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Effect of curfew from the COVID-19 pandemic on amblyopia treatment in children in Saudi Arabia

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Abstract

Background: Amblyopia was defined as a reduction in the best-corrected visual acuity in one or both eyes with the presence of amblyogenic factors.

Objective: The aim of this work was to investigate the effect of curfews resulting from the COVID-19 pandemic on amblyopia treatment in children.

Design: A prospective longitudinal study.

Methods: The study was conducted in pediatric ophthalmology clinics at a tertiary hospital in Riyadh, Saudi Arabia. Children aged 3–9 years who underwent amblyopia treatment from September 2020 to May 2021 were recruited. Visual acuity data were collected from the subjects' record files for the first visits prior to the curfew and from the clinics for the second visits after the curfew had ended.

Results: A total of 97 children with amblyopia (strabismic, anisometropic, mixed, and visual deprivation) were included. In all, 15 children did not attend the clinic for follow-up visits after the outbreak of COVID-19. The follow-up visits for most of the participants took place 4–5 months after the first visit. No significant difference in visual acuity in the amblyopic eye was found between the first and second visits ($p > 0.05$). No significant correlation was noted between the baseline difference in visual acuity at the first and second visits and the duration of the amblyopia treatment between the two visits. The adjusted model shows a variation of 0.18% according to the duration between the two visits.

Conclusion: The findings showed no significant difference in visual acuity in amblyopic eyes between the first and second visits (before and after the COVID-19 curfew), although visual acuity was clinically improved.

Keywords

Amblyopia, patching treatment, visual acuity, COVID-19, curfew

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Introduction

Coronavirus disease 2 (COVID-19) is a severe form of acute respiratory syndrome (SARS-CoV-2).[1] The COVID-19 pandemic presented an obstacle to all medical services in most specialties around the world.[2] When the number of active COVID-19 cases in Saudi Arabia reached around 500 subjects at the end of March 2020, a curfew in the country was introduced, which ended on June 22, 2020. Therefore, regular follow-up visits for patients were suspended for about 5 months. During the curfew, hospitals continued to receive emergency cases only until September 15, 2020, when the Ministry of Health announced that government hospitals should start receiving patients in all clinics, as recorded by the public health authority in Saudi Arabia.[3–5]

The curfew delayed the treatment of many ophthalmic diseases, such as amblyopia in children. Amblyopia is a common cause of visual impairment in children caused by visual abnormalities such as anisometropia, strabismus, visual deprivation, or a mix of anisometropia and strabismus.[6]

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The most common causes of amblyopia in children are anisometropia and strabismus. The success of amblyopia treatment in children may have been affected by the curfew, as most pediatric ophthalmology clinics only provided virtual consultations during that time and postponed follow-up visits.[7] People were afraid of contracting the virus, and some individuals may have lacked awareness about the visual status of their children as well as the need to comply with amblyopia treatment.[8]

Few studies in the literature have investigated the impact of the COVID-19 curfew on amblyopia treatment in children. However, a new evidence-based protocol was recommended for ophthalmic clinics in general and for pediatric ophthalmology and strabismus for amblyopia in particular, to assess amblyopic children during the critical period of visual development as COVID-19 transmission decreased.[9,10] Thus, the aim of this study was to investigate the effect of the COVID-19 curfew on amblyopia treatment in children. It was hypothesized that during the COVID-19 pandemic, regular visual examination of amblyopic children at follow-up visits to pediatric ophthalmology and optometry clinics was delayed, which may have led to visual impairment.[9,11]

Methods

This was a prospective longitudinal study designed to address the purpose of the research. The study was conducted from September 2020 to May 2021. It was approved by the Institutional Review Board (IRB) and the Human Research Ethics Committee at the College of Medicine, King Saud University, Riyadh, Saudi Arabia (ethical approval code: E-20-5550, date of approval: January 30, 2021), and adhered to the tenets of the Declaration of Helsinki. All parents/caregivers of the children gave their written informed consent for inclusion before their children participated in the study.

Subjects were recruited from pediatric ophthalmology clinics at a tertiary hospital in Riyadh, Saudi Arabia. Children with different types of amblyopia (i.e., anisometropic, strabismus, mixed, or visual deprivation) aged 3–9 years were included. Amblyopia was defined as a reduction in the best-corrected visual acuity (VA) in one or both eyes by ⩾2 lines or 20/30 or worse in the amblyopic eye, with the presence of amblyogenic factors.[6] The subjects who had undergone amblyopia treatment were selected from scheduled visits to the pediatric ophthalmology clinics. The time frame for data collection for this study was from September 15, 2020 to May 20, 2021. Children with ocular diseases, mental disorders, or systemic diseases were excluded.

