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Research Article

Investigation of the effects of sociodemographic conditions on adherence to spectacles treatment in adolescents

Sosyodemografik koşulların genç erişkinlerdeki gözlük tedavisine uyum üzerine etkilerinin incelenmesi

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Abstract

Aim: To investigate the effects of several sociodemographic conditions on adherence to spectacles treatment in adolescents.

Material and Methods: 10-19-year-old otherwise healthy adolescents who had been prescribed spectacles at least one year ago were included in this study. To quantitatively evaluate adherence to spectacles treatment, patients were asked to mark along a visual analog scale and the result was noted as an adherence score (AS). Sociodemographic conditions that have potential to affect adherence to spectacles treatment were questioned.

Results: This study includes 107 patients and the mean age of patients was 14.83 ± 2.75 years (10-19). The mean AS was 8.59 ± 2.21 (3-10) for mothers with a higher educational degree, and 6.85 ± 3.14 (0-10) for mothers with a lower educational degree (p =0.018). Similarly, the mean AS was 8.45 ± 2.40 (3-10) for fathers with a higher educational degree and 6.94 ± 3.08 (0-10) for fathers with a lower educational degree (p =0.033). According to logistic regression analysis, a higher educational degree in fathers was associated with 8 and more AS (odds ratio: 4.17, 95% confidence interval 1.14-15.25, and p =0.031). There was no significant difference in AS according to conditions regarding whether or not to use spectacles in a family and social environment (p >0.05, for all).

Conclusion: It was concluded that higher parental educational level is associated with higher adherence to spectacles treatment in adolescents.

Keywords: Adolescent, children, glasses, refractive error, spectacles.

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Öz

Amaç: Genç erişkinlerde çeşitli sosyodemografik koşulların gözlük tedavisine uyum üzerindeki etkilerini araştırmak.

Gereç ve Yöntemler: Bu çalışmaya en az bir yıl önce gözlük reçete edilmiş 10-19 yaş arası sağlıklı genç erişkinler dahil edildi. Gözlük tedavisine uyumu niceliksel olarak değerlendirmek için hastalardan vizüel analog skala uygulamaları istendi ve sonuç uyum skoru (US) olarak not edildi. Gözlük tedavisine uyumu etkileme potansiyeli olan sosyodemografik koşullar sorgulandı.

Bulgular: Bu çalışmaya 107 hasta dahil edildi ve hastaların yaş ortalaması 14,83 ± 2,75 (10-19) idi. Ortalama US annede eğitim düzeyinin yüksek olduğu durumda 8,59 ± 2,21 (3-10), eğitim düzeyinin düşük olduğu durumda 6,85 ± 3,14 (0-10) idi (p =0,018). Benzer şekilde, babada eğitim düzeyinin yüksek olduğu durumda 8,45 ± 2,40 (3-10), eğitim düzeyinin düşük olduğu durumda 6,94 ± 3,08 (0-10) idi (p =0,033). Lojistik regresyon analizine göre, babada eğitim düzeyinin yüksek olması koşulu, 8 ve daha fazla US ile ilişkiliydi (odds oranı: 4.17, %95 güven aralığı 1.14-15.25 ve p =0.031). Aile ve sosyal çevrede gözlük kullanan birey olması veya olmaması durumuna göre US'de anlamlı fark yoktu (tümü için p >0,05).

Sonuç: Genç erişkinlerde anne ve baba eğitim düzeyinin yüksek olmasının gözlük tedavisine uyumun artmasıyla ilişkili olduğu sonucuna varıldı.

Anahtar kelimeler: Çocuk, genç erişkin, gözlük, kırma kusuru.

