Refractive Criteria for Referral to a Public Danish Myopia Clinic

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Abstract

The purpose of this study was to evaluate age-specific cycloplegic spherical equivalent refraction (cSEQ) referral criteria for identifying children at risk of becoming highly myopic according to European age- and sex-specific nomograms. Further, to assess axial length (AL) progression without treatment during an observational period.

The Myopia Clinic, University Hospital of Southern Denmark, Vejle had by April 2021 introduced the following referral criteria: cSEQ at least -2 dioptres (D) for children aged 5–9 years and cSEQ at least -4D for children aged 10–12 years. We conducted a prospective observational study using these criteria and the risk of becoming highly myopic was assessed by age and sex-specific AL nomograms based on northern European cohorts. Children with an AL ≥ the 95th percentile were identified and the those fulfilling the inclusion criteria were assessed. Additionally, eye growth of ≥ 0.05 mm during an observation period was registered.

One-hundred and thirty-two children were eligible (mean observation period 200 ± 60.4 days). Ninety-six fulfilled the referral criteria (fulfilled group, 43 boys [45%], median age 9.11 years) and 36 did not (unfulfilled group, 15 boys [42%], median age 10.37 years). A significantly greater proportion of the children in the fulfilled group had an AL ≥ the 95th percentile (79% versus 61%, $p = 0.035$, χ^2). During the observation period, 94% and 88% of children progressed ≥ 0.05 mm per 6 months in the fulfilled and unfulfilled groups, respectively. Refractive error at the time of referral was not a predictor for AL growth in either group ($p = 0.67$ fulfilled, $p = 0.34$ unfulfilled).

The referral criteria improved the detection rate for identifying children at risk of high myopia defined as an AL ≥ the 95th percentile on the nomograms. However, more than half of patients with unfulfilled referral criteria were also at risk of high myopia according to the nomograms. The AL progressed for most children during the observation period.

Keywords: myopia, referral criteria, risk, high myopia, myopic progression

Introduction

In Denmark, the prevalence of myopia was 25% in 16- to 17-year-olds in a cohort study (Hansen et al., 2020). Myopia has been defined as a spherical equivalent refractive error ≤ 0.5 dioptres (D), when ocular accommodation is relaxed (Flitcroft et al., 2019). Myopia may lead to sight-threatening complications (Tideman et al., 2016) such as retinal detachment and myopic maculopathy (Haarman et al., 2020). The risk of rhegmatogenous retinal detachment has increased significantly in Denmark during the period 2006 to 2021 (Nilsen et al., 2023), whereas the prevalence in Denmark of myopic maculopathy is unknown. However, in a sample of 9980 Scandinavian adults, myopic maculopathy accounted for 7.7% of the visually impaired persons (Buch et al., 2004).

The excessive axial elongation, which is a key factor for myopia progression, may be reduced by several treatment modalities (Lawrenson et al., 2025; Schmidt et al., 2025), but so far there has been no internationally accepted consensus of whom to treat.

Situated in a public Danish hospital, we have encountered the need for myopia control in myopic children at risk of becoming highly myopic. To benefit from myopia control modalities, there must be an active axial length (AL) progression. Hence, we had to address the following two considerations: 1) how to perform risk assessment, and 2) how to define active progression.

Cycloplegic refraction-based curves have been suggested as a tool to predict high myopia. Chen and colleagues (Y. Chen et al., 2016) showed high sensitivity and specificity in predicting high myopia from cycloplegic refraction values. While their results are promising, they are based on a Chinese population, hence the comparability to a Danish population is uncertain. Age and sex-specific nomograms for AL based on 12,386 participants from three European cohort studies (two Dutch and one British) has been developed by Tideman et al. (2018). The three cohort studies contributed with different age groups to develop a risk assessment tool for children of different ages based on their AL. Although not validated in longitudinal studies, these nomograms seem to be the best alternative for risk assessment in Danish children. For example, children with an age- and sex-specific AL at the 95th percentile have an estimated 16 percent risk of developing high myopia.

