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Utilisation of eye health services and compliance with spectacles wear among community school adolescents: a mixed-methods study from Bagmati province of Nepal

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ABSTRACT

Objectives This study aims to determine the factors influencing eye care service utilisation and compliance with spectacles wear among school students.

Design Mixed-methods study.

Setting 27 community schools from 6 districts of Bagmati province of Nepal.

Participants Adolescents with mild vision impairment who were screened at schools by their trained peers for visual acuity measurement and subsequently received subsidised spectacles for refractive error correction. For the quantitative study, 317 students from 21 schools completed the survey. For qualitative study, 62 students from 6 schools participated in 6 focus group discussions.

Primary outcome measures Utilisation of eye care services and compliance with spectacles wear.

Results Among 317 students, 53.31% were aged 15–19, and 35.96% were male. More than half (52.68%, n=167) did not use eye health services. Among students who did not go, 51.50% reported eye health facilities being far away. Thematic analysis showed that distance, COVID-19 and awareness were influential in the utilisation of eye care. The multivariate analysis showed urban residents were likelier (adjusted OR (AOR) 4.347, 95% CI 2.399 to 7.877, p<0.001) to use eye care services. During an unannounced visit to schools after 3–4 months of spectacles distribution, 188 (59.31%) students were wearing spectacles. 20.16% of students not wearing spectacles reported they did not feel the need. Thematic analysis showed the influence of family and peers, affordability, aesthetic appearance, comfortability and symptomatic relief in spectacles compliance. The multivariate analysis showed that urban residents (AOR 2.552, 95% CI 1.469 to 4.433, p<0.001), older adolescents (AOR 1.758, 95% CI 1.086 to 2.848, p=0.022), mothers with paid jobs (AOR 2.440, 95% CI 1.162 to 5.125, p=0.018) and students visiting eye care centres (AOR 1.662, 95% CI 1.006 to 2.746, p=0.047) were more likely to be compliant with spectacles wear.

Conclusions There are multiple barriers for students to use eye care services and stay compliant with spectacles wear. Eye health programmes should include eye health promotion and be accessible, affordable and equitable.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Study participants included who were proactively screened and refracted, and spectacles were provided with subsidies.
⇒ Study was limited to the community schools of Bagmati province of Nepal.
⇒ Predictors were explained by the students and did not include the perspectives of teachers, parents and service providers.

INTRODUCTION

Childhood visual impairment is an important public health issue worldwide, with at least 450 million children having an eye condition that needs treatment.[1] Globally, uncorrected refractive error (RE) is the most common cause of vision impairment in school-aged children, including Nepal.[2 3] Children with poor eyesight may have poor school performance and are more likely to be excluded from schools.[4 5] Traditionally, eye care has been separated from the rest of healthcare;[6] so has been the scenario in Nepal, with limited presence in public health facilities.[7] In addition, eye health workers and facilities are limited and concentrated more in bigger towns and cities, and cataract is prioritised.[8 9]

The World Health Organization (WHO) has recommended integrating vision screening within school health programmes with appropriate resources for follow-up refraction and delivery of spectacles.[10] Recognising the shortage of human resources in eye health, the WHO suggested conducting visual acuity screening by alternate human resources—suitably trained teachers, health workers, etc.[10] The trained school nurses, teachers and students have showcased that they can effectively screen students, record

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visual acuity and refer needy students.[11–13] Vision screenings are conducted in school eye health programmes in Nepal.[14] Screening initiatives are successful only if referred students obtain the appropriate eye care and comply with regular spectacles wear. Students with vision problems are either refracted and distributed spectacles at schools or referred to nearby eye centres. In most school vision screening programmes in Nepal, the students are refracted and distributed spectacles at schools.[13 14]

The utilisation rate of eye care services among children with ocular conditions varies place by place and can be considered unsatisfactory around the world as it is as low as 25% in the USA,[15 16] and only upto 61% in Korea.[17] Early intervention is important for preventing childhood blindness from treatable conditions like RE.[18] Non-invasive, inexpensive and simple-to-wear spectacles are one of the most cost-effective interventions for RE correction among children.[19] A meta-analysis has shown that overall compliance with spectacles wear among children is 40.14%.[19] The compliance is usually higher among children with moderate to severe visual impairment than with mild visual impairment,[20–23] possibly due to notable improvement in their vision after using the recommended spectacles for RE correction. Nevertheless, even mild vision impairment affects quality of life.[24]

The health-seeking behaviour of adolescents with vision problems is unknown in Nepal. In addition, compliance with spectacles wear following RE correction has also been explored less. The factors influencing compliance are less explored among children with mild visual impairment (uncorrected visual acuity between 6/18 and 6/12), who later improved to a best-corrected visual acuity of 6/9 or better with spectacles correction. Hence, this study aimed to determine the factors influencing eye care service utilisation among students with vision problems and compliance with the spectacle wear following RE correction.

METHODOLOGY

Study design

This was a mixed-methods study. A descriptive cross-sectional survey was carried out along with focus group discussions (FGDs).

