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Chinese parents' knowledge, attitude, and practice of myopia control: 2023 update

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Abstract

Background Our previous survey identified a lack of knowledge of myopia among Chinese parents. This research aims to update the characteristics of parents' knowledge, attitude, and practice in myopia control.

Methods A self-administered questionnaire was disseminated to parents of myopic children in 16 hospitals from 11 provinces in China. Comprehensive information regarding the knowledge, attitude, and practice in myopia of parents with myopic children was collected, with the underlying correlations being analyzed.

Results A total of 1266 valid questionnaires were collected. The concern over children's visual problems arose significantly earlier among myopic parents ($P < 0.001$). Axial length was recorded by 29.9% (378/1266) of the participants. Parents' primary goal of myopia control was "retarding the progression of myopia" (64.8%, 821/1266). The effectiveness of behavioral intervention was ranked first by 68.4% (866/1266) of the participants. Single-vision spectacles were the most adopted correction practice (26.1%, 331/1266). In terms of myopic interventions, 23.5% (297/1266) of the parents chose myopic control spectacles, followed by orthokeratology (20.9%, 264/1266); 37.3% (189/507) of the participants believed that the latter was more effective. Most parents (69.8%, 883/1266) expressed satisfaction with the current efficacy of myopia control.

Conclusion Insufficient awareness of myopia and myopia control was identified among parents of myopic children in China. Efforts should be made to enhance parents' knowledge, raise their awareness, and improve the accessibility and affordability of effective myopia control interventions.

Keywords Attitude, Knowledge, Practice, Myopia control, Survey

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Background

Children and adolescents worldwide are under the threat of myopia, especially in East Asia [1]. The prevalence of juvenile myopia in China is currently at a concerning rate of 53.6% [2], which is well above other countries or districts [3]. Myopia is more than an optical inconvenience. Even low levels of myopia increase a range of ocular disease risks including retinopathy, myopic maculopathy, cataracts, and glaucoma [4–7]. The incidence of visual impairments notably increases among patients with high myopia [5]. It was reported that myopic maculopathy is the leading cause of low vision or blindness among young and middle-aged adults in northern China [8].

The progression of myopia can scarcely be reversed after the onset. Hence, for myopic children and adolescents, the core of myopia management lies in retarding the progression to high myopia and thus reducing the risk of myopia-related complications [5]. Myopia control interventions can generally be classified into three categories: behavioral, optical, and pharmacological interventions [9]. Behavioral interventions, which mainly involve increasing outdoor time and reducing near-work, have been recognized as protective factors against myopia onset but have limited effects on slowing the progression of existing myopia [10–13]. On the other hand, various optical [14–17] and pharmacological [14, 18, 19] interventions have demonstrated their efficacy in myopia control, including peripheral defocus-modifying spectacles, orthokeratology, multifocal contact lenses, and low/high-concentration atropine. For myopic juveniles, parents play a decisive role in applying these interventions, and thus parents' awareness and attitude to myopia and myopia control greatly impact children's myopia progression [20].

Therefore, an investigation into the knowledge, attitude, and practice of myopia among parents with myopic children is highly necessary. Most of the previous studies regarding Chinese parents' knowledge and attitude to myopia were regional [21–24], and mainly focused on certain aspects [21, 25–27]. Our research team has conducted a nationwide cross-sectional study on parents' perspectives on myopia from 2021 to 2022, involving parents of both non-myopic and myopic children [28]. Building upon that basis, this national study specifically targets parents of myopic children, provides insights into their knowledge and attitude of myopia and myopia control interventions, and investigates the correlation between knowledge and practice. We also aim to provide a reference for eye care practitioners to promote parents' education and compliance.

Materials and methods

Study design

This prospective and cross-sectional study was conducted from February to June 2023 across 16 hospitals located in 11 provinces and municipalities in China. The study complied with the Declaration of Helsinki and was authorized by the Ethics Committee of the Fudan University Eye and ENT Hospital (No. 2023026). All participants signed the informed consent after the researchers' introduction of the study nature.