Visual measurements—including VA, the ocular alignment test, and refraction—in addition to demographic information, were collected from all subjects. Refraction data were obtained to classify types of refractive error (i.e., myopia, hyperopia, and astigmatism). Ocular alignment tests were carried out to detect whether amblyopia was caused by strabismus (i.e., strabismus amblyopia). For the first visit, the data were collected from the subjects' records at the hospital, whereas for the second follow-up visit, the data were collected at the clinics after the curfew for COVID-19 had ended.

Statistical analyses

For statistical analysis, a nonparametric test was used to compare VA in amblyopic children before and after the curfew. The related-sample Wilcoxon signed-rank test[12] was used to compare VA in the amblyopic eye at both visits for all types of amblyopia. In addition, the correlation between the baseline difference of VA at the first and second visits and the duration between visits was tested using a linear regression model. The data were analyzed using the Statistical Package for Social Sciences (IBM SPSS software version 26).

Results

A total of 97 children who had undergone amblyopia treatment were included in this study. In all, 15 children did not attend the pediatric ophthalmology clinic for follow-up visits after the COVID-19 curfew ended. Thus, a total of 82 participants attended the clinics for their second follow-up visits at different times. The mean age ± standard deviation of the participants was 6.0 ± 1.8 years. Most of the participants had follow-up visits 7–9 months after the end of the curfew, as shown in Table 1. During the period of the COVID-19 curfew, most of the amblyopic children were not followed up by pediatric ophthalmologists or optometrists regarding their treatment plan, with the exception of emergency cases, which were dealt with by appointments in clinics. After the curfew ended, the flow of amblyopic children attending follow-up visits remained low. This was either due to a reduction in the number of booked patients, based on instructions from hospital management, or because children did not attend their follow-up visits.

Parents and caregivers reported that many children (37) did not comply with patching treatment for amblyopia during the curfew period.

In the comparison of VA between the first and second visits for the amblyopia subgroups (i.e., strabismic, anisometropic, mixed, and visual deprivation), no significant difference was found in VA in the amblyopic eye between the two visits for all types of amblyopia (Table 2). However, clinical improvement in VA by 0.2 LogMAR was observed in the strabismic and anisometropic amblyopia groups on the second visit. Figure 1 shows VA at both visits for all types of amblyopia (strabismic, anisometropic, mixed, and visual deprivation). No significant correlation was found between the baseline difference in VA at the first and second visits and the duration between visits (Figure 2). The adjusted model shows a 0.18% variation according to the duration between the two visits ($r = 0.43$; $p = 3.20$).

Table 1. Characteristics of participants.

	Total (*N* = 82)	Visual deprivation amblyopia (*N* = 3)	Mixed amblyopia (*N* = 10)	Anisometropic amblyopia (*N* = 9)	Strabismic amblyopia (*N* = 60)
Age (mean ± SD)	5.9 ± 1.8	6.6 ± 1.5	6.4 ± 1.7	4.6 ± 2.8	6.01 ± 1.8
Gender					
Male *N* (%)	31 (37.8%)	0	7 (70%)	4 (44.5%)	20 (33.3%)
Female *N* (%)	51 (62.2%)	3 (100%)	3(30%)	5 (55.5%)	40 (66.7%)
VA in amblyopic eye (LogMAR) before the curfew (*N*%)					
0–0.2	38 (46.4%)	2 (66.7%)	3 (30%)	4 (44.5%)	32 (53.3%)
0.3–0.5	13 (15.8%)	0 (0%)	1 (10%)	1 (11.1%)	12 (20%)
0.6–0.8	15(18.3%)	0 (0%)	3 (30%)	2 (22.2)	10 (16.7%)
⩾0.9	16 (19.5%)	1 (33.3%)	3 (30%)	2 (22.2%)	6 (10%)
VA in amblyopic eye (LogMAR) after the curfew (*N*%)					
0–0.2	47 (57.3%)	0 (0%)	3 (30%)	5 (55.5%)	39 (65%)
0.3–0.5	11 (13.4%)	0 (0%)	1 (10%)	2 (22.3%)	8 (13.3%)
0.6–0.8	13 (15.9%)	1 (33.3%)	3 (30%)	1 (11.1%)	7 (11.7%)
⩾0.9	11 (13.4 %)	0 (11%)	3 (30%)	1 (11.1%)	6 (10%)
Duration between first and second visits (month) (*N*%)					
1–3 M	—	—	—	—	—
4–6 M	2 (3.3%)	4 (44.4%)	4 (40%)	1 (33.3%)	3 (3.7%)
7–9 M	14 (23.3%)	3 (33.4 %)	3 (30%)	_	22 (26.8%)
10–12 M	29 (48.3%)	2 (22.2%)	3 (30%)	2(66.6%)	35 (42.6%)
⩾13 M	17 (28.3%)	—	—	—	23 (18.9%)