Introduction

The World Health Organization (WHO) reported that there are 2.2 billion people who have visual impairment, and uncorrected refractive error is one of the most important causes. [1] The prevalence of refractive errors is associated with age, sex, geographic location, education level, and duration of closeup work. [2] Studies from China and India have reported that uncorrected refractive error is the leading cause of vision loss in school aged children. [3,4]

Uncorrected refractive error can cause reduced academic, social, and economic performance. From the public health perspective, one of the most important features of the refractive error that causes visual loss in an individual who is otherwise healthy is being easily rehabilitated by wearing spectacles. Adherence to spectacles treatment can be low for various reasons. Studies from several developing and developed countries report that the rate of adherence to spectacles treatment in children and adolescents is far from desirable. [5-8] So, an important amount of the population in this age group is quite prone to uncorrected refractive error associated developmental and functional impairment. It is vital to understand why adherence to spectacles treatment in children and adolescents is low and what conditions affect the adherence. It is hypothesized that positive behavioral development of adherence to spectacles treatment in children and adolescents can be affected by perceptions and attitudes of family, school, and social environment. The purpose of this study is to investigate the effects of sociodemographic conditions on adherence to spectacles treatment in adolescents.

Material and Methods

This cross-sectional study was carried out at a tertiary referral center during 2021-2022, in Turkey. The study protocol was prepared per the ethical standards of the 1964 Declaration of Helsinki and was approved by the Hatay Mustafa Kemal University Faculty of Medicine Research Ethics Committee (Protocol no: 2022/33; Date: 14/03/2022). Informed consent was obtained from all participants.

10-19-year-old Turkish adolescents who had been prescribed spectacles at least one year ago were included in this study. Patients that had the following conditions were excluded from the study: 1) amblyopia; 2) other ocular co-morbidities related to low vision (e.g., strabismus, cataract, glaucoma, or neuroophthalmological diseases); 3) <20/20 the best-corrected visual acuity; 4) >6.0 diopters of manifest refraction spherical equivalent; 5) systemic diseases or developmental abnormalities that could affect the eye (e.g., Down's syndrome, Marfan syndrome, neurofibromatosis, dyslexia, or autism spectrum disorders).

All patients underwent a detailed ophthalmological examination including autorefractometry and tonometry (TONOREF III; Nidek Co., Ltd., Aichi, Japan), the best-corrected

visual acuity with Snellen chart, and anterior and posterior segment with slit-lamp biomicroscopy. Manifest refraction was determined using a combination of objective and subjective refraction techniques. Ocular motility was also evaluated with nine gazes and cover-uncover tests for both near and far. After noting demographic and clinical data, patients were asked to mark along a visual analog scale their adherence to spectacles treatment in the last month [ranging from 0 to 10 (0 for I never use, 10 for I use all time I am awake)] and the result was also noted as adherence score (AS). The patients were informed if their spectacles had been broken or lost; the last month before the event should be considered. Then some questions related with sociodemographic conditions that have the potential to affect adherence to spectacles treatment were directed to patients by the same physician (Dr. C.I.) and the answers were noted. The details of the questions are given in Table 1.

Table 1. Details of questions directed to patients.
When was prescribed spectacles for the first time?
Do you know your disease (myopia, hyperopia, or astigmatism) that is required spectacles treatment?
How many people (including you) do you live in your house?
How many people (other than you) use spectacles in your house?
If your mother is alive, does she use spectacles?
If your father is alive, does he use spectacles?
If you have one or more siblings, do any of them use spectacles?
Do any of your other relatives (uncles, aunts, and cousins) use spectacles?
If you go to school, do any of your close friends at school use spectacles?
If you go to school, do any of your teachers who frequently attends your class use spectacles?
If you followed one or more social media phenomenon, do any of them use spectacles?
In your spare time, do you use a smart device (phone, tablet, or computer)?
In your spare time, do you surf on social media?
In your spare time, do you read a book?
In your spare time, do you watch television?
In your spare time, do you do outdoor activities?
On a typical day, how many hours do you spend in front of screen?
On a typical day, how many hours do you spend with near working?
On a typical day, how many hours do you spend outdoor?
Does your mother have a permanent job?
Does your father have a permanent job?
What school did your mother graduate from?
What school did your father graduate from?