Questionnaire

This questionnaire was designed and optimized by experts in the field of myopia prevention and control based on the version used in our previous study [28]. High myopia is defined as a spherical equivalent refractive error of ≤ -6.0D and/or an axial length of ≥ 26.0 mm [29, 30]. The questionnaire contained 33 questions and was divided into 6 parts: basic information, children's refractive status, parents' knowledge about myopia, parents' concern about children's vision problems, parents' attitude and practices of myopic interventions, and parents' medical consultancy preference (see Additional file 1).

Participants, questionnaire distribution, and data collection

Participants should be parents of myopic children or adolescents aged between 3 to 16 years and were excluded with the following criteria: [1] does not engage in the child's daily life; [2] the participant or participant's spouse's profession is related to optometry, ophthalmology, or marketing in the medical field. Participants would receive remuneration after completing the survey, with their personal information kept strictly confidential. The questionnaire was administered online, and participants could access it by scanning a QR code placed at participating hospitals. Responses were automatically collected by the platform, with data subsequently screened manually by staff who were blinded to the study's purpose.

Statistical analyses

All statistical analyses were performed using SPSS version 26.0 (SPSS, Inc) with continuous variables presented as means ± standard deviations, and categorical variables as frequencies and percentages. The statistical significance of percentage differences was assessed using the $\chi 2$ or Fisher exact test. Multinomial logistics regression was used to reveal the correlation between parents' knowledge, attitude, and practice. The odds ratio (OR) in our study is a comparison of the odds of the outcome under certain factors with the odds of the outcome in a reference situation. A P value of < 0.05 was considered statistically significant, with all P values being two-sided.

Results

Basic demographics of participants

A total of 1266 valid questionnaires were collected in this study, with a qualified rate of 89.0% (1266/1423). The majority of participants were from first-tier cities (59.5%, 753/1,266) and the eastern region of China (72.4%, 916/1,266). Most of the participants (73.5%, 931/1266) were mothers. Children aged 3–6, 7–12, and 13–16 years old accounted for 13.1% (166/1266), 66.4% (841/1266), and 20.5% (259/1266), respectively. Regarding refractive status, 81.8% (1,035/1,266) of participants reported their children as having low myopia, 15.9% (201/1,266) reported moderate myopia, and 2.4% (30/1,266) reported high myopia. Of all the families, 25.2% (319/1266) of the families had one highly myopic parent and 4.7% (59/1266) had both parents with high myopia; the remaining families (70.1%, 888/1266) had no parent with high myopia. Detailed demographics are summarized in Additional file 2.

Parents' knowledge and attitude in myopia

Most participants (73.9%, 936/1266) thought that myopia might induce other ocular diseases, with fundus diseases being the most recognized (82.4%, 771/936), followed by strabismus (57.4%, 537/936; Fig. 1). A total of 48.5% (454/936) of the participants believed that any level of myopia can induce ocular complications while 47.2% (442/936) believed that only high myopia can induce complications. A respective 41.1% (520/1266), 44.2% (560/1266), 12.4% (157/1266), and 2.29% (29/1266) of the participants considered an annual refractive change of at least < 0.50D, 0.50-1.00D, 1.01-2.00D, and > 2.0D as fast myopic progression. Visual acuity results were recorded by most participants (72.0%, 911/1266), followed by manifest refraction (58.1%, 736/1266). Axial length was recorded by 29.9% (378/1266) of the participants, and according to the questionnaire, their children's myopic progression was significantly slower (OR = 0.65, 95%CI 0.50–0.85, $P = 0.002$).

Parents' initial concern regarding children's eyesight arose mainly during their 6–9 years of age (35.8%, 453/1266). For highly myopic parents, their concern arose notably earlier ($P < 0.001$; Fig. 2A) and the age at diagnosis was significantly younger (one: $P < 0.001$, both: $P = 0.028$; Fig. 2B). Family history was the main reason for concern among families with highly myopic parents (both: $P = 0.002$, one: $P < 0.001$; Fig. 2C). Concerns from non-highly myopic participants mainly attributed to abnormal school physical examination reports (28.7%, 255/888), self-reported blurred vision from children (27.7%, 246/888), and children's abnormal behavior observed by parents (25.5%, 226/888).

