

Spectacle Wear Compliance in Primary School Children with Refractive Error in Addis Ababa

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Abstract

Purpose: Refractive error is a leading cause of visual impairment globally. Spectacle is the most cost-effective intervention used for correcting refractive error. Different factors affect spectacle wear compliance. This study assessed the spectacle wear compliance and determinant factors among school children with refractive error in Addis Ababa, Ethiopia.

Methods: This study was a cross sectional study with 318 study participants in primary school children of Addis Ababa. Multistage sampling was used. The students were examined by a team of optometrists. A structured questionnaire used to collect demographic and clinical data, spectacle use, and reasons for not wearing spectacle. Ethical clearance obtained from IRB.

Results: The compliance of spectacle wear among primary school children in Addis Ababa was 35.2% (95% CI 30.0, 40.5). Factors associated with poor-compliance were being male ($p < 0.001$), having low power refractive error ($< 5D$) ($p < 0.001$), having negative attitude towards spectacle ($p = 0.007$) and prolonged spectacle use (> 12 months) ($p = 0.037$). Non-compliance was not associated with age, type of refractive error and parental use of spectacle. The main reason for not-wearing spectacle were parental disapproval (20.2%) (95%CI 15.8, 24.6).

Conclusion: Spectacle wear compliance is very poor among children with refractive error. Health care intervention and school health programs need to address factors affecting compliance.

Keywords: Spectacle use, Spectacle wear, Compliance, Refractive error, School children

Introduction

Blindness and visual impairment are causing significant public health and socio-economic problems in the world [1,2]. Uncorrected refractive error is the most common cause of visual impairment in school-age children, both in industrialized and developing countries [3]. Results from many population surveys show refractive error contributing for half or more of visual impairment [4-7]. The most common type of refractive error among school-aged children is myopia. Visual impairments cause poor academic performance and reduce economic participation that lead to poverty [4,8,9].

Spectacles are the most commonly used options for correcting refractive errors as they are the simplest, cheapest and most widely used methods that have a high success rate in terms of visual acuity, quality of life and cultural acceptance [10]. Compliance of spectacles is associated with improvement in visual function,

prevention from amblyopia and visual impairment. School vision screening programs are an effective way of early diagnosis of diseases and their timely intervention in children. The screening programs throughout the world are trying to improve spectacle coverage by providing children with spectacles.

School-based vision testing and spectacle distribution programs have tried to address the problem of uncorrected refractive error. However, most programs have found that at follow-up, the majority of children provided spectacles for free were not wearing them [11-13]. This means that, the whole process of refraction and dispensing has gone waste to a large extent and the child will not benefit from the refractive correction. So, it is very basic to find-out what the causes of non-compliance are.

Studies done in Ethiopia reported the prevalence of refractive error

as 9% in Gondar town, North West Ethiopia, 3.5% in Goro District, Gurage Zone, Ethiopia, 4% in Addis Ababa, Ethiopia [14-16].

Even though it is difficult to directly compare spectacle wear compliance among different studies as the methods and the time frame used for determining compliance differ between each study, studies on spectacle wear provided through school-based programs have similar finding of poor compliance [11-13]. Only a few studies reported more than half the participants wearing their spectacles at follow-up [17].

Study from south India, Pune, central India, south Brazil and Oman school children reported the compliance as 57.8%, 29.5%, 19.5%, 73.7% and 71.6% Respectively [12,17,18].

Poor visual acuity and higher degree of myopia were the main factors that have been found to be associated with wearing spectacles in most of the similar studies. Study in the schoolchildren of Dhakhiliya region of Oman reported the compliance of spectacle wear was only marginally higher in students with myopia than those with hyperopia [19].

This study assesses spectacle wear compliance of primary school children with refractive error in Addis Ababa, Ethiopia and to identify factors associated with non-compliance.

Methodology

Study Design and Study Area

A cross sectional study was conducted on randomly selected public primary schools of Yeka and Addis Ketema subcities in Addis Ababa during September-October 2019.

Addis Ababa is the capital city of Ethiopia with an estimated population of about five million and located in the heart of the country. There are 11 sub cities and 498 primary schools in Addis Ababa.

All primary school children in public school of Addis Ababa was source population. Study population was students who have refractive error and given spectacle on school screening program held in school year 2017/2018 and by vision care service, Ethiopia.