Study setting

This study was a part of 'Students for Universal Eye Health Coverage' project conducted in six districts of Bagmati Province: Bhaktapur, Dhading, Kathmandu, Kavrepalanchowk, Lalitpur and Makwanpur. These districts represent three major ecological regions of Nepal as well as metropolises to rural, remote areas. The schools were purposefully selected, each having a minimum of 200 students enrolled in grades 5–10. Each selected schools had an active Junior and Youth Red Cross Circle affiliated with the Nepal Red Cross Society. The project was implemented in 120 schools, with 20 selected from each district.

The study was conducted in 27 randomly selected community schools from the list of 120 schools, from October 2021 to May 2022. 21 schools were selected for the quantitative study, and 6 schools were selected for qualitative study.

The community school students aged 14–17 years from grades 7, 8 and 9, along with a school teacher or school nurses, were trained to measure visual acuity by optometrists as detailed in a previous study.[13] One-day training was provided to 8–10 students per group at schools or nearby community centres. The training consisted of a 2-hour theoretical session followed by 2 hours of hands-on training, with a refreshment break in between. The vision screener students were selected based on their academic performance and engagement in extracurricular activities. The screeners were members of the school's Junior and Youth Red Cross Circle. Among 4–5 screeners, at least two were females, and they screened their fellow peers studying in grades 5–10 inside the school premises.

After vision screening at schools by trained students, students with visual acuity ≤6/12 in better eye were referred to a nearby eye centre with a certified refractionist for further evaluation between October and December 2021. The referred students received a referral form and were asked to share it with their guardians. The referral form was in the Nepali language with information on the referred student's name, age and visual acuity measured by fellow trained students. The form also included the location and contact details of the nearest eye centre, information about free Outpatient Department services, free refraction and subsidies of US$9.00 for spectacles and US$2.00 for ocular medicines, if required. The students who did not visit nearby eye centres even after 2–3 months of referral were refracted by optometrists at their respective schools.

Study sample

This study sample included students whose initial visual acuity in the better eye was at least 6/12, progressing to a best-corrected visual acuity of 6/9 or better with appropriate spectacles correction in both eyes. Students who benefited from subsidised spectacles to treat uncorrected RE from the project were only included in the study. Students who were wearing spectacles before the study were excluded. Beneficiaries absent on the day of the survey were also excluded from the study.

Sampling

The sample size for the quantitative study was calculated using the following formulae:

$n=(z^2pq)/e^2$

where,

z=1.96 at a 95% Confidence level

p=0.72[25]

q=0.28

e=0.05 (margin of error)

The formula yielded 310, and adding a 5% non-response rate, the sample size for the quantitative study was 327.

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The project aimed to serve at least 200 students in each school. We assumed that 8% of children required spectacles for RE correction. Based on this assumption of 16 participants (8% of 200) per school, 21 schools (327/16=20.47) were needed to meet the required sample size. Each eligible student from the selected schools was invited for a face-to-face interview for the quantitative study.

The schools not selected for the quantitative study served as potential study sites for qualitative study.

We conducted six FGDs. We conducted one FGD in one randomly selected school from each of the first three randomly selected districts to understand students' perspectives on the utilisation of eye care services. Additionally, one more FGD was conducted in one randomly selected school from each of the remaining three districts to explore compliance with spectacle wear. FGDs were conducted in a group of 8–12 participants. If more than 12 students were eligible, only 6 students aged 10–14 years and 6 students aged 15–19 years were purposively selected, ensuring at least one-fourth were female participants, to take part in the study. There were 9, 10, 10, 11, 10 and 12 students in FGD#1, FGD#2, FGD#3, FGD#4, FGD#5 and FGD#6, respectively.

Study variables

The eye health service utilisation in this study was defined as referred students going for further evaluation at the nearest eye centre following visual acuity measurement by trained students. An eye care centre with a certified refractionist within 30 min of walking distance from the student's home was regarded as accessible. The compliance of spectacle wear was determined by making unannounced visits to the schools after 3–4 months (March–May 2022) of the distribution of spectacles and observing if they were wearing spectacles or not during the interview. Students studying in schools situated in metropolises or municipality were defined as urban residents, and students studying in schools situated in rural municipality were defined as rural residents. Regularly paid jobs in this study meant they had a guarantee to generate regular income, like services, teachers and business, and the remaining were grouped as non-regularly paid occupations.

Data collection

A semistructured questionnaire for the quantitative study and FGD guide (online supplemental file 1) for the qualitative study were drafted from literature review. The draft tools were shared in a workshop and discussed among participants with expertise in eye health research, public health research, health promotion research, paediatric ophthalmology, and paediatric optometry and finalised. The study tool was pretested in a non-project school in Madhyapur Thimi Municipality, Bhaktapur.

The enumerators were trained to ensure uniform methods of approaching the potential participants, explaining the information needed, taking written assent, extracting the information through interviewing and writing the information on the semistructured questionnaire. The purpose of the study and the nature of the information needed were explained to the participants before taking written assent. The participants were assured of the confidentiality of the information and informed about their right to skip questions or withdraw anytime from the interview.