Results

This study included 107 patients, 24.17% were male and 75.83% were female. The mean age of patients was 14.83 ± 2.75 years (10-19). 37.24% of patients had at least one companion (parents, siblings, or other relatives) during evaluation. 85.86% of patients stated that they had information about their disease that made spectacles treatment necessary. The mean AS was 7.45 ± 3.23 (0-10) in males and 7.29 ± 2.90 (0-10) in females, 7.45 ± 3.08 (0-10) in patients aged 10-14 and 7.25 ± 2.87 (0-10) in patients aged 15-19, 7.80 ± 3.07 (0-10) in patients who had a companion and 7.10 ± 2.86 (0-10) in patients who had no companion, and 7.46 ± 2.82 (0-10) in patients who had information about the disease and 6.92 ± 3.71 (0-10) in patients who had no information ($p > 0.05$, for all).

The mean AS was 6.94 ± 3.21 (0-10) in patients who stated that their mothers used spectacles and 7.57 ± 2.80 (0-10) in patients who stated that their mothers did not use spectacles; 6.88 ± 2.94 (0-10) in patients who stated that their fathers used spectacles and 7.52 ± 2.96 (0-10) in patients who stated that their fathers did not use spectacles; and 7.45 ± 2.88 (0-10) in patients who stated that their teachers used spectacles and 7.23 ± 3.06 (0-10) in patients who stated that their teachers did not use spectacles. There was no significant difference in AS according to conditions regarding whether or not spectacles were used in the family and social environment ($p > 0.05$, for all), and the details are given in Table 2.

The mean AS was 7.31 ± 3.05 (0-10) in patients who stated that they used a smart device and 7.55 ± 2.61 (3-10) in the others; 7.32 ± 2.77 (0-10) in patients who stated reading and 7.46 ± 3.41 (0-10) in the others; and 7.09 ± 3.13 (0-10) in patients who stated doing outdoor activities and 7.50 ± 2.86 (0-10) in the others. The differences in AS between patients doing the aforementioned activities or not were not statistically significant ($p > 0.05$, for all), and the details are given in Table 2.

The mean value of spherical equivalents was 2.56 ± 1.57 diopters (0.75-6.00), duration of spectacles use 2.75 ± 2.24 years (1-10), population of households 4.85 ± 1.10 persons (2-9), and number of households using spectacles 1.17 ± 1.13 person (0-4). On a typical day, the mean time spent in front of a screen was 3.70 ± 2.05 hours (0-10), with closeup working 3.76 ± 2.40 (0-8), and outdoors 1.73 ± 1.84 (0-6). There was no significant relationship between AS and magnitudes of other continuous variables ($p > 0.05$, for all), and the details are given in Table 3.

Table 2. Comparisons of adherence scores according to different conditions.