Regarding active progression we had to consider possible seasonal variations (Gwiazda et al., 2014). Since it is questionable to consider axial growth "normal" in myopic children on or above the 95th percentile, we decided to define axial progression ≥ 0.05 mm during a 6-month period. This value was chosen to ensure that actual progression had emerged, taking the AL measurement repeatability of 0.025 mm (95% CI [0.021–0.030]) of a modern biometer in consideration (Garcia Ardoy et al., 2023).

The Danish health care system is organised in a primary and a secondary sector. The ophthalmological primary sector consists of practicing ophthalmologists, and the secondary sector consists of ophthalmic departments at hospitals. Since referral of a myopic child for treatment is managed by a practicing ophthalmologist, who may not have access to equipment for measuring AL, we had to develop referral criteria based on cycloplegic refraction. To avoid being overwhelmed by large numbers of myopic children, the following referral criteria were introduced in April 2021: For children aged 5–9 years cycloplegic spherical equivalent refraction (cSEQ) of at least -2D, and for children aged 10–12 years cSEQ of at least -4D. These referral criteria were not evidence-based but simply chosen based on an assumed balance between risk of high myopia and workload for the department. Since children had been

referred for treatment before and after the introduction of the referral criteria, we wanted to evaluate the effect of the criteria.

Hence, the purpose of this study was to evaluate the number of children who fulfilled the referral criteria and were on or above the 95th percentile on the nomograms compared to the children who did not fulfil the referral criteria. Further, to assess the degree of progression in AL between the first and second visit among children on or above the 95th percentile on the nomograms who did not immediately start treatment for myopia control.

Methods

Study design and subjects

In this prospective observational study, we included children aged 5–12 years with myopia who had been referred for myopia control to the Department of Ophthalmology, University Hospital of Southern Denmark, Vejle, Denmark. All referrals were made by ophthalmologists in the primary healthcare sector in the period April 2018 to May 2023. The last day of inclusion was May 12th, 2023.

Exclusion criteria included genetic disorders, incomplete data, and involvement in other research projects.

Data collection

For each child, the following parameters were extracted from the electronic patient journal system (EPJ Syd / Columna CIS, Aarhus, Denmark): date of birth, date of examination, sex, cycloplegic autorefraction, and AL.

Cycloplegic refractive error was assessed by the referring ophthalmologist or was measured at the first visit at the hospital clinic. In the hospital clinic, cycloplegia was achieved by administering one drop of Cyclopentolate 1% twice with an interval of five minutes, and subsequently performing autorefraction using the NIDEK TONOREF III autorefractor (NIDEK CO. LTD., Gamagori, Japan). We were not able to track if the same procedure was used by the referring ophthalmologist. cSEQ was calculated as the spherical power plus half the cylindrical power.

AL was measured without cycloplegia using the biometer IOLMaster 700 (Carl Zeiss Meditec AG, Jena, Germany). The risk of high myopia was assessed for each child using age and sex-specific nomograms for AL (Tideman et al., 2018). Children with ALs on or above the 95th percentile were offered a clinical care pathway at the department.

The children were categorised into two groups: i) those fulfilling the referral criteria (cSEQ of at least -2D for children aged 5–9 years, and cSEQ of at least -4D for children aged 10–12 years) (fulfilled group), and ii) those with lesser age-specific myopic refractive error (unfulfilled group).

For children not receiving immediate myopia control treatment, we recorded time to follow-up examination and renewed AL measurement. The individual change in AL during this period was recorded, and both monthly and yearly changes were calculated (monthly change = AL change during the follow-up period without treatment / 30 days, half-yearly = monthly change×6, and yearly = monthly change×12).

Power calculation

Since this is the first study of its kind, no a priori sample-size calculations could be made. However, based on the data of the study post-hoc power calculations were made. Regarding the analysis on the proportion of fulfilled versus unfulfilled at or above the 95th percentiles of the age- and sex-specific nomograms and given a power of 80% and alpha 0.05, 112 participants were needed. Regarding the analysis of difference in AL progression per month between the fulfilled and unfulfilled groups, 24 participants was required to show a difference of 0.029 mm monthly (SD = 0.025) using a power of 90%, and alpha 0.05.