Data analysis

The completed questionnaires were checked daily for completeness, legibility and consistency. Data entry was done using Microsoft Excel 2019, and analyses were done using IBM SPSS V.26.0 software. The frequencies and percentages were computed to describe the sample and related variables. The logistic regression model was applied to find the association between the outcome variable and each independent variable. The adjusted ORs and a 95% confidence interval (CI) were estimated to identify the factors associated with eye care service utilisation and compliance with spectacles wear. All variables of interest were included in multivariate analyses. A $p<0.05$ was considered statistically significant. Thematic analysis was done following Braun and Clarke's six-step method.[26]

Patient and public involvement

There was no patient or public involvement in the design or conduct of this study.

RESULTS

Sociodemographic characteristics of the participants

Among 329 eligible students approached for the study, only 317 participated and completed the interview (3.6% non-response). More than half (53.31%) of the participants were aged 15–19 years, and 35.96% were male, as presented in table 1. 100 students (31.55%) reported that at least one of their family members was also wearing spectacles.

Utilisation of eye health services

Less than half (47.32%, n=150) of students went to the nearby eye centre after referral for further evaluation after they were informed that they might have vision issues following visual acuity screening by their trained peers. Higher proportion of adolescent males visited (51.75%, n=59) eye centres than females (44.83%, n=91). Among multiple responses for not going to eye centres, the most common reason reported by the students was the eye health facility being far (51.50%), as depicted in table 2.

The bivariate analysis showed that urban adolescents, adolescents whose mothers had paid jobs and adolescents residing within 30 min walking distance from the nearest eye care centre were more likely to go for eye check-ups after referral, and the association was statistically significant. The multivariate analysis showed that an urban resident was four times more likely to visit the eye centre on a

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Table 1 Socio-demographic characteristics of the participants (n=317)

Characteristics	Frequency	Percentage
Gender		
Male	114	35.96
Female	203	64.04
Age group		
10–14 years	148	46.69
15–19 years	169	53.31
District		
Kathmandu	47	14.83
Bhaktapur	44	13.88
Lalitpur	65	20.50
Kavrepalanchowk	61	19.24
Dhading	66	20.82
Makwanpur	34	10.73
Residency		
Metropolitan city	33	10.41
Submetropolitan city	10	3.15
Municipality	186	58.68
Rural municipality	88	27.76
Father's education status		
Unable to read and write (illiterate)	31	9.78
Able to read and write	81	25.55
Primary school education	81	25.55
Secondary school education	97	30.60
High school education	22	6.94
Attended university education	5	1.58
Mother's education status		
Unable to read and write	59	18.61
Able to read and write	138	43.53
Primary school education	70	22.08
Secondary school education	34	10.73
High school education	14	4.42
Attended university education	2	0.63
Father's occupation		
Service	45	14.20
Business	72	22.71
Farmer	124	39.12
Daily labourer	66	20.82
Teacher	2	0.63
Housekeeper	8	2.52
Mother's occupation		
Service	21	6.62
Business	48	15.14
Farmer	135	42.59
Daily labourer	47	14.83
Teacher	4	1.26
Housekeeper	62	19.56

referral than her/his rural counterpart and was the only statistically significant association, as depicted in table 3.

The analysis of verbatim transcripts of FGDs with students yielded three major themes in relation to eye care service utilisation.

Theme 1: accessibility to eye care facility

During the discussion about factors influencing service utilisation, most of the students discussed that the eye care facility should be conveniently located and accessible.

> We live far away from eye clinic. Once I went to town with my family to visit our relative…. that is when I got these spectacles.—Participant#4, Male, FGD#2

Theme 2: COVID-19 pandemic

The students also shared their worries about the risk of infection from COVID-19 as one of the barriers to limited utilisation of eye care services.

> I didn't share about my poor vision with my parents… I didn't want to go to the hospital for eye check-up… I was scared of catching COVID-19 there…—Participant#2, Male, FGD#3

Theme 3: awareness of eye health

The discussions also showed that students and parents neglect their eye health needs due to a lack of awareness about the importance of eye health, resulting in reduced utilisation of eye services.

> When I told my father that I need spectacles for my eyes… he told me that green vegetables will cure my eyes—Participant#7, Female, FGD#1.

Some of the verbatims regarding eye care service utilisation from the three FGDs are presented in online supplemental table 1.

Compliance with spectacles wear

During unannounced school visits, 188 (59.31%) students were wearing spectacles. Higher proportion of males (62.28%, n=71) were wearing spectacles than females (57.64%, n=117). Among many reasons for being compliant with spectacles, a majority (45.21%) replied that their vision had been clearer. Among the students who were not wearing spectacles at the time of the interview, 20.16% reported that they did not feel the spectacles were needed, and 17.05% reported that spectacles were difficult to wear while wearing masks, as presented in table 4.

In bivariate analysis, urban residency, mothers who had paid jobs, and students visiting eye care centres were statistically significant to compliance with spectacles wear. In multivariate analysis, the compliance with spectacles wear was statistically significant with urban residents, older adolescents, adolescents whose mothers had paid jobs and adolescents visiting eye care centres for further evaluation, as presented in table 5.