		Frequency (%)	Adherence scores			p value*
			Mean	Median	Min-Max	
Spectacles using conditions in family and social environment	Mother					
	Yes	35.48	6.94 ± 3.21	7	0-10	0.386
	No	64.52	7.57 ± 2.80	9	0-10	
	Father					
	Yes	27.95	6.88 ± 2.94	7.50	0-10	0.315
	No	72.05	7.52 ± 2.96	9	0-10	
	Sibling					
	Yes	37.63	6.74 ± 3.07	7	0-10	0.146
	No	62.37	7.71 ± 2.84	9	0-10	
	Other relative					
	Yes	88.17	7.26 ± 2.96	8	0-10	0.429
	No	11.83	8.00 ± 2.93	10	2-10	
	School friend					
	Yes	72.04	7.40 ± 2.91	8	0-10	0.734
	No	27.96	7.15 ± 3.07	8	0-10	
	Teacher					
	Yes	58.51	7.45 ± 2.88	8	0-10	0.706
	No	41.49	7.23 ± 3.06	8	0-10	
	Social media phenomenon					
	Yes	44.00	7.45 ± 2.95	9	0-10	0.704
	No	56.00	7.31 ± 2.92	8	0-10	
Free time activities	Using a smart device					
	Yes	76.59	7.31 ± 3.05	8.50	0-10	0.808
	No	23.41	7.55 ± 2.61	8	3-10	
	Surfing on social media					
	Yes	61.70	7.19 ± 2.95	8	0-10	0.484
	No	38.30	7.64 ± 2.95	9	0-10	
	Reading					
	Yes	72.34	7.32 ± 2.77	8	0-10	0.463
	No	27.66	7.46 ± 3.41	10	0-10	
	Watching television					
	Yes	51.06	7.27 ± 3.07	8.50	0-10	0.837
	No	48.94	7.46 ± 2.83	8	0-10	
	Outdoor activities					
	Yes	34.04	7.09 ± 3.13	7.50	0-10	0.587
	No	65.96	7.50 ± 2.86	9	0-10	
Parents' working in a permanent job	Mother					
	Yes	15.39	8.00 ± 2.87	9.50	2-10	0.853
	No	84.61	7.71 ± 2.85	10	0-10	
	Father					
	Yes	84.61	7.87 ± 2.57	9	0-10	0.922
	No	15.39	7.10 ± 4.10	10	0-10	
Parents' education level	Mother					
	High school or higher	48.49	8.59 ± 2.21	10	3-10	0.018
	Lower than high school	51.51	6.85 ± 3.14	7.50	0-10	
	Father					
	High school or higher	50.00	8.45 ± 2.40	10	3-10	0.033
	Lower than high school	50.00	6.94 ± 3.08	7	0-10	

* Statistical analysis was made with Mann Whitney-U test.

Table 3. Correlations between adherence scores and other continuous variables.

	Mean	Median	Min-Max	p value*	r value*
Age (year)	14.83 ± 2.75	15	10-19	0.348	-0.099
Spherical equivalent (diopter)	2.56 ± 1.57	2	0.75-6.00	0.139	0.162
Duration of spectacles using (year)	2.75 ± 2.24	2	1-10	0.145	0.158
Population of households (person)	4.85 ± 1.10	5	2-9	0.662	-0.046
Number of households using spectacles (person)	1.17 ± 1.13	1	0-4	0.059	-0.200
Time spent in front of screen (hour)	3.70 ± 2.05	3	0-10	0.668	-0.045
Time spent in near working (hour)	3.76 ± 2.40	3	0-8	0.471	0.076
Time spent outdoor (hour)	1.73 ± 1.84	1	0-6	0.471	-0.076

* Correlation analysis was made with Spearman correlation test.

The mean AS was 8.00 ± 2.87 (2-10) in patients who stated that their mothers worked in a permanent job and 7.71 ± 2.85 (0-10) in patients who stated that their mothers did not; 7.87 ± 2.57 (0-10) in patients who stated that their fathers worked in a permanent job and 7.10 ± 4.10 (0-10) in patients who stated that their fathers did not. There was no significant difference in AS between mother/father of patients working in a permanent job or not (p >0.05, for both). The mean AS was 8.59 ± 2.21 (3-10) in higher educational degree for mothers and 6.85 ± 3.14 (0-10) in lower educational degree for mothers. Similarly, the mean AS was 8.45 ± 2.40 (3-10) in higher educational degree for fathers and 6.94 ± 3.08 (0-10) in lower educational degree for fathers. The differences in AS between higher and lower educational degrees for both of mothers and fathers were statistically significant (p =0.018 and p =0.033, respectfully). The details of comparisons of AS according to parents working and education conditions are given in Table 2. The demonstration of AS of patients according to educational levels of parents is given in Figure 1.