Inclusion and Exclusion Criteria

Students who had refractive error and given spectacle in the school screening project in year 2017/2018. Students with refractive error who were given spectacle but poor in communication or in responding the questions were excluded.

Sample Size Determination

Sample size was calculated using single population proportion formula with the assumption; $P = 50\%$ (prevalence of spectacle wear compliance), 95% confidence interval, 5% margin of error (d). Non-response rate = 10 %.

$$n = Z\alpha/2^2 P (1-P) / d^2$$

Where, z = the standard score corresponding 95% confidence level, P = compliance rate (57.8%) d = margin of sampling error (0.05).

Adding the 10% non-response rate the total sample size will be 384, then using finite population correction formula = $n * N / (n + (N - 1)) = 384 * 1050 / 384 + (1050 - 1)$. The total sample becomes 281.

Sampling Technique

Number of students calculated using probability proportionate to size based on number of students in each sub cities and the schools within the sub cities selected randomly till sample size reached. About 120 students from 397 in Yeka, and 198 from 653 students from Addis Ketema were sampled.

Data Collection Tools and Techniques

Data collected by trained optometrists. Pretested, structured questionnaire used to collect data (socio-demographic characteristics, ophthalmic history and attitude related questions, family history of spectacle wear, family educational level and occupation, and reasons for non-compliance if any). Type and magnitude of refractive error were collected from the records. The information included their spectacle acceptance time and how often they wore their pair of spectacles. Those who did not wore their spectacles at the time of data collection considered as non-compliant and asked to choose their reason for not wearing the spectacle.

Study Variables

Spectacle wear compliance is dependent variable. Socio-demographic characteristics, type of refractive error, magnitude of refractive error, attitude, parental socio-demographic characteristics were independent variable.

Operational Definitions

Compliant: Wearing spectacle at the time of interview.

Non compliant: Not wearing spectacle at the time of interview.

Mild myopia: -0.25 to -3.00 D. **Moderate myopia:** -3.25 to -5.00 D. **High myopia:** greater than -5.00 D. **Mild Hyperopia** < +2.00 diopters. **Moderate Hyperopia** +2.00 to +5.00 diopters. **High hyperopia:** greater than +5.00 D.

Positive Attitude: If the student answers NO for 6 or more of the 8 attitude related questions.

Negative Attitude: If student answers YES for 6 or more of the 8 attitude related questions [16].

Data Quality Management

The quality of data was assured through careful adaptation and pretesting of questioner on one of primary school. Questionnaires were checked for completeness and consistency during data collection, management, storage and analysis. Proper training of data collectors and supervisors, close supervision of the data collection procedures and proper categorization and coding of data was followed attentively. The collected data was checked for its accuracy and completeness.

Data Analysis

The data analyzed using the Statistical Package for the Social Sciences (SPSS), version 22. Descriptive statistics and logistic regres-

sion analysis carried out to assess the factors influencing spectacle compliance.

Ethical Issues

Ethical clearance obtained from GAMBY Medical and Business college IRB. Permission to conduct the study obtained from Addis Ababa city education bureau. Written informed consent obtained from children's parent or guardian. Helsinki declaration for research was followed.

Result

Socio-Demographic Characteristics of Study Participants

Out of 15606 children who participated in the school screening program 1050 were diagnosed with refractive error making the prevalence of refractive error to be 6.7% and all were given spectacles for free. From the total of 318 study participants recruited, 307 were included and interviewed making response rate of 96.5%. The remaining 11 did not bring back the family consent form. The age of the respondent ranged between 7 and 18 with the mean 11.54 yrs (± 2.32 SD). Most of the participants, 145(47.2%), were Orthodox Christians. Half of the fathers (51.1%) and a third of mothers (31.6%) are college graduates or above. Table 1

Characteristics		Frequency	Percentage
Age (Yrs)	7-9	66	21.5
	10-12	138	45.0
	13-15	82	26.7
	greater than 15	21	6.8
Gender	Female	168	54.7
	Male	139	45.3
Grade	2-5	178	58.0
	6-8	129	42.0
Religion	Orthodox	145	47.2
	Muslim	89	29.0
	Protestant	62	20.2
	Catholic	7	2.3
	Others	4	1.3
Mother's education level	Cannot read or write	16	5.2
	Primary school	60	19.5
	Secondary school	134	43.6
	College graduate or above	97	31.6