Statistics

Normality was assessed using the Shapiro Wilks test with STATA 18: BE (Statacorp, Lakeview Drive, USA). Normally distributed data are presented as mean ± *SD*, and non-normally distributed data as median and ranges. *p*-values for baseline characteristics were calculated with the Wilcoxon rank-sum test in STATA 18: BE.

We used multiple linear regressions with ordinary least squares to identify predictors for AL growth per month in the two patient groups. The programming language Python version 3.11.4 (Python Software Foundation, Wilmington, USA) or Sigmaplot (version 14.0, Systat Software Inc., San Jose, California) was used for the calculations.

A *p*-value of < 0.05 was considered statistically significant. Only data from the right eye were used in this study.

Results

Of the 249 patients identified for the study with the ICD-10 diagnosis myopia, 132 were included in this study. Study flow and reasons for exclusion are shown in Figure 1. Baseline characteristics of the 132 children eligible for data analysis are presented in Table 1.

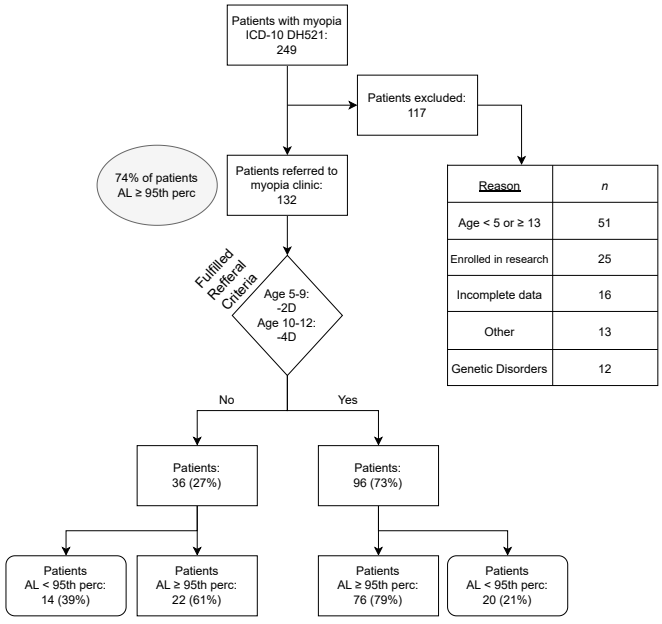

Figure 1: *Flowchart depicting the selection process and results of this study. AL = axial length.*

Table 1: *Baseline characteristics of children who fulfilled the cycloplegic refraction (cSEQ) referral criteria (Fulfilled group) versus those who did not (Unfulfilled group).*

Baseline characteristics	Fulfilled (n = 96)	Unfulfilled (n = 36)	p-value
Boys, n (%)	43 (45%)	15 (42%)	
Age, years	9.11 (5.20 to 12.78)	10.37 (5.30 to 12.84)	0.02
cSEQ, D	-3.50 (-11.75 to -1.50)	-1.75 (-3.75 to -0.75)	< 0.01
Baseline AL, mm	24.75 (22.69 to 28.45)	24.35 (22.3 to 26.56) *	0.06

Note: Data are median (range) unless otherwise indicated. * Is normally distributed (24.35 ± 0.96). Data from right eye only. AL = axial length, cSEQ = cycloplegic spherical equivalent refractive error.

Ninety-six children fulfilled the cSEQ referral criteria (fulfilled group). Of these 76 (79%) had an AL on or above the 95th percentile according to the age and sex-specific growth charts. The 20 children (21%), who were below the 95th percentile, were referred back to their practicing ophthalmologist. Forty-nine children (64%) were observed without treatment with a mean observation period of 200 days (SD = 60.4, range 84–471 days). The mean AL growth during this period was 0.19 mm (SD = 0.11, range 0.02–0.58 mm). In order to assess the proportion of children with an estimated AL progression ≥ 0.05 mm per 6 months, the average monthly progression was calculated and multiplied by 6. Using this estimate, 46 of the children, equivalent to 96%, had an estimated AL progression ≥ 0.05 mm per 6 months.

