not using spectacles.

All information was collected, compiled and analyzed by applying suitable tests. Data analysis was done by using statistical software Microsoft Office Excel 2013, Epi info7.1.4, 2014. Chi-square test was used to analyse the quantitative data. Data with value less than 0.05 was considered statistically significant.

Results

During the study period, a total of 365 adolescents with uncorrected visual acuity of < or equal to 6/9 due to refractive errors were studied, out of which 190 (52.05%) were females and 175 (47.95%) were males. The mean age of the respondents was 14.08 (range 10-19) years. 211 (57.8%) belonged to urban area while 154 (42.2%) belonged to rural area. As our hospital is located in the heart of the city, residents from urban locality form the majority of the patient load in OPD. The overall literacy was found to be higher among the paternal side in comparison with the maternal side.

Only 171 (46.85 %) complained of difficulty in distance vision while 365 actually had defective vision, rest of the study subjects experienced only asthenopic symptoms or headache. This denotes that a lot of adolescents may not be aware of their refractive errors and hence regular screening should be mandatory for the early detection and timely correction of refractive errors.

Visual acuity in the better eye at the time of presentation was better than or equal to 6/18 in 73.97 % adolescents. Hence, most of the adolescents had mild to moderate visual impairment in the present study.

Myopia (68.76 %) was the most frequently encountered refractive error in the present study. Astigmatism was seen in 19.45 % whereas 11.79 % were found to be

hypermetropic.

52.88 % adolescents didn't use the spectacles at all throughout the day whereas 47.12 % used the spectacles daily.

Only 315 out of 365 study participants procured the spectacles whereas 50 didn't (29 due to parental disapproval and 21 due to social stigma/misconceptions about spectacle use). Out of these 315, 59.68 % reported good vision after spectacle use and 53.01 % showed an improvement in their academic performance following regular use of spectacles.

In our study, 47.12 % study subjects were found to be compliant for spectacle use while 52.88% were non-compliant.

50.29 % males were found to be compliant for spectacle use while among females, compliance was seen in only 44.21 %. The difference was not found to be statistically significant. ($X^2 = 1.34$, degree of freedom= 1, p value = 0.245)

Among the age groups, maximum compliance was seen in the age group 13-16 years (48.85 %) whereas least compliance was found in age group 16-19 years (45.37 %). The difference was not found to be statistically significant. ($X^2=0.29$, degree of freedom=2, p value=0.86)

39.61% of the subjects from rural regions were found to be compliant for spectacle wear while among the urban residents, 52.6 % were compliant. This difference was found to be statistically significant. ($X^2=6.03$, degree of freedom=1, p value= 0.014)

The compliance rate was found to be much lower in study subjects with illiterate fathers (38.82 %) as compared to those who had higher education levels (61.54 %). The difference was found to be statistically significant. ($X^2=9.65$, degree of freedom=3, p value= 0.022)

Similarly, lower compliance rate was observed in study subjects with illiterate mothers (41.95 %) as compared to those who had higher education levels (54.54 %). This difference was not found to be statistically significant ($X^2=2.84$, degree of freedom=3, p value=0.417)

The compliance for spectacle wear was found to be higher in adolescents with visual acuity worse than 6/18 in better eye (61.05 %) than those with visual acuity equal to or better than 6/18 in better eye (42.22 %). The difference was found to be statistically significant. ($X^2=10.0003$, degree of freedom=1, p value=0.0015)

The maximum compliance was seen in myopic patients (53.39 %) followed by patients with astigmatism (36.62 %). The patients with hypermetropia were found to be least compliant (27.91 %). This difference was found to be statistically significant. ($X^2=13.46$, degree of freedom=2, p value=0.001)

Out of 193 adolescents who were not compliant for spectacle wear 34 (17.62 %) didn't use spectacles due to peer pressure and 29 (15.03 %) due to parental disapproval. 26 (13.47 %) said their spectacles were broken, 23 (11.92 %) disliked their spectacles, 21 (10.87 %) were non-compliant due to social stigma/misconceptions about spectacles, 17 (8.81 %) reported occasional use, 14 (7.25 %) had forgotten their spectacles at home, 12 (6.22 %) had lost their spectacles, 10 (5.18 %) experienced headache due to spectacles and 7 (3.63 %) experienced discomfort due to spectacles.