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Table 2 Reasons for non-utilisation of eye services among adolescent students

Reasons for not going to eye centres (multiple responses, n=167)	Frequency	Percentage
Eye health facility is far	86	51.50
No guardian free to take me to the eye health facility	45	26.95
I do not need an eye examination or spectacles	26	15.57
No money for travel to eye centres	19	11.38
Family told spectacles will deteriorate eye and vision	16	9.58
Parents or guardians didn't allow to go for eye check-ups	14	8.38
Did not believe in student's eye examination	12	7.19
No money for eye check-ups, spectacles, or medicines	12	7.19
Didn't know about place to go for eye check-ups	12	7.19
Due to COVID-19	11	6.59
I didn't want to wear spectacles	10	5.99
Nobody told me to go	0	0.00

In FGDs about compliance with spectacles wear, we identified four major themes.

Theme 1: affordability

The students shared that the costs of spectacles act as a deterrent in non-compliance, especially if they lose or break their present pair.

> One day I had to go to forest to collect firewood with my mother. It was difficult to wear spectacles using tumpline to carry firewood…. So, I think I had kept my spectacles in my pocket…. When I reached home, it was missing from my pocket. My father did not buy new spectacles for me, so I didn't wear again.—Participant#5, Female, FGD#5

Theme 2: symptomatic relief

The students also shared that symptomatic relief, such as better vision and reduced headaches, after starting to wear spectacles were influential in better compliance rates.

> I used to sit close to watch TV before wearing spectacles… Now I can watch TV from anywhere in the room. Now, I wear spectacles all the time.—Participant#1, Male, FGD#5

However, some students shared that their vision had not improved, and some had headaches after wearing spectacles, which hindered their compliance.

> The friend who refused to come to this discussion said he had pain in eyeball after using spectacles. So, he didn't wear them.—Participant#7, Male, FGD#4

Theme 3: role of friends, family and teachers

The students also discussed the roles of teachers, friends and family in motivating and discouraging spectacles wear.

> After wearing spectacles, my teachers started asking me to read (aloud) from whiteboard… Now I can easily read and my teachers compliment for that. So, I keep on wearing spectacles.—Participant#3, Female, FGD#6

Theme 4: comfortability

The students also discussed aesthetic appearance, frame designs, fittings and easy-to-wear spectacles as essential components for compliance with spectacles wear and a positive overall experience.

> After wearing spectacles, I saw myself at mirror, I felt good…. My mother also said the spectacles looks good (suits) on me…. So, I wear my spectacles regularly.—Participant#10, Male, FGD#4

Few more verbatims captured from three FGDs about compliance with spectacles wears are presented in online supplemental table 2.

DISCUSSIONS

Our school-based study showed that 52.68% of adolescent students did not go to a nearby eye centre after referral for further evaluation following visual acuity screening by their trained peers. Similarly, after 3–4 months of spectacles distribution, unannounced school visits showed that 40.69% were not wearing spectacles.

Utilisation of eye care services

Our study showed that less than half (47.32%) went for further evaluation at a nearby referral centre after an abnormal vision screening at school. In a study in Kerala, India, among primary school students aged 4–12 years with symptoms in the past, 38% used the services of an ophthalmologist.[27] The local health department records from Michigan, USA, showed that only 25% of school-aged children with abnormal vision screening completed

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Table 3 Factors associated with eye care service utilisation among adolescent students

Characteristics	Used eye care service					
	Yes (%)	No (%)	COR (95% CI)	P value	AOR (95% CI)	P value
Gender						
Male	59 (51.8)	55 (48.2)	1.320 (0.834 to 2.091)	0.236	1.211 (0.739 to 1.984)	0.447
Female	91 (44.8)	112 (55.2)				
Age group						
10–14 years	73 (49.3)	75 (50.7)	1.163 (0.747 to 1.810)	0.503	1.063 (0.661 to 1.711)	0.800
15–19 years	77 (45.6)	92 (54.4)				
Residence						
Urban	131 (57.2)	98 (42.8)	4.854 (2.742 to 8.595)	<0.001†	4.347 (2.399 to 7.877)	<0.001†
Rural	19 (21.6)	69 (78.4)				
Father's educational status						
High school and above	15 (55.6)	12 (44.4)	1.435 (0.649 to 3.173)	0.370	1.316 (0.550 to 3.149)	0.537
School education or illiterate	135 (46.6)	155 (53.4)				
Mother's educational status						
High school and above	9 (56.3)	7 (43.7)	1.459 (0.530 to 4.019)	0.463	1.375 (0441 to 4.292)	0.583
School education or illiterate	141 (46.8)	160 (53.2)				
Father's job						
Regularly paid	61 (51.3)	58 (48.7)	1.288 (0.817 to 2.032)	0.276	1.171 (0.640 to 2.144)	0.609
Non-paid regularly	89 (44.9)	109 (55.1)				
Mother's job						
Regularly paid	43 (58.9)	30 (41.1)	1.835 (1.080 to 3.119)	0.024*	1.424 (0.720 to 2.815)	0.309
Non-paid regularly	107 (43.9)	137 (56.1)				
Family member using spectacles						
Yes	52 (52.0)	48 (48.0)	1.315 (0.818 to 2.115)	0.257	1.022 (0.579 to 1.803)	0.941
No	98 (45.2)	119 (54.8)				
Nearest eye centre						
Within 30 min walk	26 (65.0)	14 (35.0)	2.291 (1.148 to 4.576)	0.017*	1.451 (0.702 to 3.002)	0.315
Beyond 30 min walk	124 (44.8)	153 (55.2)				

*Statistically significant at p<0.05.
†Statistically significant at p<0.001.
AOR, adjusted OR; CI, confidence interval; COR, crude OR.

follow-up examinations.[15] In another state of the USA, Philadelphia, a similar proportion (25%) of children aged 5–13 years needing follow-up care completed referral eye examinations.[16] Our study and other literature suggest that the utilisation of eye care among children is not satisfactory and requires urgent attention to minimise the multiple barriers to seeking care.