Of the 36 children who did not fulfil the cSEQ referral criteria (unfulfilled group), 22 (61%) had an AL on or above the 95th percentile on the age and sex-specific growth chart.

Sixteen of the 22 children (73%) were observed without treatment with a mean observation period of 224 days (SD = 59.5, range 168–383 days). The mean AL growth during this period was 0.20 mm (SD = 0.15, range 0.00–0.55 mm), and 14 children (88%) progressed ≥ 0.05 mm per 6 months. Progression was assessed by calculating the monthly AL growth for each patient and extrapolating this growth for 6 months

The yearly estimated growth in AL for all children (both groups included) were 0.39 mm and 0.28 mm for children aged 5–8 years and 9–12 years, respectively.

Comparisons between fulfilled and unfulfilled groups

The proportion of children with AL on or above the 95th percentile was significantly larger in the fulfilled group compared to the unfulfilled group (χ^2, p = 0.035, 95% confidence interval CI [3.97–4.91]).

A multi linear regression was conducted to examine the association between group status (fulfilled vs. unfulfilled) and monthly estimated AL progression, adjusted for age as a possible confounder. The regression model showed that age was not significantly associated with axial progression, and the difference between groups was not statistically significant after adjusting for age (p = 0.31). Mean AL progression per month was 0.029 mm (SD = 0.017) for the fulfilled group versus 0.029 mm (SD = 0.025) for the unfulfilled group.

In the fulfilled group, age at baseline was the only significant predictor for AL growth (p = 0.03, multiple linear regression) (Please see Figure 2). Neither cSEQ (p = 0.67) nor baseline AL (p = 0.11) was a significant predictor of AL growth. In the unfulfilled group, we found no significant correlations between AL growth and age, cSEQ, or baseline AL.