Parents' awareness, aim, and practice of myopia control

Most participants (68.4%, 866/1266) perceived behavioral intervention as the most effective; optical and pharmacological interventions were ranked first by 11.8% (149/1266) and 3.40% (43/1266) of the parents. Among participants who opted for myopia control spectacles or orthokeratology for their children, 37.3% (189/507) and 10.1% (51/507) believed that orthokeratology and myopia control spectacles were more effective, respectively; 16.6% (84/507) perceived both interventions to have similar effects, and 36.1% (183/507) of the parents were not sure. Nearly half (47.7%, 116/243) of the parents who applied myopia control spectacles expressed uncertainty about their efficacy. Most parents (62.4%, 131/210) who chose orthokeratology favored their choice.

Parents' primary goal of myopic control was "to retard the progression of myopia" (64.8%, 821/1266), followed by "to achieve a reduction in myopia" (56.6%, 717/1266) and "to reduce the risk of developing high myopia" (41.2%, 522/1266). Among parents who believed that myopia could lead to ocular pathologies, the majority aimed at "retarding the progression of myopia" (70.9%, 664/936, $P = 0.011$). "Reducing the risk of developing high myopia" was selected by notably higher proportions of parents who perceived the optical intervention as the most effective (56.4%, 84/149, $P = 0.007$) and parents of children with myopic progression of more than 1.0D in the past year (59.4%, 38/64, $P = 0.011$). Parents of highly myopic children primarily aimed at "reducing the risk of ocular complications" (66.7%, 20/30, $P = 0.018$) (Table 1).

Behavioral interventions including "increasing time spent outdoors" were adopted by most of the participants (85.8%, 1086/1266). Single-vision spectacles, myopic control spectacles, and orthokeratology were utilized by 26.1% (331/1266), 23.5% (297/1266), and 20.9% (264/1266) of the participants, respectively. A small portion of the parents (7.50%, 95/1266) used orthokeratology and atropine as combination therapy (Fig. 3).

Most of the parents were satisfied (32.5%, 411/1266) or relatively satisfied (37.3%, 472/1266) with the efficacy of their current myopia control strategy. Parents' satisfaction was mostly affected by children's myopic progression over the past year, with faster progression yielding lower satisfaction ($P < 0.001$). Parents with higher follow-up frequency ($P = 0.004$) and lower average annual expenditure ($P = 0.023$) expressed higher satisfaction (Fig. 4). No correlation was observed between the parents' satisfaction and the interventions currently or previously adopted ($P > 0.05$).

Parents' medical consultancy preference

Public hospitals were the first choice of medical consultancy for most parents (73.0%, 924/1266), and the frequency of follow-up visits was negatively correlated

