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Parent's Awareness of Preventive Measures for Digital Eye Strain Syndrome among Saudi Students after 1 Year of Online Studies – A Survey

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Abstract:

PURPOSE: The digital eye strain (DES) is of public health magnitude in students undertaking online studies during the COVID-19 pandemic. The DES prevention strategies will be effective if all stakeholders, including parents, work together. We present an awareness level of preventive measures among parents of students studying online for 1 year.

METHODS: This web-based survey was held in December 2021. Parents of Saudi students in the Qassim region responded to 15 questions about the preventive measures for DES. The responses were summed up and graded into very poor, poor, good, and excellent. The level of awareness was associated with determinants.

RESULTS: The awareness was excellent in 566 of 704 (80.4%) (95% confidence interval 77.5–83.3) participants. Parents had poor awareness about the importance of the 20-20-20 rule (43.8%), frequent blinking (56.7%), using digital devices beyond studies (57.4%), using eye lubricants while using a digital device (56%), and using devices at night in lying position (69.6%). Excellent awareness was significantly associated with primary-level students ($P = 0.0004$), those having ophthalmic consultation in the past ($P = 0.02$), and students with DES ($P = 0.0006$). Parents with excellent awareness were not satisfied with online studies of their wards ($P = 0.001$).

CONCLUSION: Awareness of parents about preventive measures to address DES in students is relatively high. However, health promotion is recommended, especially focusing on the weak areas to improve DES and its impact on students.

Keywords:

Asthenopia, awareness, computer vision syndrome, COVID-19 pandemic, digital eye strain, prevention

Introduction

Digital eye strain (DES) or computer vision syndrome has become a public health issue.^[1] It is rapidly increasing in the young adult population due to excessive usage of smartphones and tablets.^[2,3] Due to changes in the education systems using virtual platforms during the COVID-19 pandemic, children now face a high prevalence of DES.^[4,5] Prevention of

DES is the best strategy for minimizing the negative impact on eye, mental, and general health.^[6] Parents have a critical role in preventing health problems, including DES in children. During the lockdown of the pandemic, while schools are closed, parents at home need to monitor the health behavior of their children. To imbibe healthy practices in children, parents should be more aware of the available preventive measures. Al Mazrou *et al.*^[7] found a low level of awareness among Saudi parents regarding pediatric eye diseases.

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The strategies to improve a child's eye health should be based on the level of awareness of parents and prepare health promotion to target weak areas in knowledge.

We conducted a study in Saudi Arabia to review DES among school children 1 year after online studies during the COVID-19 pandemic and parent awareness regarding the associated measures to prevent DES in children. In this study, we describe the level of awareness of Saudi parents and its determinants noted in an administrative region of Central Saudi Arabia.

Methods

This web-based survey was held in 2021. The Research and Ethical Committee of Qassim University approved implementing this survey. We included all the government schools in Buraidah City and school-aged children who finished 1 year of online classes in 2020 during the COVID-19 pandemic. The schools in Buraidah represented the Qassim region. The administration of the Ministry of Education permitted the approach of school authorities and parents for this study. Parents provided written informed consent. Parents agreeing to participate were included in the current study.

For sample size calculation, we noted 241,000 student population. We assumed that the acceptable level of awareness about DES preventive measures among parents was 40%.^[8] To achieve a 95% confidence interval (CI), 5% acceptable error margin, and clustering effect of 2.0, we needed 645 randomly selected participants. To compensate for incomplete information in web-based responses, we increased the sample by a contingency of 10%. We used OpenEpi version 3.01 software for sample size calculation for our cross-sectional study.^[9] The random selection method of sample to represent students of both genders of Buraidah, Qassim study area, is described in our previous publication.^[10]

There were 15 questions related to preventive measures for avoiding/minimizing DES in their children. The participating parents responded yes, no, and I don't know. For correct answers, +1 score was given, while for wrong answers, -1 score was given. For "don't know," a zero score was awarded. The sum of 15 replies constituted the awareness score of each participant. The level of awareness was further graded as very poor (score three or less), poor (score 4–7), good (8–11), and excellent (12 and more).