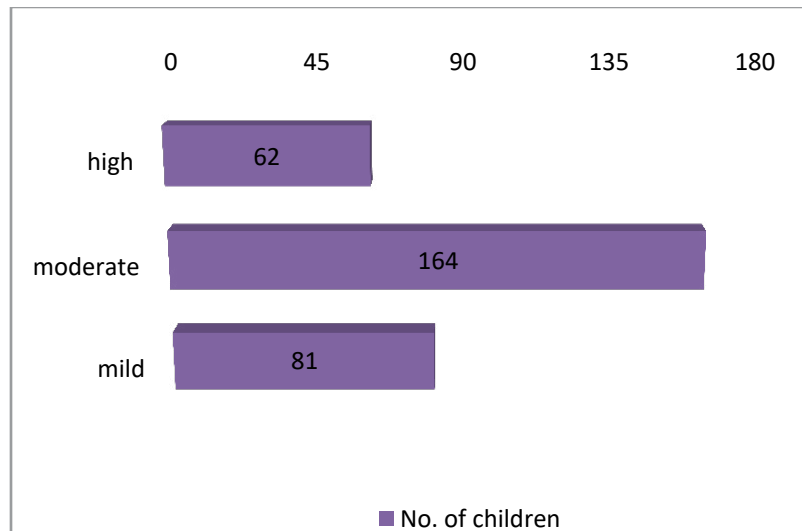
Father's education level	Cannot read or write	1	.3
	Primary school	28	9.1
	Secondary school	121	39.4
	College graduate or above	157	51.1
Mother's occupation	House wife	104	33.9
	Government employee	80	26.1
	Private organization employee	69	22.5
	Merchant	28	9.1
	Daily laborer	14	4.6
	Had No mother (died or divorced)	4	1.3
	Other	8	2.6
Father's occupation	Government employee	121	39.4
	Private organization employee	83	27.0
	Merchant	53	17.3
	daily laborer	6	2.0
	Pensioner	2	.7
	Had no father (died or divorced)	3	1.0
	Other	39	12.7

Table 1: Socio-demographic characteristics of study participants in Addis Ababa

Ophthalmic History

The children with RE had hyperopia in 44.3% (n=136), myopia in 39.4% (n=121) and astigmatism in 16.3% (n=50). More than half of children (n=164, 53.4%) had moderate degree of refractive error and the remaining (n=81(26.4%) had mild and 62(20.2%) had high degree refractive error. Graph 1.

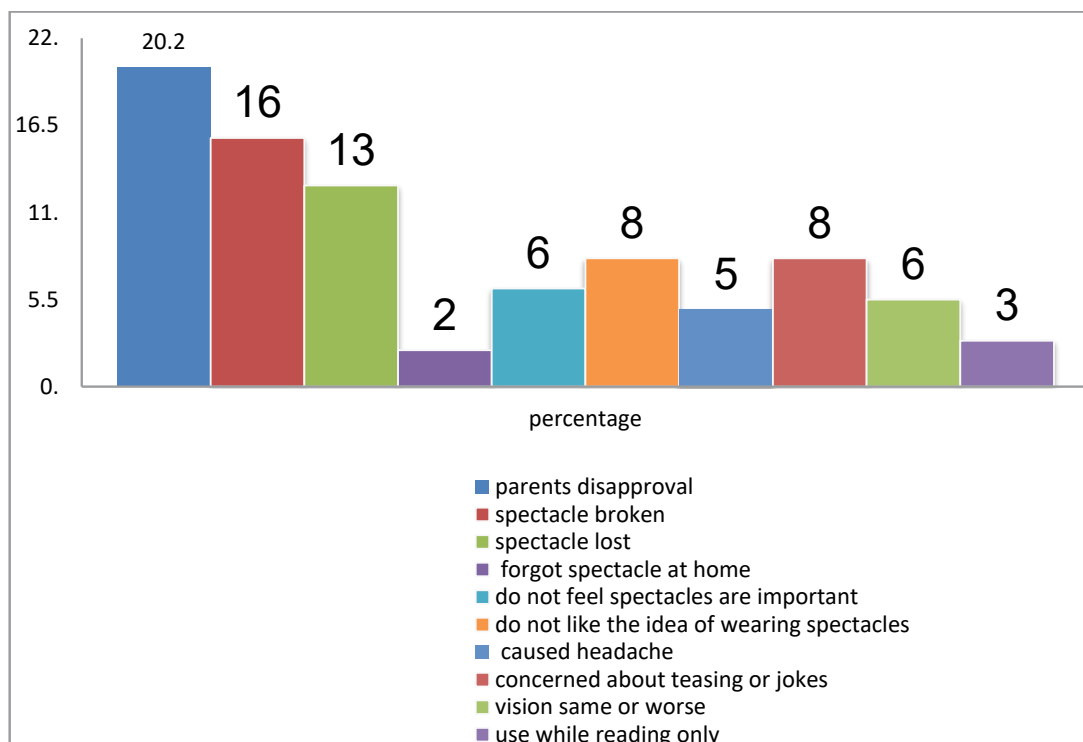
Among 307 participants, 30.9% (n=95) of them had parents either father or mother who wear spectacle for different purpose. One third (36.5%) of the students were given spectacle 12 months back. Over all mean duration between dispensing of spectacle and interview was 12.0 (± 2.3) months (range 8-18 months).