Our mixed-method study identified multiple reasons among adolescents for not going to eye care services, which are similar to other studies. Eye health facilities being far away was the primary reason for non-utilisation. The non-availability of an eye care facility nearby and the cost associated with reaching a facility farther from home were also shared as a reason for the non-utilisation of eye care services. The students also reported that their families could not afford eye check-ups, spectacles or medicines if required. Non-affordability and inaccessible reasons were also shared by parents of school students with ocular conditions from Kerala, India.[27] The parents of preschool children with ocular morbidities from the USA also reported a lack of insurance coverage for eye examinations as reasons for not following up.[28] A systematic review also determined non-availability, non-accessibility and non-affordability as the main barriers to accessing paediatric eye care services in Africa.[29] There is little doubt that the interdependencies of availability, affordability and accessibility significantly limit the reach of any health programmes, including eye care services. Greater efforts are needed to make eye care available, affordable and accessible.

In our study, additional reasons related to non-utilisation were the roles and awareness of family members. They were either busy with their household or were not convinced their child needed eye care. A study

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Table 4 Facilitators and barriers for compliance with spectacles wear among adolescent students

Facilitators of wearing spectacles (multiple responses, n=188)	Frequency	Percentage
Vision is clearer	85	45.21
No or less headache	43	22.87
Easy to wear and use	38	20.21
Spectacles look good on me	35	18.62
No or less eye pain	31	16.49
Parents and guardians advise to wear them	29	15.43
Peers also wear spectacles	29	15.43
Got free spectacles	25	13.30
Reasons for not wearing spectacles (multiple responses, n=129)	**Frequency**	**Percentage**
Don't feel spectacles are needed	26	20.16
Difficult to wear spectacles while wearing masks	22	17.05
Friends tease	21	16.28
Wearing spectacles will lead to wear them for life	20	15.50
Parents and guardians forbid using spectacles	19	14.73
Cannot afford new spectacles if required	19	14.73
Vision diminishes if one wears spectacles	18	13.95
Need to change spectacles power always	17	13.18
Broken spectacles	16	12.40
Forgot spectacles at home	7	5.43
Lost spectacles	6	4.65
Vision was not clear	5	3.88
Had headache after wearing spectacles	4	3.10
Not easy to wear	3	2.33

in the USA among preschool children (3–5 years) with vision problems also showed that parents either ignored the issues in their child or waited for the problem to deteriorate or did not believe their child had vision issues.[28] A telephone survey among parents of school-aged children with abnormal vision screening from Michigan, USA, also pointed out that parents did not suspect a problem and/or doubted the screening test's accuracy.[15] Meanwhile, a study in Australia among young children's parents showed that concern about the child's vision was a major reason for their child having an eye examination.[30] Another reason shared for the non-utilisation of eye care among our study participants was their perception of eye health. Some believed their vision was good, and they did not need eye examination, while some did not want to go as they did not want to wear spectacles. A study among students aged 4–12 years in India also revealed that the majority did not feel any reason to consult the doctor despite having symptoms of eye diseases.[27] Negative attitude or ignorance can exacerbate existing eye conditions. There is a need to raise awareness and educate students and their guardians to help them overcome concerns that hinder them from seeking timely care and saving the sight of children.

Another reason shared by our students for the non-utilisation of eye care services was the ongoing COVID-19 pandemic during the study period. The number of patients visiting for eye care during the pandemic decreased worldwide due to the fear of infection.[31 32] This is obvious as staying safe from the infection was the priority over most other ailments during the period.

Our study showed that male students used eye care services more than female students, but the association was not statistically significant. In contrast, the Canadian Community Health Survey between 2007 and 2008 showed that males were 10% less likely than females to use services.[33] A study from Taiwan showed that female children with ocular conditions had lower utilisation than their male counterparts.[34] A hospital-based review in Nepal also showed that females consulted for eye care less commonly than males.[35] Nepal is a patriarchal society, and earlier reports suggest that gender disparity was profound in the utilisation of eye care services and pervasive in all regions of Nepal.[36] Promoting equity in eye care access contributes to gender equality by ensuring that females have the same opportunities as males to receive the care they need and can break down barriers and stereotypes related to gender roles and expectations.