The data were collected using the Google Survey platform and then transferred into a spreadsheet of the Statistical Package for Social Studies (SPSS 25) (IBM, NY, USA).

The categorical variables were presented as number and percentage proportions. The continuous variables were presented as mean and standard deviation (range). If the distribution was not normal, we estimated the median and interquartile range of the variable. The level of awareness was grouped as excellent and not excellent and was associated with the potential determinants. We performed the Mann–Whitney *U*-test for two subgroups to note the two-sided *P* value. For >2 subgroups, we used the Kruskal–Wallis test to note the Chi-square value and *P* value. *P* <0.05 was considered statistically significant.

Results

We studied the responses of 704 parents; among them, 286 (40.6%) were male and 418 (59.4%) were female. The students were from elementary (lower grades), elementary (higher grades), intermediate, and high school grades (the range was 22.2%–30%).

The awareness was excellent in 566 (80.4%) (95% CI 77.5–83.3) parents of students in the Qassim region. The grades of awareness about preventive measures for avoiding/minimizing DES among parents are illustrated in Figure 1. Only 3% and 2% of parents had poor and very poor levels of awareness.

The responses of parents regarding 15 questions on the prevention of DES in their wards are demonstrated in Table 1. Parents had poor awareness about the importance of the 20-20-20 rule (43.8%), frequent blinking (56.7%), using digital devices beyond studies (57.4%), using eye lubricants while using digital devices (56%), and using devices at night in lying position (69.6%).

The excellent and not excellent grades of awareness among parents were associated with different independent

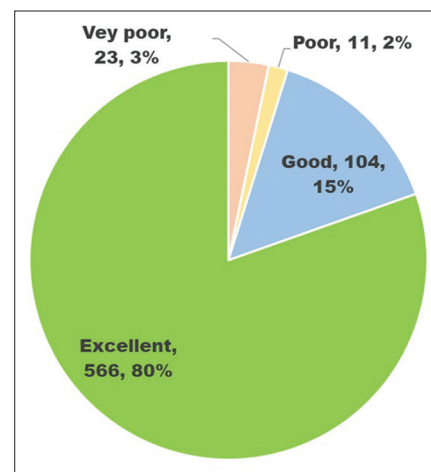


Figure 1: Distribution of grades of awareness of parents about preventive measures for digital eye strain in children

Table 1: The responses of parents regarding awareness related to digital eye strain in children

Question number	Question	Correct, n (%)	Don't know, n (%)	Wrong, n (%)
1	We should apply the rule of 20-20-20 while studying	308 (43.8)	361 (51.3)	35 (5.0)
2	Using lubrication is important while the child is studying	394 (56.0)	202 (28.7)	108 (15.3)
3	It is important to sit in a good position to avoid neck and shoulder pain	662 (94.0)	28 (4.0)	14 (2.0)
4	Prolonged use of digital devices during online classes causes dry eye	547 (77.7)	90 (12.8)	67 (9.5)
5	The distance between the child's eye should be a minimum of 18 inches	550 (78.1)	124 (17.6)	30 (4.3)
6	When noticing any problem in the student's eyes due to online classes, it is important to examine the student with an ophthalmologist	644 (91.5)	39 (5.5)	21 (3.0)
7	It suits me if my son or daughter asks me to use the digital device after finishing the online class	404 (57.4)	66 (9.4)	234 (33.2)
8	Having a break every 1 h while studying is important for the health of the eyes	641 (91.1)	39 (5.5)	24 (3.4)
9	It is important to encourage the child to blink while studying	399 (56.7)	219 (31.1)	86 (12.2)
10	It is important to adjust the light of the digital device to moderate intensity	638 (90.6)	47 (6.7)	19 (2.7)
11	The child should have a minimum of 1 h daily doing physical activity away from digital devices	651 (92.5)	38 (5.4)	15 (2.1)
12	The child has to stop using the digital device at least 1 h before going to sleep	603 (85.7)	64 (9.1)	37 (5.3)
13	Dim light can cause myopia and increase myopia progression	506 (71.9)	129 (18.3)	69 (9.8)
14	The child should not take the digital device to his bedroom	490 (69.6)	69 (9.8)	145 (20.6)
15	The room light should be of moderate intensity	589 (83.7)	68 (9.7)	47 (6.7)