Table 2. Comparison of VA between first and second visits before and after the curfew.

Comparison of VA between first and second visits	First visit (median ± SD)	Second visit (median ± SD)	*p*-Value
Strabismic amblyopia	0.3 ± 0.36	0.2 ± 0.38	0.339
Anisometropic amblyopia	0.3 ± 0.45	0.2 ± 0.31	0.293
Mixed amblyopia	0.6 ± 0.42	0.65 ± 0.38	0.732
Visual deprivation amblyopia	0.9 ± 0.11	0.9 ± 0.05	0.317
All groups	0.4 ± 0.38	0.2 ± 0.37	0.147

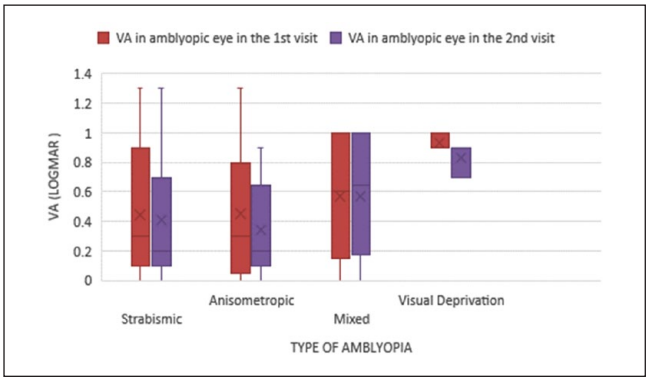

Figure 1. Comparison of VA between types of amblyopia at the first and second visits. VA at both visits for all types of amblyopia groups (strabismic, anisometropic, mixed, and visual deprivation).

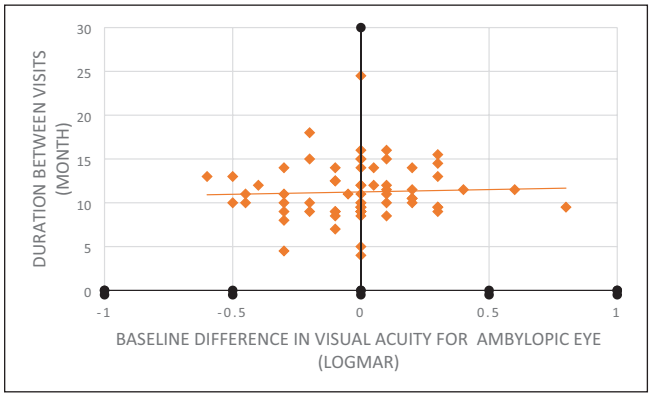

Figure 2. Correlation between baseline difference in VA in amblyopic eye and duration between first and second visits.

Discussion

The effect of curfews as a result of the coronavirus has affected the health sector worldwide. This study investigated the effect of the curfew in Saudi Arabia on amblyopia treatment in children. The findings showed no significant difference in VA in amblyopic eyes between the first and second visits (before and after the COVID-19 curfew), although VA

was clinically improved. This indicates that children with amblyopia may have continued treatment during that period. The duration between the two visits is considered to be long for follow-up visits for amblyopia treatment, affecting recovery by delaying treatment and having a negative impact on the ophthalmology practice.[13]

Most of the children who participated in this study were strabismic amblyopes. This was expected as the prevalence of strabismus in Saudi Arabia is considered to be high.[14,15] Usually, children with strabismus amblyopia are seen by pediatric ophthalmologists early in their childhood for the correction of ocular alignment.[16] Most of the children in this study visited the hospital for follow-up appointments 6 months after their last visit before the curfew. One participant visited the clinic for follow-up after 2 years, and this child recovered from amblyopia. No correlation existed between baseline VA and the duration between the two visits. The duration between the two visits, which was more than 7 months, may reflect that many of the patients were wary of visiting clinics in person due to COVID-19 even after the curfew had ended in the country.