In our study, there was no significant difference between young and older adolescents in the utilisation of eye care services. More younger students used eye care services than older adolescents in our study. A study among 4–12

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Table 5 Factors associated with compliance with spectacles wear among adolescent students

Characteristics	Compliance with spectacles wear					
	Yes (%)	No (%)	COR (95% CI)	P value	AOR (95% CI)	P value
Gender						
Male	71 (62.3)	43 (37.7)	1.214 (0.759 to 1.942)	0.419	1.006 (0.607 to 1.665)	0.982
Female	117 (57.6)	86 (42.4)				
Age group						
10–14 years	80 (54.1)	68 (45.9)				
15–19 years	108 (63.9)	61 (36.1)	1.505 (0.959 to 2.362)	0.075	1.758 (1.086 to 2.848)	0.022*
Residence						
Urban	153 (66.8)	76 (33.2)	3.048 (1.835 to 5.066)	<0.001†	2.552 (1.469 to 4.433)	<0.001†
Rural	35 (39.8)	53 (60.2)				
Father's educational status						
High school and above	15 (55.6)	12 (44.4)				
School education or illiterate	173 (59.7)	117 (40.3)	1.183 (0.534 to 2.618)	0.678	1.403 (0.572 to 3.439)	0.459
Mother's educational status						
High school and above	7 (43.8)	9 (56.3)				
School education or illiterate	181 (60.1)	120 (39.9)	1.939 (0.703 to 5.348)	0.194	2.718 (0.859 to 8.600)	0.089
Father's job						
Regularly paid	72 (60.5)	47 (39.5)	1.083 (0.681 to 1.722)	0.736	1.361 (0.732 to 2.530)	0.330
Non-paid	116 (58.6)	82 (41.4)				
Mother's job						
Regularly paid	52 (72.1)	21 (28.8)	1.966 (1.116 to 3.464)	0.018*	2.440 (1.162 to 5.125)	0.018*
Non-paid	136 (55.7)	108 (44.3)				
Family member wearing spectacles						
Yes	62 (62.0)	38 (38.0)	1.178 (0.725 to 1.915)	0.507	1.015 (0.564 to 1.826)	0.961
No	126 (58.1)	91 (41.9)				
Gone to eye care centre						
Yes	103 68.7)	47 (31.3)	2.114 (1.335 to 3.347)	0.001†	1.662 (1.006 to 2.746)	0.047*
No	85 (50.9)	82 (49.1)				

*Statistically significant at p<0.05.
†Statistically significant at p<0.001.
AOR, adjusted OR; CI, confidence interval; COR, crude OR.

years students in Ernakulam District of Kerala, India, showed that children of higher age groups used eye care services more.[27] In our study, as described above, the initial vision screening was conducted by fellow students aged 14–17 years. The older adolescents, being the peers of the screeners, might not have believed in the vision screening capacity of students or were ignorant of their advice to go for check-ups.

The students whose parents had a high school education and above were 1.3 times more likely to use eye care services than parents who had just a school education or were literate. However, there was no statistically significant association between parents' education and utilisation in our study. The Taiwan National Health Interview Survey showed that among children aged 3–12 years with ocular conditions, higher levels of mother's and father's education also had similar odds as our study of receiving subsequent eye care, and father's education was significantly associated with utilisation.[34] However, a study in urban Kerala showed that the parents' education level did not influence utilisation of eye care services among children aged 4–12 years when they are inflicted with an eye disease.[27] Parents with higher levels of education can have better access to information about the importance of eye care and are more likely to seek care.

The students whose parents had regular paid jobs like in services, teaching or business were likelier to use eye care services in our study than parents with other jobs like daily labour or were housemakers or farming. The students with mothers with regularly paid jobs were more likely to use eye care services in our study, and this association was statistically significant. The survey from Taiwan has also

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added evidence that children aged 3–12 years with ocular conditions living in families with higher family incomes were much more likely to receive eye care.[34] A study from the USA also showed that family with higher income were likely to take their preschool-aged children with abnormal vision screening for follow-up care.[28] A cohort study from Avon, in Southwest England, UK, showed that children from lower socioeconomic status groups were less likely to see an eye care specialist or to use screening services.[37] The same cohort study also suggested that eye conditions were more prevalent among children in the lower social classes, suggesting they have a greater healthcare need but less access to services than those from higher socioeconomic groups.[37] The differences between socioeconomic groups in using eye care services suggest inequitable access. If we are to tackle preventable sight loss and move along with eye health as an essential part of Sustainable Development Goals,[38] ensuring equitable access to eye care is vital.

In our study, the students residing in urban areas were more than four times more likely to use eye care services, and the association was statistically significant. Similarly, in our study, the students residing within a half-an-hour walk to the nearest eye clinic were more likely to use eye care services than those who had to walk more than half-an-hour, and the association was statistically significant. In Nepal, there is a negligible number of eye care services by governmental health facilities, with 90% of eye health services primarily delivered by non-governmental organisations run eye hospitals, followed by private health facilities.[7 39] Almost all eye care centres are in metropolises or district headquarters. Distance and poor accessibility have always influenced eye care service utilisation for children or other populations. An earlier study has shown that great distance from home to eye facilities, unavailability of eye health service providers in their locality, and inadequate eye care services in their local health facilities affected eye health services utilisation among people from Mustang, Nepal.[40] The study among parents of school students also disclosed that poor accessibility was one of the major reasons for not taking students for follow-up care.[27] Expanding access to affordable eye care services, particularly in underserved areas, can address disparities in the utilisation of eye care services.