Reference: Mild R.E: SEQ <2 D, Moderate R.E: 2D<SEQ>5D, High R.E: SEQ >5D

Graph 1: Degree of refractive error among primary school children in Addis Ababa Compliance

It was found that 35.2% (n= 108) of children wore corrective glass at the time of interview. Only 74.1% (n=80) wore spectacle daily and 25.9% (n=28) wore occasionally. From 199 who did not wear spectacle 9(2.9%) had it but they use it only while reading or at class. Children who did not have the spectacle at the time of interview reported different reasons from the 10 reasons given as an option. The common reasons for not wearing spectacle were parent's disapproval 20.2% (n=62), break 15% and loss 12.7%. Graph 2



Graph 2: Self-reported reasons for non-compliance among primary school children in Addis Ababa

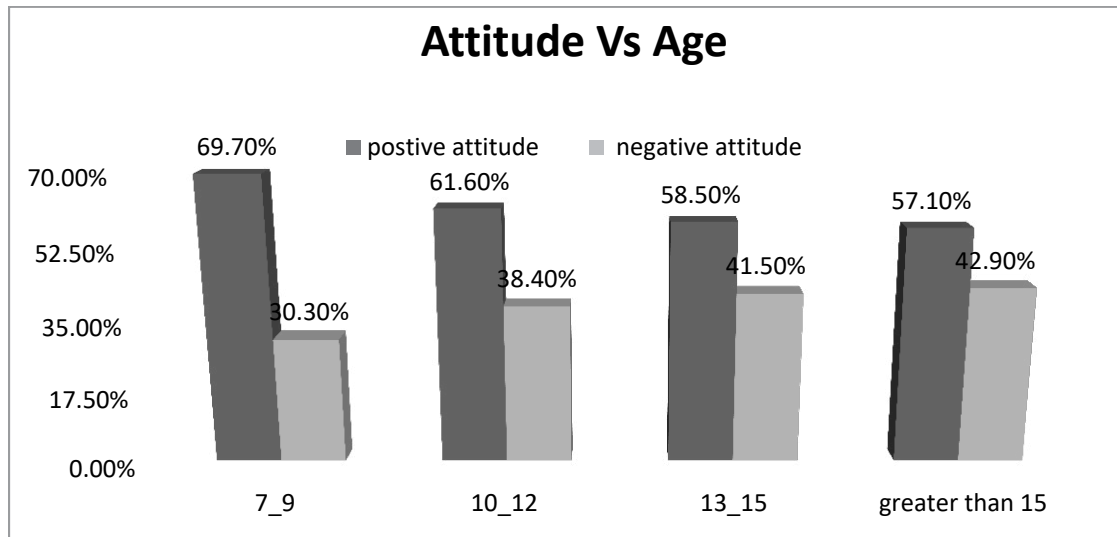
Attitude towards Spectacle Wear

Majority of the students (62.2%, n=191) had positive attitude towards spectacle wear. Although it didn't match with compliance