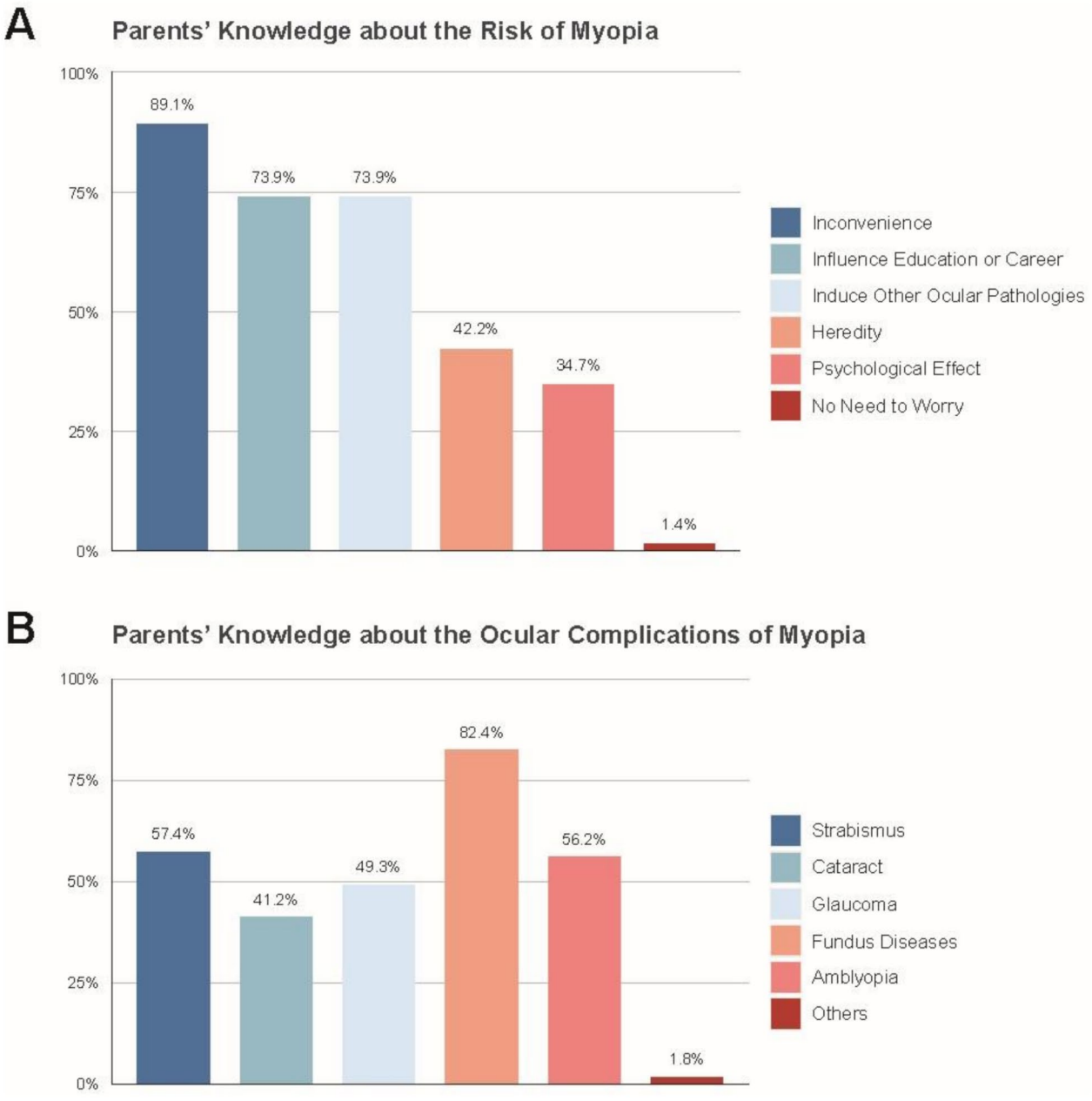

Fig. 1 Parents' knowledge about myopia. (**A**) Parents' knowledge about the risk of myopia. Total respondents: $n = 1266$. The number of respondents selecting each option: "Inconvenience" ($n = 1128$); "Influence on Education or Career" ($n = 936$); "Induces Other Ocular Pathologies" ($n = 936$); "Heredity" ($n = 534$); "Psychological Effect" ($n = 439$); "No Need to Worry" ($n = 18$). (**B**) Parents' knowledge about the ocular complications of myopia among parents who believed that myopia can induce other ocular pathologies. Total respondents: $n = 936$. The number of respondents selecting each option: "Strabismus" ($n = 537$); "Cataract" ($n = 386$); "Glaucoma" ($n = 461$); "Fundus Diseases" ($n = 771$); "Amblyopia" ($n = 526$); "Others" ($n = 17$)

with children's myopic progression in the previous year ($P < 0.001$). The primary source of myopia control-related knowledge for parents was medical settings (69.8%, 884/1266), followed by schools (56.4%, 714/1266) and multimedia (48.7%, 617/1266). The vast majority (99.1%, 1255/1266) of parents expected more relevant knowledge during consulting with doctors. In terms of content, "the causes and prevention of myopia" (75.9%, 953/1255) and "the selection and principle of prevention and myopic control methods" (72.9%, 915/1255) were of the greatest demand. The "oral explanation" (66.1%, 830/1255) and "demonstration involving physical models" (58.7%, 737/1255) were the most preferred teaching methods.