Compliance with spectacles wear

Three to four months after the distribution of subsidised spectacles, in unannounced school visits, 59.31% of students were wearing spectacles in our study. This is higher than a previous study in Lumbini, Nepal, where 51% of students were wearing spectacles on similar visits.[41] In South India, 57.8% of school children aged 7–15 years were found to be in compliance with spectacles wear during unannounced visits conducted after 3 months of providing spectacles free of cost.[42] A study among Tanzanian students showed that 56% of students were wearing their spectacles or had them at school at the 3-month follow-up.[43] A study among Botswanian school students aged 12–17 years showed 60.1% of children were compliant with spectacle wear at 3–4 months follow-up from spectacle distribution.[22] In a study among 5–16 year old students from Chitwan, Nepal, only 28% were wearing spectacles after a year.[25] Another study among rural secondary school children (8–16 years) in Western India showed that 29.5% were wearing spectacles after 6–12 months of providing free spectacles.[44] A multicentre study in Southern Arizona, USA, among children aged 8–14 years showed only 33.2% were wearing spectacles after a year.[45] These studies show that the compliance rate has decreased as days have passed by. All these studies from around the globe show that compliance with spectacles use is a major issue in eye care, even though the children get it for free or not.

Our study showed that relief of the symptoms after wearing the spectacles was one of the facilitators for compliance with spectacles wear. Many students reported vision being clearer and relief from eye pain and headaches after wearing spectacles in our study. The beneficial impact on their vision also influenced compliance with spectacles wear among Tanzanian students.[43] The children from the USA who were wearing spectacles also reported that their distance vision was blurred without spectacles.[45] In contrast, headaches after wearing spectacles or discomfort were also reasons for the non-wear of spectacles in our study. One common reason our study participants shared was difficulty in wearing masks and spectacles together as the study was conducted during COVID-19. Similar inconveniences like uncomfortable spectacles, headaches and their eyes watering were shared by 10–16 years old students from India for non-compliance with spectacles.[46]

The aesthetic aspect of the spectacles was also a facilitator for compliance with spectacles in our study. Liking how they looked in spectacles was also significantly associated with school children wearing spectacles in Southern Arizona.[45] A study in Tanzania among early teenage students showed they seemed happy with the appearance of their spectacles.[43] Some students from India complained that they did not like the frame, it was bad looking, or the colour of the frame was not to their liking as a reason for non-compliance to spectacles wear.[46] The shape and colour of the frame, according to face shape, along with personal fashion, style and comfort, can enhance one's overall appearance and boost one's confidence. Hence, be it free or subsidised, students must be allowed to choose and try the frame so it fits them and use them.

The peers and family were facilitators and barriers in compliance with spectacles wear in our study. Few students reported that compliance with spectacles wear was support from peers and family or their peers and family members were wearing spectacles. Some students reported negative attitudes about wearing spectacles from peers and family, which also barred them from wearing spectacles. Peer pressure and parental concerns about the safety of spectacle wear were barriers to

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spectacles wear in a study in Tanzania.[43] Students from Chitwan, Nepal, were also concerned about teasing and were not wearing spectacles.[25] Some students refused to wear spectacles after being subjected to teasing, name-calling and harmless jokes to being bullied or discriminated against in Tanzania.[43] A few students from the same cohort believed their families did not like them wearing spectacles.[43] Similar reasons were also shared by students from India, where friends calling them names, teasing from relatives, parents not allowing them to wear spectacles and disliking spectacles themselves.[46] In a study from Onitsha, Nigeria, students aged 5–15 years reported that parents' disapproval about the wearing of spectacles, concerned or teased about appearances and children should not wear spectacles were a few reasons for non-compliance with spectacles.[47] The most common cause of non-compliance in Lumbini, Nepal, was a lack of awareness among guardians about the need for distance spectacles for the children.[41] Poor awareness about the usefulness of spectacles wear was found among our study participants also. Some of our study participants did not feel they needed spectacles and were not wearing them. The students from Nigeria also had similar attitudes and reported that they felt that they did not need to wear spectacles.[47] Some students in our study did not wear spectacles because they thought that vision diminishes if one wears spectacles. Students from southern Nepal were also worried that spectacles would make their eyes weak.[41] Some students from Tanzania also reported that they did not use spectacles because they cause headaches, and spectacles will sink into the eye sockets.[47] Chinese adolescent students who held the attitude that 'spectacles make the vision worse' were less likely to wear spectacles.[23] Besides selling or recommending spectacles, counselling related to the importance of compliance with spectacles wear needs to be given due emphasis to the students and their caretakers to bust myths and misconceptions about spectacles.

Two of the barriers to spectacles mentioned in our study were lost and broken spectacles. Similar reasons were cited by students aged 5–16 years from Chitwan, Nepal.[25] A multicentre study from the USA also showed that the most common reasons among children aged 8–14 years children for non-wear were lost (44.9%) or broken (35.3%) spectacles, even though they were provided with two pairs the previous year.[45] Lost and broken spectacles as reasons for the non-wear of spectacles were also shared by students from India.[46] In addition, our study participants reported that the cost associated with buying new spectacles or even changing powers made them not wear spectacles even if they got them for free the first time. Students from Tanzania shared similar affordability issues.[43] The future school eye health programme should focus on providing high-quality frames as well as educating students and parents about the importance of taking care of spectacles and keeping them safe to reduce the incidence of lost or broken spectacles.