Visual acuity was clinically improved in strabismic and anisometropic amblyopia subgroups after the COVID-19 curfew, although this improvement was not statistically significant. An improvement in VA by almost 0.2 LogMAR was observed for three types of amblyopia (i.e., anisometropic amblyopia, strabismic amblyopia, and visual deprivation amblyopia). For young children with amblyopia, it is preferred to start amblyopia treatment with refractive correction alone,[17] followed by patching treatment. The selected treatment for most of the participants in this research was optical correction with patching. Only one child was treated with atropine, but the child discontinued this treatment after complaining of a skin-sensitive reaction.

The results of this study were supported by Altintas's report, which stated that delayed optometry clinics for regular visual examination during the COVID-19 pandemic, especially for amblyopic children, may affect vision outcomes. During this period, ophthalmic screening programs were interrupted, and some children with either refractive errors and/or amblyopia were not diagnosed and treated.[11] It is important to highlight that good communication between doctors and patients during the curfew was reflected in the progress of VA for many amblyopic children. The curfew affected the treatment of amblyopia indirectly through surgery delays and the loss of contact with patients.

During the curfew, it was reported that about 97% of ophthalmic practitioners offered consultation services, and approximately 77.3% of ophthalmic surgeons performed ophthalmic surgery. About 44% of these doctors used phone and video calls for consultations with their patients.[18] Some telehealth services require technical skills, and some healthcare workers may find them difficult to use. However, most healthcare workers found the telephone to be the most convenient communication tool.[13]

Recent studies have presented urgent processes to resolve potentially sight-threatening conditions during the COVID-19 pandemic.[9,18] Some hospital cases were evaluated and rescheduled based on certain priorities. Saleem et al.[19] stated that it was important to consider the advantages of the various telemedicine technologies for providing medical services to the pediatric population, which were required during the COVID-19 curfew. Most of the telemedicine procedures were used during the curfew such that patients were checked and their conditions were monitored, even if this was not documented or recorded in the patient's hospital records. However, for this study, tele-examination was not used for participants during the curfew as it is impossible to test visual outcomes in children and to assess their condition via this process. In addition, teleclinics could not assist in monitoring adherence with amblyopia treatment, in particular compliance with patching treatment.

The limitations of this study are acknowledged. The sample size in some of the amblyopia subgroups was small and unequal, particularly in the visual deprivation amblyopia subgroup. There was a high number of amblyopic participants in the strabismus subgroup followed by mixed and anisometropic amblyopia with a lack of power analysis for sample size calculation. Thus, the statistical analysis for the smallest subgroup (i.e., three participants in the visual deprivation subgroup) should be highly cautioned. In addition, compliance with amblyopia treatment was not recorded as these data were not available. Thus, whether this negatively affected the improvement in VA in amblyopic eyes at the second visit is unknown. Teleconsultations provided by the ophthalmic practitioners were not noted in the patients' records. Thus, they could be assumed to be appointments missed by the patients.

Moreover, visual outcomes, which have been studied in this present study, were not conclusive as VA alone is not the only dysfunctional issue in amblyopia to present outcome measures in its treatment where other factors should be included in future studies.

Conclusions

The findings showed no significant difference in VA in amblyopic eyes between the first and second visits (before and after the COVID-19 curfew), although VA was clinically improved. Advice and recommendations to the parents/caregivers of amblyopic children can help to encourage compliance during a pandemic or similar circumstances.

Author contributions

Conceptualization and experimental design: K.A.B. and F.R.M; experimental work and data collection: K.A.H.; data analysis: K.A.B. K.A.H., and G.A.H.; writing—original draft preparation: K.A.B., K.A.H., and F.R.M; writing—review and editing: K.A.B., K.A.H., and F.R.M; All authors have read and agreed to the published version of the manuscript.

Data availability statement

The data are contained within the article.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval

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Informed consent

All parents/caregivers of the children gave their written informed consent for inclusion before their children participated in the study.

Trial registration

Not applicable.

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