Discussion

In developing countries like India, uncorrected refractive errors account for a considerably large proportion of ocular

morbidities among the adolescents. Uncorrected refractive errors can hamper the overall development of an adolescent by affecting the daily activities. Till date, most of the studies done to analyze the pattern of refractive errors in children/adolescents are either school based screening programs or population based studies which require huge economic resources. The present study being a hospital based study is unique as it has been conducted in the OPD premises without the need of extra manpower and equipments.

Overall compliance of spectacle wear:

In the present study it was found that only 47.12 % of adolescents were compliant for spectacle use. Similar results were obtained by Parmar *et al.* (2017)^[9] in Gujarat where 61.02% children did not use spectacles and by Castanon Holguin *et al.* (2006)^[7] among school aged children in Mexico, where an overall compliance rate of 47.4% was observed at the time of unannounced follow up after 4-18 months. Compliance rates much lower than the present study were 29.5% among the rural secondary school children in a study by Gogate *et al.* (2013)^[10] in Pune and 19.5% from central rural India in a study by Khandekar *et al.* (2008)^[11]. In the available literature, compliance was much higher in other studies, such as 57.8% in a study by Pavithra MB (2014)^[12] in South India and 71.6% in a study conducted by Khandekar RB *et al.* (2002)^[13] in Oman.

Gender wise compliance

In our study, males were found to be more compliant for spectacle use than females, though the difference was not found to be statistically significant. This was probably due to girls being more concerned regarding their looks as compared to boys. Reasons like parental disapproval and social stigma are more prevalent among females due to effect on cosmetic appearance and also the fear that spectacle use might affect the marriage prospects of females.

In a study by Rajiv Khandekar *et al.* (2008)^[11] in central India, it was found that how one looks when wearing spectacles was a major deciding factor for students to use spectacles. The aesthetic problem was mostly encountered among girls and their parents, who believed that by wearing spectacles, the girl's marriage prospects might be negatively affected.

In a study by Morjariya *et al.* (2017)^[14], girls reported parental disapproval as a reason for non-wear more frequently than boys (11.4% [5 of 44] and 4.2% [2 of 48], respectively).

Data obtained from studies by Castanon Holguin *et al.* (2006)^[7] in Mexico, Khandekar *et al.* (2002)^[13] in Oman and Aldeebasi *et al.* (2013)^[15] in Saudi Arabia, showed that girls (49.8%) were found to be more compliant to spectacles than boys (40.8%), though the data was not statistically significant ($P = 0.174$).

Relation of compliance with age

In the present study, maximum compliance was seen in age group 13-16 years. The difference in compliance among the age groups was not found to be statistically significant. Adolescents in higher age group (16-19 years) were more non-compliant probably because they were more concerned regarding their physical appearance.

This finding is comparable to a study carried out by Holguin Castanon *et al.* (2006)^[7] in Mexico who observed that older

children were less likely to be compliant than younger ones. In a study by Bhatt *et al.* (2017)^[16] in Rohtak, it was found that older children were less compliant for spectacle use. A study by Gogate P *et al.* (2013)^[10] in Pune showed that non-compliance was not related to age of the students ($P = 0.058$), but older children were slightly more non-compliant. In contrast to this, studies by Congdon *et al.* (2008)^[4] in China and Khandekar *et al.* (2002)^[13] in Oman have found older teens more likely to wear spectacles as compared to younger children.

Relation of compliance with area of residence

In the present study, compliance was found to be more in study subjects residing in urban residence than those from rural regions and this difference was found to be statistically significant. This may be attributed to the higher literacy status of urban residents and more awareness among urban residents regarding the advantages of spectacle wear.

In a study by Pavithra MB (2014)^[12] in South India, children from urban schools were more likely to show compliance. This was similar to results observed by Congdon *et al.* (2008)^[17] in South Africa where urban children ($P = 0.02$) were more likely to be wearing their spectacles during the follow-up, but unlike Mexican children where rural were more compliant^[7]. A study by Gogate P *et al.* (2013)^[10] reported that children from larger villages or small towns were more non-compliant than those from smaller villages. They observed that cosmesis may be less of an issue in small villages whereas in larger villages and small towns, children could be choosier about their spectacles.