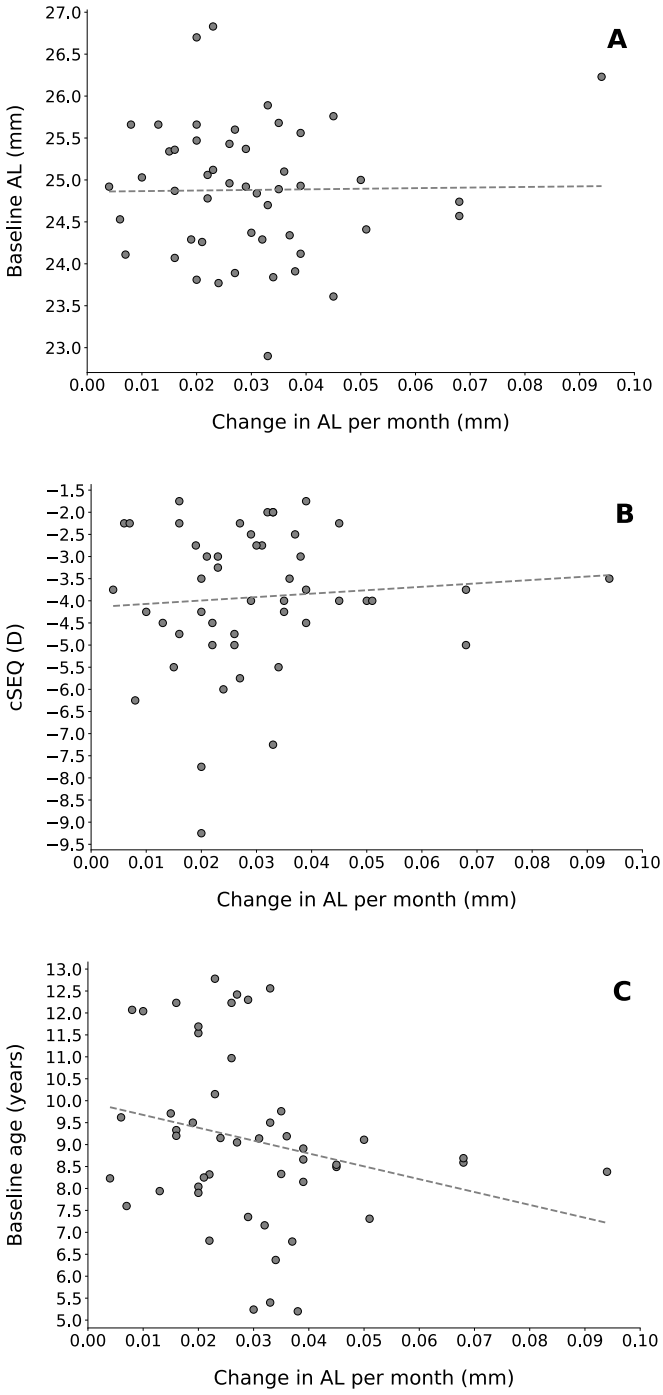

Figure 2: *The graphs show the correlation between A) baseline axial length (AL), B) cycloplegic spherical equivalent refraction (cSEQ), and C) age and monthly change AL for patients fulfilling the cycloplegic refraction referral criteria. Data from right eye only. Age at baseline was statistically associated with AL progression (multiple linear regression, p = 0.03).*

Table 2 shows participant characteristics according to age groups 5 to 8 years and 9 to 12 years, respectively, for the 65 referred children who were ≥ the 95th percentile of the nomograms and were followed without treatment during the observation period. AL growth for each age group per year was calculated from

the estimated AL growth per month for each child. There was a recurring tendency, that younger children had faster AL progression. Table 3 shows data for the same children for the fulfilled and the unfulfilled groups.

Table 2: *Characteristics of 65 referred children who were followed without treatment during the observation period, stratified by age group.*

	Patient age (years)	
	≥ 5 to < 9 (*n* = 29)	≥ 9 to ≤ 12 (*n* = 36)
Baseline age, years	7.94 (5.2 to 8.92)	10.72 (9.03 to 12.78)
Baseline AL, mm	24.57 ± 0.72	25.13 ± 0.72
ΔAL/year, mm	0.39 (0.05 to 1.13)	0.28 (0 to 1.04) *

Note: Axial length growth (ΔAL) for each age group per year was calculated from the estimated AL growth per month for each child. Data are median (range) or mean ± standard deviation. * $p = 0.04$. High myopia corresponds to an axial length of 26.5 mm (Flitcroft et al., 2019).

Table 3: *Characteristics of the same non-treated patients as in Table 2, now grouped according to whether they fulfilled the referral criteria (Fulfilled group) or not (Unfulfilled group).*

Baseline characteristics	Fulfilled (*n* = 49)	Unfulfilled (*n* = 16)	*p*-value
Boys, *n*	22 (45%)	7 (44%)	0.94
Age, years	8.91 (5.20 to 12.78)	9.82 ± 1.96	0.15
cSEQ, D	-3.75 (-9.25 to -1.75)	-2.13 ± 0.86	< 0.01
Baseline AL, mm	24.88 ± 0.80	24.88 ± 0.69	0.10
Est. ΔAL/year, mm	0.33 (0.05 to 1.13)	0.29 (0.00 to 1.04)	0.47

Note: Data are median (range) or mean ± standard deviation. Data from right eye only. AL = axial length, ΔAL = axial length growth, cSEQ = cycloplegic spherical equivalent refractive error.

Discussion

In this prospective observational study on "real life data" of children referred for myopia control, we found that 79% of those fulfilling the referral criteria (cSEQ -2D for children aged 5–9 years and cSEQ -4D for children aged 10–12 years) had ALs on or above the 95th percentile of the chosen nomograms. While this was significantly more than in the group who did not fulfil the cSEQ referral criteria, we found it surprising that 61% of the children in the unfulfilled group had an AL at or above the 95th percentile. This indicates that the referral criteria for the myopia clinic are not identifying all children at risk of developing high myopia. Since no power calculation a priori was made to justify this statement, it should be interpreted with caution. A post-hoc sample-size was performed to contextualise the finding. It showed that a total of 112 participants in the fulfilled and unfulfilled groups were needed, indicating that the result from the 132 participants in the current study may be clinically meaningful.