variables. Table 2 shows that excellent awareness was significantly associated with male students ($P = 0.02$), primary-level students ($P = 0.0004$), those having ophthalmic consultation in the past ($P = 0.02$), and students with DES ($P = 0.0006$). Parents with excellent awareness were not satisfied with online studies of their wards ($P = 0.001$) and believed that their ward's eye health deteriorated due to online studies ($P = 0.001$), which resulted in the worsening of the scholastic performance of wards ($P = 0.0001$).

Discussion

Many parents were well aware of prevention measures that should be adopted to avoid/prevent DES in their children. However, there was a wide variation in having correct knowledge about different modalities of prevention. Stressing health promotion for encouraging children to blink frequently while working on digital devices, reducing screen time, using eye lubricants while using digital devices, and avoiding the use of devices at night and in a lying position is needed. Awareness of parents of boys was better than parents of girls. Parents of primary students were better than those of older students.

This is perhaps the first study in Arab countries to review the level of awareness of parents about preventive measures to address DES. Parent's level of awareness noted in this study reflects how responsible the adult Saudi population is toward their children's health and consciousness to tackle the harmful effects of modern technologies. It also shows the reach of preventive health messages that are used in the study area, be it one-to-one communication by primary health staff or through widely accepted mass media and social media. Proactive steps taken by the Ministry of Health in this

direction also could be the reason for this high level of awareness among parents.^[11]

The awareness of DES prevention in the present study was much higher than that reported for oral health among the adult Saudi population.^[12] However, in this study, the percentages of correct answers ranged from 26% to 75%. The awareness about eye diseases related to diabetes, ocular trauma, and general eye diseases among the adult urban population of Saudi Arabia was high.^[13] Almalki *et al.*^[14] noted that the knowledge about diabetes and the associated risk factors among the Saudi adult population was only 49%. A disease like diabetes with high prevalence and intense efforts going on to address this public health problem shows such a low level of awareness in the general population.^[15] Our study findings could be overestimated. The use of five graded responses (Likert scale) and validation of questions for internal consistency would make such a study more robust.^[16,17]

The awareness level among parents of boys was better than those of girls. This contrasts with better awareness about eye diseases among females compared to male adult participants in a previous study done in Saudi Arabia.^[13] Differential awareness by gender of wards needs further investigation.

Parents of younger children (primary students) had better awareness about preventive measures of DES than those of older children. The young generation, who are savvy on electronic and social media and better educated, could explain this observation.^[18]

Awareness of parents was better among those who consulted eye care professionals in the past for their ward's eye problems. This could be due to counseling of

Table 2: Awareness of parents about the prevention of digital eye strain among children in Qassim, Saudi Arabia

	Awareness to prevent DES		Validity
	Excellent* (n=566), n (%)	Not excellent** (n=138), n (%)	
Gender of student			
Boys	242 (84.6)	44 (15.4)	MW P=0.02
Girls	324 (77.7)	94 (22.5)	
School level			χ^2
Elementary (lower grades)	137 (87.8)	19 (12.2)	KW $\chi^2=12$,
Elementary (higher grades)	133 (85.3)	23 (14.7)	P<0.001
Intermediate	161 (75.9)	51 (24.1)	
Secondary	135 (75.0)	45 (25.0)	
Child using spectacles			
Yes	99 (81.8)	22 (18.2)	MW P=0.67
No	467 (80.1)	116 (19.9)	
Eye problems in the past			
Yes	53 (82.8)	11 (17.2)	MW P=0.32
No	513 (80.2)	127 (19.8)	
Consulted eye doctor in the past			
Yes	121 (87.7)	18 (13.0)	MW P=0.03
No	445 (78.6)	120 (21.2)	
DES in child			
None	212 (74.1)	74 (25.9)	$\chi^2=12.5$
Mild	129 (84.9)	23 (15.1)	KW P=0.008
Moderate	85 (86.7)	13 (13.3)	
Severe	140 (83.3)	28 (16.7)	
Satisfaction related to online education			
Yes	274 (74.5)	94 (25.5)	MW P<0.001
No	292 (86.9)	44 (13.1)	
Effect of online studies on the eye health of the child			
Same	352 (76.7)	107 (23.3)	MW P=0.001
Worsened	214 (87.3)	31 (12.7)	
Studies of children affected			
Worsened	196 (87.9)	27 (12.1)	KW $\chi^2=19.8$
Same	220 (81.5)	50 (18.5)	Df=2
Improved	150 (71.1)	61 (28.9)	P=0.0001
DES in child			
None	212 (74.1)	74 (25.9)	MW P=0.01
Yes	354 (84.7)	64 (15.3)	