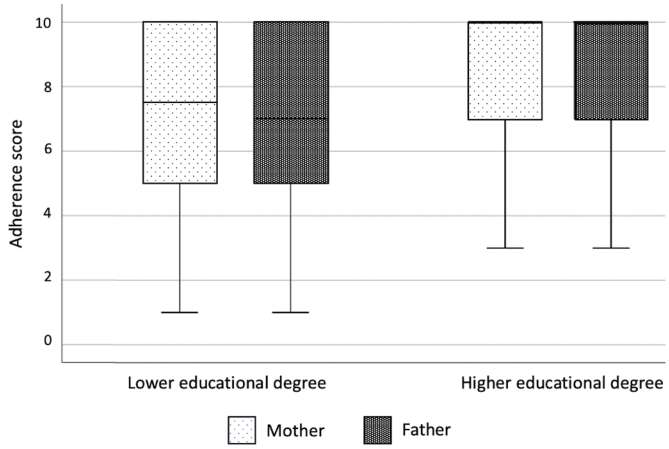

Figure 1. The demonstration of adherence scores of patients according to educational levels of parents.

According to logistic regression analysis, higher educational degree in fathers was associated with 8 and more AS (odds ratio :4.17, 95% confidence interval 1.14-15.25, and p =0.031) while other analyzed parameters (magnitude of spherical equivalent, duration of spectacles using, number of households using spectacles, and mother's education level) were not significantly associated (p >0.05, for all), and the summary of the analysis is given in Table 4.

Discussion

This study contributes to the literature in many different aspects. Some of the previous studies have focused on adherence to spectacles treatment in amblyopic children. [9-11] Spectacles use was not considered as only visual rehabilitation for amblyopic children, and adherence to treatment can be more reinforced by family and social environment because of amblyopia treatment/prevention by using spectacles. So, the results of studies conducted on amblyopic children are not representative of the otherwise healthy population with refractive error. Large sample sized population-based or school-based screening programs were the methods of many previous studies, and contained many children and adolescents who had never used spectacles despite having refractive error. [1,4,6,7,12] This is not an ideal way to investigate conditions that had the potential to affect adherence to treatment because adherence has been decided as very low, with surprise visits for reasons like losing spectacles, breaking the spectacles, or forgot the spectacles and left them at home. [1,4,6,7,12] It was also reported that patients who were not used to spectacles are less likely to be using spectacles than the others. [6] So, the patients who wear spectacles for at least one year and who were admitted to an ophthalmology clinic for spectacles correction are more eligible subjects to investigate. In some studies, standard spectacles were provided under public

Table 4. Summary of the logistic regression analysis for some conditions* that have potential to effect adherence score.

	Odds ratio	95% confidence interval		p value*
		Lower limit	Upper limit	
Duration of spectacles using	1.259	0.940	1.685	0.122
Spectacles use condition in siblings (ref :yes)	4.345	0.982	19.221	0.053
Father's education level (ref :lower than high school)	4.172	1.141	15.257	0.031

* Logistic regression analysis was made with Backward-LR test. Magnitude of spherical equivalent, duration of spectacles using, number of households using spectacles, mother's education level, and father's education level were conditions included into the logistic regression analysis, and the final comparison (given in the table) was reached after six steps. Fitting for logistic regression model was checked with Hoshmer-Lemeshow test.

health promotional programs. Despite this method providing a greater opportunity to remove the barriers prior to the availability of treatment, one size/color/design standardized spectacles could not be deemed as being acceptable for all children and adolescents, and some of them have never used these spectacles that were provided free of charge. [12] Many of the previous studies determine the adherence using a binary format (0 for non-adherence and 1 for adherence). In this study, another method, a visual analogue scale was used to determine adherence to spectacles treatment. A Visual analogue scale allows a more comprehensive evaluation to the adherence. Grading of adherence to spectacles treatment is a more appropriate method than binary format because Gajiwala et al.13 reported only less than a third of students use spectacles for the whole day. The scale was not conducted on very young children, only adolescents were included, and an older family member accompanied then for some of the time during the evaluation.