Most of the children in the current study showed AL progression during the observation period, which is in line with other studies. In a study with 8,546 myopic children, Chen et al. found that only 7.06% were non-progressive myopes (J. Chen et al., 2023). In a Danish randomised study on myopia control using orthokeratology lenses (Jakobsen & Møller, 2022), the control group using single vision spectacles showed variation in AL progression. About 10% of children in the control group progressed < 0.2 mm in 18 months which was defined as no or emmetropic progression. However, 22% progressed > 0.62 mm in 18 months, which was defined as fast progression. Accordingly, in our experience, using an observation period may support the decision on whether to treat or not. It also qualifies which treatment to select, since treatment efficacy differs between treatment modalities. This has recently been shown in a systematic review with network meta-analysis (Schmidt et al., 2025). On the other hand, by using an observation period we deliberately allow the children's eyes to grow for 6 months despite the increasing risk of sight-threatening conditions. Thus, some colleagues argue for immediate intervention, especially in young children (Bullimore & Brennan, 2023).

Another challenge lies in our referral criteria, which are already less restrictive than in one myopia clinic in the Netherlands (Polling et al., 2020). They include children aged 10 and younger with -2.5 D, or -5.0 D for 11-year-olds and older. Still, our criteria did not identify all children at risk of developing high myopia.

The increase in AL per month was not significantly different between the fulfilled and unfulfilled groups. However, this finding should be interpreted with caution, since the study may have been underpowered. To contextualise the result, a post hoc sample size calculation was performed, indicating that 24 participants would have been sufficient to detect a possible difference in AL per month with adequate power. Since 65 participants were included our study was likely adequately powered.

We found an estimated yearly growth in AL of 0.39 mm for children aged 5–8 years and 0.28 mm for children aged 9–12 years. In comparison, Tideman et al. (2018) found a yearly AL increase of 0.34 mm over the 3-year follow-up period of the 6-year-old myopic children, resulting in a mean AL of 23.98 mm at the age of 9 years (Tideman et al., 2018). Since AL increases at a steeper rate with increasing baseline AL (Tideman et al., 2018), it would be expected that the AL yearly growth would be greater in the Danish children, since AL in our youngest group was 24.75 mm at baseline.

Seasonal variation in AL growth has been described (Nilsen et al., 2023) in the form of slower ocular growth in summer and autumn. However, we were unable to account for seasonal variability due to varying observation periods. As the children in this study were consecutively referred over a 5-year period, and mean progression rates rather than individual rates were analysed, the influence of seasonal variation on the results is likely minimal.

A recent meta-analysis showed that annual AL declined by 15% in both Asian and non-Asian children with low to moderate myopia (Brennan et al., 2024). Applying a similar annual decline in AL progression for the children in the current study would suggest a need for treatment. The oldest age group, with a mean yearly AL progression of 0.28 mm at age 10.7 years, as shown in Table 2, would be expected to reach an AL of 26.5 mm by age 17.9 years if left untreated. This estimate is based on a model assuming a 15% yearly (n) reduction in progression, expressed as: $gn = 0.28 \times (0.85)^n$. For the youngest group, with a mean progression of 0.39 mm at age 7.9 years, the same AL threshold would be reached even earlier, by age 16.3 years, under the same model assumptions. This is concerning, as Tideman et al. (2016) showed that an AL of approximately 26.5 mm correlates to high myopia.