Relation of compliance with parental level of education

The compliance rate was found to be much lower in study subjects with illiterate fathers as compared to those who had higher education levels. The difference was found to be statistically significant. Similarly, the compliance rate was lower in study subjects with illiterate mothers than those who were more educated though this difference was not found to be statistically significant.

In a study by Pavithra MB (2014)^[12], it was found that children having father with higher level of education were found to be better compliant (OR = 5.8) than children whose fathers were illiterate ($p < 0.05$) and the spectacle compliance was also significantly associated with maternal education ($p < 0.05$). Children of less educated mothers were more likely to be non-compliant. This was probably due to lack of knowledge regarding the necessity of spectacle use in less educated mothers.

This finding was consistent with the study carried out in Pune by Gogate *et al.* (2013)^[10], where it was found that children with low father's education were more likely to be non-compliant for spectacle wear than others. Gogate P *et al.*^[10] did not find significant association between maternal education and spectacle wear compliance.

Relation of compliance with levels of uncorrected visual acuity in the better eye

In the present study, the compliance for spectacle wear was

found to be higher among adolescents with visual acuity worse than 6/18 in the better eye (61.05 %).

Gogate P *et al.* (2013)^[10] in a study on secondary school children in Pune found that children who had unaided visual acuity $\geq 6/18$ were less likely to wear their spectacles while those with vision $\leq 6/60$ were more likely to use them.

In a study by Khandekar *et al.* (2008)^[11] in Central India, students with high-power refractive error comply better than those with low-power refractive error.

This is similar to the studies conducted by Congdon *et al.* (2008)^[4] on secondary school children in China and Khandekar *et al.* (2002)^[13] on school children in Oman.

Relation of compliance with type of refractive error

In our study, the maximum compliance was seen in myopic patients (53.39 %) whereas hypermetropes were found to be least compliant (27.91 %).

A study by Anwar *et al.* (2017)^[18] reported that the children with myopic refractive error were found to be more compliant 77 (17.5%) than those with hypermetropia 21 (4.8%), astigmatism 45 (10.2%) and compound 38 (8.6%).

There was no significant difference between types of refractive error in Chile^[19], Oman^[13] and Brazil^[20]. However, in Tanzania^[21], compliance was zero amongst patients with hypermetropia and astigmatism compared with 43% in myopic patients.

Reason for non-compliance

The common reasons for spectacle non-compliance were peer pressure (17.62 %), parental disapproval (15.03 %), broken spectacles (13.47 %), dislike their spectacles (11.92 %), social stigma/misconceptions about spectacles (10.87 %).

The results were comparable to study conducted by Gogate *et al.* (2013)^[10] in Pune where, the reason "teased by other children" (19.9%) was the single most common cause of not wearing spectacles, followed by broken spectacles (17.4%) and lost spectacles (9.3 %).

However, in a study conducted by Pavithra *et al.* (2014)^[12] in south India showed the most common reason of noncompliance was 'forgetting spectacles at home' (31.4 %), lost their spectacles (14.3 %), broken spectacles (11.4%) and parental disapproval (11.4%).

Congdon *et al.* (2008)^[4] found that the most common reasons for non-wear of spectacles among rural Chinese secondary school children were "wear only when needed or on special occasions" and "worried spectacles will make eyes weak". These reasons were similar to the reasons given by the Mexican school children in a study conducted by Castanon Holguin *et al.* (2006)^[7].

The two most frequent reasons for non-wear in a study by Morjariya *et al.* (2017)^[14] were teasing or bullying by peers (48.9 %) and lost or forgot or stolen spectacles (26.1 %), accounting for three-quarters of non-wear. Reasons for non-wear were explored by age and sex using the age groups 11 to 12 years (preadolescent) and 13 to 15 years (adolescent). In both age groups, teasing or bullying by peers was the main reason for non-adherence, followed by lost or forgot or stolen spectacles.