Many studies reported parental disapproval, teasing by peers, unattractive frames/poor appearance, and a negative attitude from society as important factors for low adherence to spectacles treatment. [14-17] In their meta-analysis, Dhirar et al. [18] classified the reasons for low adherence as personal factors 25.78%, social factors 13.18%, visual problems/ headache 5.47%, and breakage/loss/forgetfulness 23.34%. They reported that sociocultural factors are more important contributors in adherence to spectacles treatment, especially for upper/middle income countries. [18] They also emphasized the importance of positive reinforcement at both school and household levels. [18] Similarly, Morjaria et al. [19] investigated the attitudes of parents and teachers to clarify the reasons for low adherence to treatment in students. Classmates, teachers, parents, other family members, and community perceptions regarding spectacles were described as sociodemographic factors by Morjaria et al., [20] and they stated that the reasons for low adherence are more complex. It is thought that the presence of individuals who used spectacles within a close circle of adolescent friends can contribute to developing positive behavioral development of spectacles use. In this study, comprehensive questioning was conducted, including family members, school friends, teachers, and social media phenomena. According to the results of this study, the presence of individuals who used spectacles within a close circle of adolescents has no significant effect on adherence to spectacles treatment.

In the literature, conflicting results had reported the relationship between adherence to spectacles treatment and age/sex/magnitude of refractive error. [8,12,18,21-24] According to the results of this study, demographic conditions including age and sex have no significant effect on adherence to spectacles treatment in adolescents. Albeit there is a tendency to think the adherence to spectacles treatment should be higher in the adolescents who have information about their disease, had a higher magnitude of refractive error, and used spectacles for a longer duration; the results of statistical analysis did not support this theory. So, it can be concluded that clinical conditions have a limited effect on adherence to spectacles treatment in adolescents.

Varieties of daily habits or free time activities like using a smart device, reading, surfing on social media, watching television, and doing outdoor activities was another parameter investigated; however, whether or not these activities were carried out had no significant effect on adherence to spectacles treatment. Additionally, there was no significant relationship between adherence to treatment and the time spent in front of a screen, closeup working, and outdoor activities. In the literature, there is not enough data to compare the results of this study and it can be easily thought that there is a negative effect of doing outdoor activities or the magnitude of the time spent outdoors on adherence to spectacles treatment in adolescents; however, this study clearly demonstrates that there is not a significant

relationship. To conclude, the effects of daily habits or free time activities on adherence to spectacles treatment in adolescents is one of the most important aspects of this study.

The relationship between adherence to spectacles treatment and parents' education level was not clear enough. Messer et al. [6] reported that the education level of the father was not associated with the adherence to spectacles treatment. Gogate et al. [12] reported that low adherence to spectacles treatment in children is related to low education in the father, and the worst adherence occurs in children with illiterate fathers. On the other hand, a similar relationship with mother's education was not reported. [12] Another study demonstrated that adherence to spectacles treatment increases with the education level of the parents. [25] According to the results of this study, both father's and mother's education levels are significantly related to adherence to spectacles treatment in adolescents, and better adherence was found in higher educational degree for both father and mother. To clearly separate working status and education degree, the condition of parents' working in a permanent job was questioned and there was no significant relationship between adherence to treatment and working status of parents. Additionally, logistic regression analysis used in this study clearly revealed the strong relationship between increased adherence to spectacles treatment in adolescents and higher educational level of father. A study from India associated a similar result with patriarchal social structure. [12] This cause-and-effect relationship can apply to the social structure which was conducted in this study to some degree; this study does not provide objective data to support this hypothesis. Maybe, educated women having equal or more educated husbands can be a reason affecting the results of statistical analysis that presents the father's education level as more important than the mother's.

When compared with similar studies, having a small sample size and being a single center study are limitations of this study. Despite not being technically difficult, not doing an objective evaluation of AS obtained with visual analog scale was another important limitation. On the other hand, this study is one of the most important reports that has detailed and investigated the effects of sociodemographic conditions on adherence to spectacles treatment in adolescents.

Conclusion

In conclusion several clinical conditions were investigated in this study (magnitude of refractive error or duration of spectacles use): social (spectacles use in conditions within a close circle of friends), and personal (daily habits or free time activities). There was no important effect on adherence to spectacles treatment in adolescents. On the other hand, it was found that higher parental educational level is related to higher adherence to spectacles treatment.

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