High myopia was defined as SEQ ≤ –6.00 D (Flitcroft et al., 2019). Further, AL ≥ 26 mm has been shown to be correlated with a considerable increase in the risk of visual impairment in adults (Tideman et al., 2016). The risk of myopic macular degeneration has been shown to increase from an odds ratio of 14 in adults with low myopia (defined as SEQ < –0.5 to > –3.0 D) to an odds ratio of 845 in adults with high myopia (defined as SEQ ≤ –6.00 D) compared to non-myopic people (Haarman et al., 2020; Tideman et al., 2016). Tideman and colleagues found the lowest risk of visual impairment in people with AL < 24 mm and AL between 24 and 26 mm (Tideman et al., 2016). While there is no "safe" level of low-degree myopia, the same study showed a similar risk of visual impairment in low to moderate myopes and non-myopic individuals. In a public health care system, therefore, it is most relevant to focus on treating myopic children at risk of high myopia. However, it is important to note that we do not know whether an individual child will remain on the initial AL percentile over time, as growth trajectories may vary between individuals. This is a limitation when using growth charts for individual risk assessment for high myopia.

Our findings highlight two important tasks for the future. First, the referral criteria must be optimised in order to achieve higher specificity and sensitivity between referral criteria and age-specific ALs on or above the 95th percentile. The 61% of children in the unfulfilled group who had an AL on or above the 95th percentile may be an overestimation with regards to the general public, since referral may be selected according to previous progression rates or family history, information we did not have access to. Nevertheless, this study raises concerns about under-referral of children with the current referral criteria. Hence, children who could benefit from myopia control are excluded from evaluation by the current criteria, emphasising the need for optimised referral criteria — work that is currently ongoing in our department. Second, the currently used observation period postpones treatment for all children referred to the clinic. Thus, we need to implement a new system that can identify children at greatest risk of high myopia and allow them to start treatment immediately. Since age was significantly associated with axial progression, age may be important in the selection of patients with an immediate need for treatment. This point is supported by a recent systematic review and meta-analysis on myopic children showing similar results, i.e., that younger children are progressing at a faster rate of approximately 0.4 mm at the age of 8 years, declining to approximately 0.18 mm at the age of 15 (Brennan et al., 2024).

A limitation of the study is the extrapolated progression rates from monthly to 6- and 12-month periods. Since the AL repeatability of a modern biometer is approximately 0.025 mm (95% CI [0.021–0.03]) (Garcia Ardoy et al., 2023) both over- and underestimating axial growth in this magnitude may have biased our results, especially for short follow-up periods.

In conclusion, the current referral criteria at our myopia clinic have enhanced the detection of children at risk of developing high myopia according to the AL ≥ 95th percentile of nomograms. However, over half of the children not fulfilling the referral criteria were also at risk of developing high myopia, hence optimised referral criteria are needed.

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Refraktive kriterier for henvisning til en offentlig dansk myopiklinikk

Sammendrag

Formålet med denne studien var å evaluere aldersspesifikke henvisningskriterier for cykloplegisk sfærisk ekvivalent refraksjon (cSEQ) for å identifisere barn med risiko for høygradig myopi i henhold til europeiske alders- og kjønnsspesifikke nomogrammer. Videre å vurdere progresjon av aksial lengde (AL) uten behandling i løpet av en observasjonsperiode. Myopiklinikken ved Syddansk Universitetshospital, Vejle, hadde innen april 2021 innført følgende henvisningskriterier: cSEQ minst -2.0 dioptrier (D) for barn i alderen 5–9 år og cSEQ minst -4.0 D for barn i alderen 10–12 år. En prospektiv observasjonsstudie med disse kriteriene ble gjennomført, og risikoen for høygradig myopi ble vurdert ved hjelp av alders- og kjønnsspesifikke AL-nomogrammer basert på nordeuropeiske kohorter. Barn med en AL ≥ 95-persentilen ble identifisert, og de som oppfylte inklusjonskriteriene ble vurdert. I tillegg ble øyevekst på ≥ 0,05 mm i løpet av en observasjonsperiode registrert.