Table 1: Socio-demographic distribution of the study subjects

		Number of subjects	Percentage
Gender	Female	190	52.05%
	Male	175	47.95%
Residence	Rural	154	42.2%
	Urban	211	57.8%
Age	10-13 years	126	34.52%
	13-16 years	131	35.90%
	16-19 years	108	29.58%
Father's education	Illiterate/Primary education	85	23.29%
	High school	138	37.81%
	Graduate	116	31.79%
	Post-graduate	26	7.11%
Mother's education	Illiterate/Primary education	124	33.97 %
	High school	173	47.39 %
	Graduate	57	15.62 %
	Post-graduate	11	3.02 %
Uncorrected visual acuity in better eye	> or equal to 6/18	270	73.97 %
	< 6/18	95	26.23%
Type of refractive error	Myopia	251	68.76 %
	Hypermetropia	43	11.79 %
	Astigmatism	71	19.45 %

Table 2: Reason for prescription of spectacles

Reason	Number	Percentage
Difficulty in distance vision	171	46.85 %
Headache	97	26.58 %
Eye strain	63	17.26 %
Watering	34	9.31 %
Total	365	100 %

Table 3: Duration of spectacle use per day

Duration	Number	Percentage
None	193	52.88 %
4-8 hours	37	10.14 %
8-12 hours	84	23.01 %
>12 hours	51	13.97 %
Total	365	100 %

Table 4: Association of compliance with socio-demographic factors

		Total number of subjects	Compliance		X² df p-value
			Yes	No	
Gender	Male	175	88 (50.29 %)	87 (49.71 %)	1.34, 1 0.245
	Female	190	84 (44.21 %)	106 (55.79 %)	
Age groups (in years)	10-13	126	59 (46.82 %)	67 (53.18 %)	0.29, 2 0.86
	13-16	131	64 (48.85 %)	67 (51.15 %)	
	16-19	108	49 (45.37 %)	59 (54.62 %)	
Residence	Rural	154	61 (39. 61 %)	93 (60.39 %)	6.03, 1 0.014
	Urban	211	111 (52.6 %)	100 (47.4 %)	
Father's educational qualification	Illiterate/Primary	85	33 (38.82 %)	52 (61.18 %)	9.65, 3 0.022
	High school	138	58 (42.02 %)	80 (57.98 %)	
	Graduate	116	65 (56.03 %)	51 (43.97 %)	
	Post graduate	26	16 (61.54 %)	10 (38.46 %)	
Mother's educational qualification	Illiterate/Primary	124	52 (41.95 %)	72 (58.05 %)	2.84, 3 0.417
	High school	173	83 (47.98 %)	90 (52.02 %)	
	Graduate	57	31 (54.39 %)	26 (45.61 %)	
	Post graduate	11	6 (54.54 %)	5 (45.46 %)	
Uncorrected visual acuity in better eye	> or =6/18	270	114 (42.22 %)	156 (57.78 %)	10.0003, 1 0.0015
	<6/18	95	58 (61.05 %)	37 (38.95 %)	
Type of Refractive error	Myopia	251	134 (53.39 %)	117 (46.61 %)	13.46, 2 0.001
	Hypermetropia	43	12 (27.91 %)	31 (72.09 %)	
	Astigmatism	71	26 (36.62 %)	45 (63.38 %)	

Table 5: Reasons for non-compliance with spectacle wear

S. No.	Reason for not wearing spectacles	Number of adolescents	Percentage
1.	Peer pressure	34	17.62 %
2.	Parental disapproval	29	15.03 %
3.	Broken spectacles	26	13.47 %
4.	Dislike spectacles	23	11.92 %
5.	Social stigma/misconceptions	21	10.87 %
6.	Occasional use	17	8.81 %
7.	Forgetfulness	14	7.25 %
8.	Lost spectacles	12	6.22 %
9.	Headache due to spectacles	10	5.18 %
10.	Discomfort	7	3.63 %
TOTAL		193	100 %

Conclusion

The overall compliance for spectacle wear among adolescents was found to be low. Compliance was higher among male gender, younger age groups, urban residence, subjects with educated parents, poor uncorrected visual acuity in better eye and myopic patients. The most common cause for non-compliance was peer pressure and parental disapproval.

Proper counseling and education regarding importance of regular spectacle wear is essential at the time of prescribing spectacles. At the same time, spreading awareness at the school level and society level can help improve the spectacle wear compliance.

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