*Excellent: Awareness score >12, and **Not excellent: Awareness score of <12. DES: Digital eye strain, KW: Kruskal–Wallis, MW: Mann–Whitney

parents during ophthalmic consultation or subsequent exploration of health knowledge by parents with eye problems in children.^[19]

Awareness of the 20-20-20 rule was poor in our study. Eye care professionals strongly recommend the 20-20-20 rule: taking a 20-s break every 20 min by looking 20 feet away. This measure has been helpful in preventing asthenopia, dry eye syndrome, and DES.^[20,21] Health promotion packages to the community and students should include this preventive measure.

The importance of encouraging the child to blink while using a digital device was less known to parents in our study. Change in tear film by a blink protects the cornea and prevents dry eye. Blinking exercises/training to maintain a standard blinking rate is one of the preventive measures recommended by eye professionals.^[22,23]

The use of rewetting eye drops helps in reducing DES while undertaking online studies for a long time, as well as using digital devices.^[24] The knowledge of this preventive measure was low among parents. Primary eye care providers and school nurses could give these medications to students with long hours of study using digital devices. They also could be made available as over-the-counter medicine. Use of a smartphone at bedtime with ambient light switched off and in a lying-down position results in eye strain.^[25] Parents should forbid children to take digital devices to the bedroom to minimize DES in children. Prolonged use of digital devices for a long time, especially smartphones, will result in unusual head position and shoulder posture, resulting in neck and upper back pain.^[26] Awareness about using digital devices in sitting positions in a large proportion of parents in our study is very promising.

Awareness about DES prevention was not associated with refractive error and the use of spectacles by wards. Correction of refractive error in students is one of the preventive measures for DES.^[24] Perhaps, optometrists and optical outlets are not dispensing knowledge about preventive measures to parents while dispensing spectacles to their children.

There was a positive association between DES in children and excellent awareness about preventive measures of DES in parents in our study. The presence of symptoms of DES in children might have prompted parents to seek knowledge from cyberspace during the COVID-19 pandemic and online education. It could also be possible that responses to questions about DES symptoms were more accurate among parents with excellent awareness of preventive measures. The knowledge of preventive measures should translate into adopting healthy practices while students are using digital devices for online studies. Parents with excellent levels of knowledge were not satisfied with the online education of their wards as they were aware of its harmful effect on eye health, study performance, and overall health.

There were a few limitations in our cross-sectional study. The severity and presence of DES in students were perceived by parents, and responses to preventive measures for DES were also collected at one time. Thus, associations of these two factors should be looked at with caution, and causal associations should be avoided. The method of determining DES could be objective, and the tool for determining awareness could be time-tested and validated. The high prevalence of diabetes and intense efforts to address it in Saudi Arabia^[15] and low awareness about diabetes in the same population contrast with the high awareness of DES noted in the present study and do not match the low awareness noted among the adult population about DES.

Conclusion

Virtual education and excessive use of digital devices by students during the COVID-19 pandemic and lockdown have caused apprehension in parents about their eye, mental, and overall health. Their awareness about preventive measures could have increased as they could have undertaken a proactive search for prevention and solutions due to the limited availability of health services during the pandemic. Eye health care and child health care in the study area and of the country should focus on this issue of DES in students and integrate preventive measures and its health promotion to students and parents through widely accepted modern platforms for better reach and impact.

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Conflicts of interest

There are no conflicts of interest.

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