Til sammen ble 132 barn inkludert (gjennomsnittlig observasjonsperiode 200 ± 60,4 dager). Nittiseks oppfylte henvisningskriteriene (oppfylt gruppe, 43 gutter [45%], medianalder 9,11 år) og 36 gjorde det ikke (uoppfylt gruppe, 15 gutter [42%], medianalder 10,4 år). En betydelig større andel av barna i den oppfylte gruppen hadde AL ≥ 95-persentilen (79% versus 61%, $p = 0,035$, χ^2). I løpet av observasjonsperioden hadde 94% og 88% av barna en progresjon på ≥ 0,05 mm per seks måneder i den oppfylte versus den uoppfylte gruppen. Brytningsfeil på henvisningstidspunktet kunne ikke forutsi AL-vekst i noen av gruppene ($p = 0,67$ oppfylt, $p = 0,34$ uoppfylt).

Henvisningskriteriene forbedret identifikasjonsraten av barn med risiko for høygradig myopi definert som AL ≥ 95-persentilen på nomogrammene. Imidlertid hadde mer enn halvparten av barna som ikke oppfylte henvisningskriteriene også risiko for høygradig myopi i henhold til nomogrammene. AL økte for de fleste barna i løpet av observasjonsperioden.

Nøkkelord: myopi, henvisningskriterier, risiko, høy myopi, myopisk progresjon

Criteri refrattivi di invio a una clinica pubblica danese per la miopia

Riassunto

Lo scopo di questo studio era valutare criteri di invio basati sull'equivalente sferico cicloplegico (cSEQ) specifico per età, per identificare bambini a rischio di sviluppare miopia elevata secondo nomogrammi europei specifici per età e sesso. Inoltre, è stata valutata la progressione della lunghezza assiale (AL) in assenza di trattamento durante un periodo osservazionale.

La Myopia Clinic dell'University Hospital of Southern Denmark, a Vejle, nell'aprile 2021 aveva introdotto i seguenti criteri di invio: cSEQ di almeno -2 diottrie (D) nei bambini di età compresa tra 5 e 9 anni e cSEQ di almeno -4 D nei bambini di età compresa tra 10 e 12 anni. Abbiamo condotto uno studio osservazionale prospettico utilizzando questi criteri e il rischio di sviluppare miopia elevata è stato valutato mediante nomogrammi della lunghezza assiale specifici per età e sesso, basati su coorti del Nord Europa. Sono stati identificati i bambini con una lunghezza assiale ≥ al 95° percentile e sono stati valutati quelli che soddisfacevano i criteri di inclusione. Inoltre, una crescita oculare ≥ 0,05 mm durante il periodo di osservazione veniva registrata.

Centotrentadue bambini erano eleggibili (periodo medio di osservazione 200 ± 60,4 giorni). Novantasei soddisfacevano i criteri di invio (gruppo "fulfilled", 43 maschi [45%], età mediana 9,11 anni) e 36 non li soddisfacevano (gruppo "unfulfilled", 15 maschi [42%], età mediana 10,37 anni). Una proporzione significativamente maggiore di bambini nel gruppo che soddisfaceva i criteri presentava una lunghezza assiale ≥ al 95° percentile (79% contro 61%, $p = 0,035$, χ^2). Durante il periodo di osservazione, il 94% e l'88% dei bambini nei gruppi rispettivamente "fulfilled" e "unfulfilled" hanno mostrato una progressione ≥ 0,05 mm ogni 6 mesi. L'errore refrattivo al momento dell'invio non era un predittore della crescita della lunghezza assiale in nessuno dei due gruppi ($p = 0,67$ nel gruppo "fulfilled", $p = 0,34$ nel gruppo "unfulfilled").

I criteri di invio hanno migliorato il tasso di identificazione dei bambini a rischio di miopia elevata, definita come una lunghezza assiale ≥ al 95° percentile nei nomogrammi. Tuttavia, più della metà dei pazienti che non soddisfacevano i criteri di invio risultavano comunque a rischio di miopia elevata secondo i nomogrammi. La lunghezza assiale è aumentata nella maggior parte dei bambini durante il periodo di osservazione.

Parole chiave: miopia, criteri di invio, rischio, miopia elevata, progressione miopica