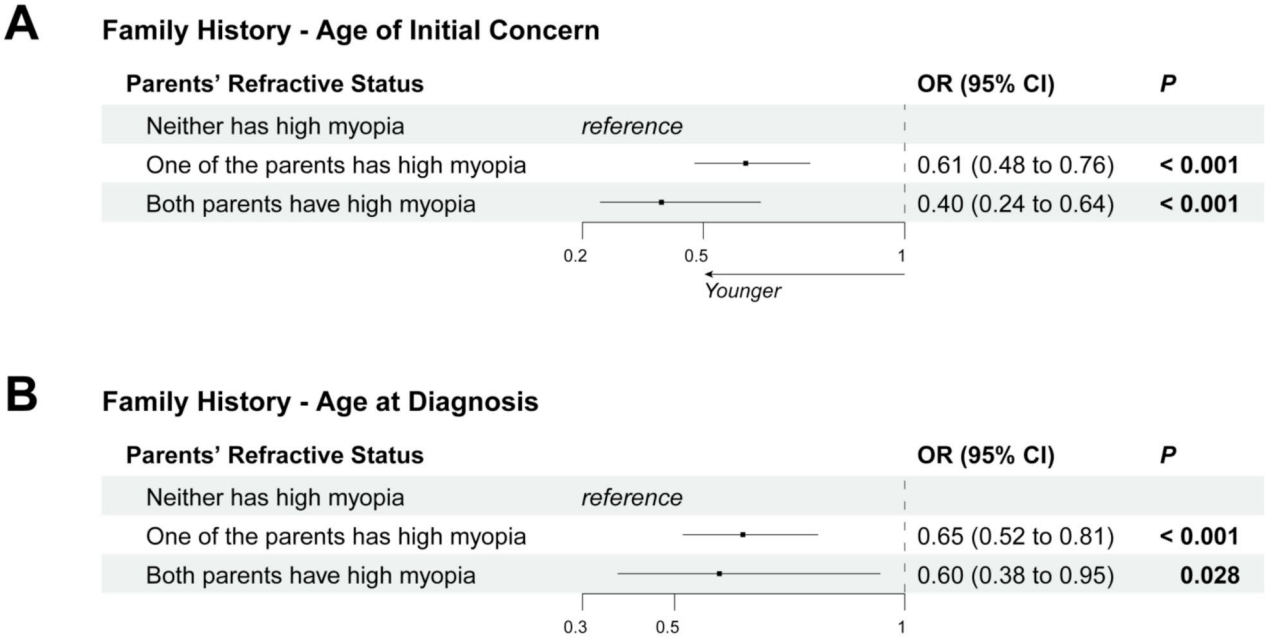

Fig. 2 The correlation between family history of myopia and parents' initial concern on children's visual problems (**A**), children's age at diagnosis (**B**) and the reason for concern (**C**). Multinomial logistics regression was used to analyze the correlation

Discussion

This study provides insights into parents' knowledge, attitude, and practice toward myopia control, with the correlation comprehensively analyzed. Insufficient awareness of myopia control among parents of myopic children was identified, particularly in the aspects of monitoring myopia progression, the efficacy of various myopia interventions, and proper aims for myopia control. On a national scale, single-vision spectacles remain the most used myopia correction modality. For control purposes, the myopic control spectacles have the highest adoption rate, yet most parents expressed a positive attitude towards orthokeratology.

To evaluate parents' knowledge of myopia, questions covering the risk of myopia, myopia progression, and eye examinations were administered. Nearly three-quarters of the participating parents believed that myopia can induce other ocular pathologies, exceeding the reported proportions of 55.1% [28] and 46% [20] in previous studies which included parents of both myopic and non-myopic children. This result indicates that parents of myopic children possessed a relatively augmented awareness of the ocular risk of myopia. Besides, nearly half of the parents considered that all levels of myopia can lead to ocular diseases, which was 20% more than our previous investigation [20]. However, except for fundus diseases, parents' awareness of other potential ocular pathologies induced by myopia was inadequate.