Our study showed no significant difference between male and female students in compliance with spectacles wear. Though the proportion of males wearing spectacles is higher than females in our study as well as in the Chinese study,[23] there was no significant sex difference, unlike in the study in Tanzania.[43] A significantly higher proportion of 8–16 years males (73.7%) were not wearing their spectacles compared with females (67.5%) in Pune, India.[44] A study among Chinese adolescents showed the prevalence of spectacles utilisation was 35.2% for females and 36.2% for males, with no significant difference.[23] In the multicentre study from the USA, 64.6% of females and 35.4% were wearing spectacles, and females were 1.8 times more likely to wear spectacles, and the association was statistically significant.[45] The study from students (12–17 years) of Botswana also showed that female children were 2.32 times more likely to wear spectacles than males.[22] A study among school children aged 6–17 years of Oman also showed higher compliance among females (78.3%) than males (65.1%).[48] A study from the Rupandehi district of Nepal also showed that spectacles wear compliance was higher in females (58%) than males (48%).[41] These studies have shown that both sexes could be less compliant with spectacles wear. Both sexes can have RE, and it is important to emphasise that wearing spectacles is primarily related to RE correction and eye health and be made aware of it.

Older adolescents were nearly twice as likely to keep wearing spectacles than younger adolescents in our study, and this association was statistically significant in multivariate analysis. Among students aged 6–17 years of Dhakhiliya, Oman, higher compliance was observed among secondary than preparatory students, implying higher-aged students were wearing spectacles, and the association was statistically significant.[48] Non-compliance was not significantly related to the age of the students, but older children were slightly more non-compliant in Pune, India.[44] A study in Goodhope district, Botswana, among students aged 12–17 years, showed that the odds of spectacle wear decreased with age.[22]

In our study, the students with parents who were illiterate or only had a school education were likelier to wear spectacles than those with a high school education and above. However, in other studies from Nepal, compliance was better among students with higher education levels of parents.[25 41] Spectacles non-compliance among secondary school students in Pune, India, was significantly related to lack of education of the father but not of the mother.[44] Parental education levels were positively associated with spectacles utilisation among students from Mojian, southwestern China.[23] Parents with lower levels of education can be proactive in supporting their children to continue to wear spectacles if they are counselled well about RE and keeping spectacles safe. Therefore, efforts to promote spectacle compliance should focus on education and awareness for all parents, regardless of educational background, to ensure that every child with RE continues wearing spectacles.

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Students whose parents had regular paid jobs in services, teaching or business were more likely to wear spectacles in our study than parents with other jobs like daily labour, housemakers or farming. The students who had mothers with regularly paid jobs had more than twice the odds of spectacles compliance than those who did not, and this association was statistically significant in multivariate analysis. Non-compliance among Indian students was not significantly associated with the father's occupation.[44] In a study among Chinese adolescent students, students whose families had higher incomes were more likely to wear spectacles.[23] Economic constraints can affect a family's ability to replace lost or damaged spectacles or afford regular eye exams, impacting compliance. In addition, a mother with regular pay is usually empowered and caring enough to influence her child with spectacle compliance positively.

In our study, adolescents whose family members were wearing spectacles were more likely to be compliant with spectacles wear. Chinese adolescents whose parents had a higher rate of spectacle-wearing were also more likely to wear spectacles.[23] Adolescents might have observed their family members' positive experiences with spectacles, which could have encouraged them to wear spectacles as prescribed.

In our study, the students who had gone to eye care centres and were prescribed spectacles were more likely to wear spectacles than those who got spectacles at schools, and the association was statistically significant. Students liked the spectacles procured from the base hospitals much more than those given free by an organisation in a study in India.[46] In our study, the students residing in urban areas had odds of nearly 2.5 times more likely to have compliance with spectacles than those from rural areas, and the association was statistically significant in multivariate analysis, too. This might be because eye care centres are in proximity to the students, mostly in urban areas. However, the students motivated to go for eye check-ups at clinics may also be motivated to wear them. In addition, going to an eye centre can help one choose a variety of frames than at school-based refraction with limited choices. The aesthetic aspect of spectacles was a major reason for spectacles compliance in our study and other studies.[43 45 46]

The major limitation of the study was that the study site was Bagmati Province, one of the most developed provinces with relatively greater access to eye care services in Nepal. Therefore, the results cannot be generalised to other parts of the country. The cross-sectional nature of the study precludes the analysis of behaviour over time or the long-term trends in compliance with spectacles wear among students. Furthermore, it is difficult to establish cause-and-effect relationships, such as the utilisation of eye care services among students with poor vision. Furthermore, during group discussions, there could be a presence of social desirability bias among study participants. Another limitation of this study is that the calculated sample size was not reached due to a low response rate from students.

CONCLUSION

There are multiple barriers for students to use eye care services and stay compliant with spectacles. Eye health promotion programmes should focus on educating parents and students about the importance of eye care and the benefits of spectacles wear. Eye health policymakers should design and implement a health system that can provide affordable, accessible and equitable eye care services.

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