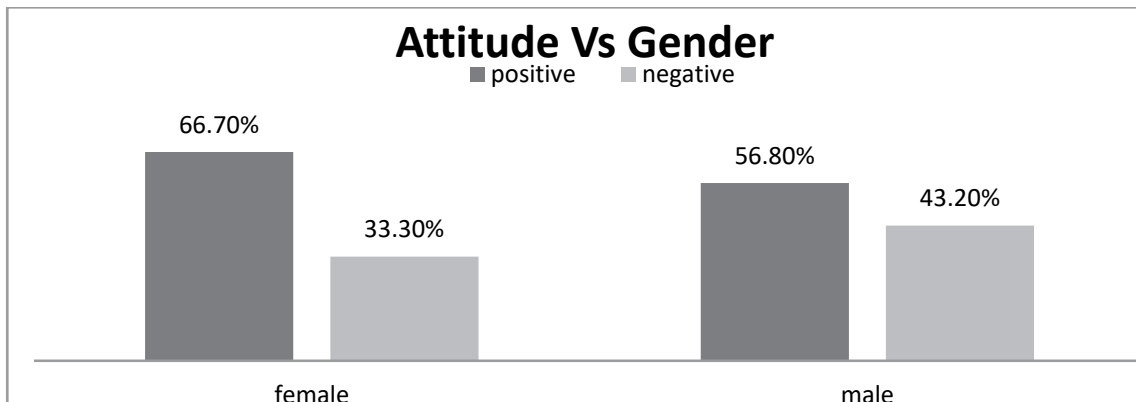
rate. Half of the participants (52.1%) believed that wearing spectacles reduces personal activities such as sports. One third (34.2%) of the children reported that the aesthetics of the spectacles affect

their decision to wear. Almost 33.9% of respondents in this study believed that wearing spectacle cause discomfort, 33.2% believed that spectacle can lead to low self-esteem, 26.7% are concerned about the negative perception regarding spectacle wear, 17.6% of the respondents thought that continued use of spectacle might increase the problem they have, 16% believed that spectacles are only for old people and 15.6% believed that the spectacle will worsen the vision or damage their eyes.

Younger children had positive attitude towards spectacle wear better than older children but not statistically significant association. ($\chi^2=2.30$, $P=0.513$). Girls had positive attitude to spectacle wear better than boys, but not significant association. ($\chi^2=3.13$, $P=0.077$).



Graph 3: Attitude towards spectacle wear among primary school children by age in Addis Ababa.



Graph 4: Attitude towards spectacle wear among primary school children by gender in Addis Ababa.

Characteristics	X ² (Chi square)	P value
Age	2.055	0.561
Gender	20.592	<0.001*
Grade	0.009	0.926
Religion	7.634	0.0106
Mother's education level	2.371	0.499
Father's education level	1.395	0.498
Mother's occupation	4.204	0.649
Father's occupation	8.204	0.224
Type of R.E	2.318	0.314
Magnitude of R.E	20.568	<0.001*
Time period spectacle given	9.479	0.002*
Attitude towards spectacle wear	19.269	<0.001*
Family history of spectacle use	2.894	0.089

Table 2: Association of spectacle wear compliance with different characteristics of primary school children in Addis Ababa

	Outcome (n, %)		Odds ratio COR (95%CI)	P Value	Odds ratio AOR (95%CI)	P Value
	Compliant	Non-compliant				
Gender						
Male	36(21.6)	109(78.4)	REF	<0.001	REF	<0.001
Female	78(46.4)	90(53.6)	3.15(1.90-5.22)		2.96(1.71-5.11)	
Magnitude of R.E						
High	36(58.1)	26(41.9)	REF	<0.001	REF	<0.001
Moderate	54(32.9)	110(67.1)	0.36(0.19-0.65)		0.30(0.15-0.58)	
Mild	18(22.2)	63(77.8)	0.21(0.10-0.43)		0.19(0.09-0.43)	
Attitude						
Positive	85(44.5)	106(55.5)	REF	<0.001	REF	<0.001
Negative	23(19.8)	93(80.2)	0.31(0.18-0.53)		0.31(0.17-0.55)	
Time Spectacle Given						
> 12 MO	27(24.1)	81(41.5)	REF	0.002	REF	0.037
< 12 MO	85(79.9)	114(58.5)	2.24(1.33-3.58)		1.82(1.03-3.20)	

Significance (p<0.05), REF (reference group for odds ratio), CI (confidence interval), COR (crudes odds ratio), AOR (adjusted odds ratio), MO (Months).

Table 3: Logistic regression analysis of association between spectacle wear compliance and different characteristics in primary school children of Addis Ababa

Discussion

Spectacle wear compliance in children is very poor in Addis Ababa. In our study 35% of students are compliant with spectacle wear. It is comparable with other studies among school children in Pune (29.5%), in Qassim province (33.12%), in USA, Ohio (30%) and in Mexico (13.4%). It is lower compared with South India school children (57.8%) [2,11,12,17,18].

Out of 199 children not wearing spectacle the majority (64.8%) reported 'parents' disapproval' as a reason, which is also main reason in Qassim province (41.6%) [2]. 'Parents disapproval' is not main reason in South India (11.4%) [12]. In children from USA, Ohio and Qassim province 'breakage or loss' are the main reason for not wearing spectacles (80%) however they are the second reason in Addis Ababa (27.7%) [2,17].

Nearly 8% do not like the idea of wearing spectacle and 8.1% have concern about tearing and jokes made due to spectacle. From Mexico school children study 16.6% have concern about teasing and jokes and 14% report spectacles broken or lost as a reason [11]. Where as in this study 6% have concern over the appearance of being teased in class.

Girls have 3 times higher good spectacle wear compliance than boys in Addis Ababa (AOR=2.96, CI (1.71-5.11). Similarly, female children in South India and USA are more compliant to spectacle wear 2.2 times and 1.8 times respectively [12,17]. Study in Mexican children did not report gender difference [11].

Age was not found to be associated with spectacle wear in Addis Ababa ($P>0.05$). The studies done in Mexico, Oman and south India reported that older children were less compliant than younger ones [11,12,19]. Hence larger studies might be needed to verify this in Ethiopia.

Neither parental education nor family occupations were associated with likelihood of spectacle wear in Addis Ababa children. Which was similar with USA, Ohio and Australian report [4,17]. Study in Pune and South India reported that spectacle wear noncompliance was significantly associated with lack of formal education in parents [12,18]. South India study reported that children with well-educated father to be more compliant (OR=5.8) than children whose father were illiterate [12].

Clinical factor associated with spectacle wear compliance was degree of refractive error (P value < 0.001). Those children with mild and moderate degree of refractive error were less likely to wear spectacle. The probability of compliance among children with mild and moderate degree of refractive error was 16.2% and 22.8% respectively. The results were comparable with South India study, only 2% of children with mild refractive error were compliant [12]. The reason could be that, children with mild RE continue their daily activity with less difficulties. Those with high degree of RE were more affected their vision and likely to be compliant. Oman children spectacle compliance was significantly higher among students with myopia of higher degree ($p<0.001$) [19].

There was no significant association between types of refractive error with spectacle wear compliance in Addis Ababa ($P = 0.32$) as reported in Qassim province, SA and Mexico [2,11]. However, in Oman school children the compliance was high in children with myopia than hyperopia [19]. Hyperopia was more prevalent in our study group. This needs more exploration and it was a limitation in our study.

Children who were dispensed spectacle 12 months prior to this study were 2 times (AOR=1.82, CI (1.03-3.20) more likely to be compliant than those whom spectacle provision time was more than 12 months. Similarly, in Pune, India shows a shorter duration after dispensing may have shown a higher figure of compliance

[18]. The reason may be as time goes by the probability to be broken and lost increases.

The probability of spectacle wear among children with negative attitude towards spectacle wear is 23.4% as compared to those with positive attitude towards spectacle use which is 76.6%. From study done in Pune district, India 99.2% students had a positive attitude to spectacle wear in general [18]. Similar studies reported that children with negative attitude to spectacle have less compliance to wear [2,11].

We have some limitation on the study. Information bias in the understanding of the questions by the children at lower grades. Selection bias due to participants are only those included in school-based refractive error program. Students in private school and those who bought spectacle were not included in the study, which might give different picture.

Conclusion

Non-Compliance to spectacle wear in this study is high 64.8%. Though spectacles were provided free of cost the compliance was found very low in Addis Ababa. Success of school eye health programs depends on parental acceptance and children's compliance not only on provision of spectacle or eye care services. Hence educating parent regarding the child's need for spectacle correction before giving the spectacle may help in changing the child negative attitude towards spectacle wear and can improve compliance. Creating awareness among children about use of spectacle before dispensing.

This information is vital for establishing a school eye health program and will strengthen its efforts for a better eye care in primary school children with refractive errors. It will also improve school performance of the children which ensures the quality of education in the country. The SDG target of Quality education for all can be achieved by ensuring good vision for all kids in the school.

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