Regarding the biometrics to track myopic progression, 72.0% and 58.1% of the participants would record the results of visual acuity and manifest refraction of their children, whereas only 29.9% would record axial length. Since axial length is the preferred parameter for monitoring progression and evaluating the efficacy of interventions, along with its significant association with visual impairment [31–38], the concept and the importance of axial length should be more broadly disseminated among parents. Notably, children whose parents tracked their axial length showed significantly slower myopic progression. The plausible explanation is that parents who monitored axial length may have been more actively engaged in following their children's myopia progression, which could enhance compliance to myopia control strategies and facilitate timely adjustments to treatment plans. Additionally, 44.2% and 41.1% of the parents regarded rapid progression as an annual progression of at least 0.50D ~ 1.0D and < 0.5D, respectively, whereas fast myopia progressors are classified as children experiencing an annual progression of > 0.75D [17, 39, 40]. Based on the above findings, parents' education should be further enhanced, especially in the knowledge of potential myopia-related ocular complications and the monitoring of myopia progression.

The level of concern expressed by parents regarding their children's eyesight can reflect their understanding and attitude toward myopia [41]. Our study found that the concern arose notably earlier among highly myopic parents and was primarily driven by family history, indicating a better understanding of heredity among these parents. Additionally, their children were diagnosed with

Table 1 Parents' goals of myopic control

	Reduce the Myopic Degree	Retard the Progression of Myopia	Reduce the Risk of Developing High Myopia	Reduce the Risk of Ocular Complications	Clear Vision after Myopic Correction	*P*
Parents' Knowledge about the Risk of Myopia						
Myopia can Induce Other Ocular Pathologies ($n=936$)	516 (55.1%)	664 (70.9%)	443 (47.3%)	395 (42.2%)	114 (12.2%)	0.011[a]
Myopia cannot Induce Other Ocular Pathologies ($n=330$)	201 (60.9%)	157 (47.6%)	79 (23.9%)	53 (16.1%)	38 (11.5%)	
Intervention Considered Most Effective						
Behavioral ($n=866$)	501 (57.9%)	554 (64.0%)	345 (39.8%)	291 (33.6%)	94 (10.9%)	0.007[b]
Optical ($n=149$)	61 (40.9%)	121 (81.2%)	84 (56.4%)	73 (49.0%)	18 (12.1%)	
Pharmacological ($n=43$)	27 (62.8%)	32 (74.4%)	13 (30.2%)	10 (23.3%)	4 (9.3%)	
Uncertain ($n=208$)	128 (61.5%)	114 (54.8%)	80 (38.5%)	74 (35.6%)	36 (17.3%)	
Children's Myopic Progression of Last Year						
<0.5D ($n=611$)	362 (59.2%)	397 (65.0%)	229 (37.5%)	205 (33.6%)	70 (11.5%)	0.011[c]
0.5D – 1.0D ($n=337$)	149 (44.2%)	261 (77.4%)	167 (49.6%)	138 (40.9%)	24 (7.1%)	
>1.0D ($n=64$)	36 (56.3%)	46 (71.9%)	38 (59.4%)	28 (43.8%)	10 (15.6%)	
Uncertain ($n=254$)	170 (66.9%)	117 (46.1%)	88 (34.6%)	77 (30.3%)	48 (18.9%)	
Children's Refractive Status						
Low Myopia ($n=1035$)	611 (59.0%)	652 (63.0%)	410 (39.6%)	341 (32.9%)	119 (11.5%)	0.018[d]
Moderate Myopia ($n=201$)	90 (44.8%)	145 (72.1%)	102 (50.7%)	87 (43.3%)	27 (13.4%)	
High Myopia ($n=30$)	16 (53.3%)	24 (80.0%)	10 (33.3%)	20 (66.7%)	6 (20.0%)	

* Chi-squared or Fisher exact test was used to analysis frequency data

[a] Comparison of the aim proportion between parents holding opposite opinions on the risk of myopia

[b] Comparison of the aim proportion among parents with different perceived effectiveness of myopic interventions

[c] Comparison of the aim proportion among parents of children with different levels of myopic progression in the previous year

[d] Comparison of the aim proportion among parents of low, moderately, and highly myopic children

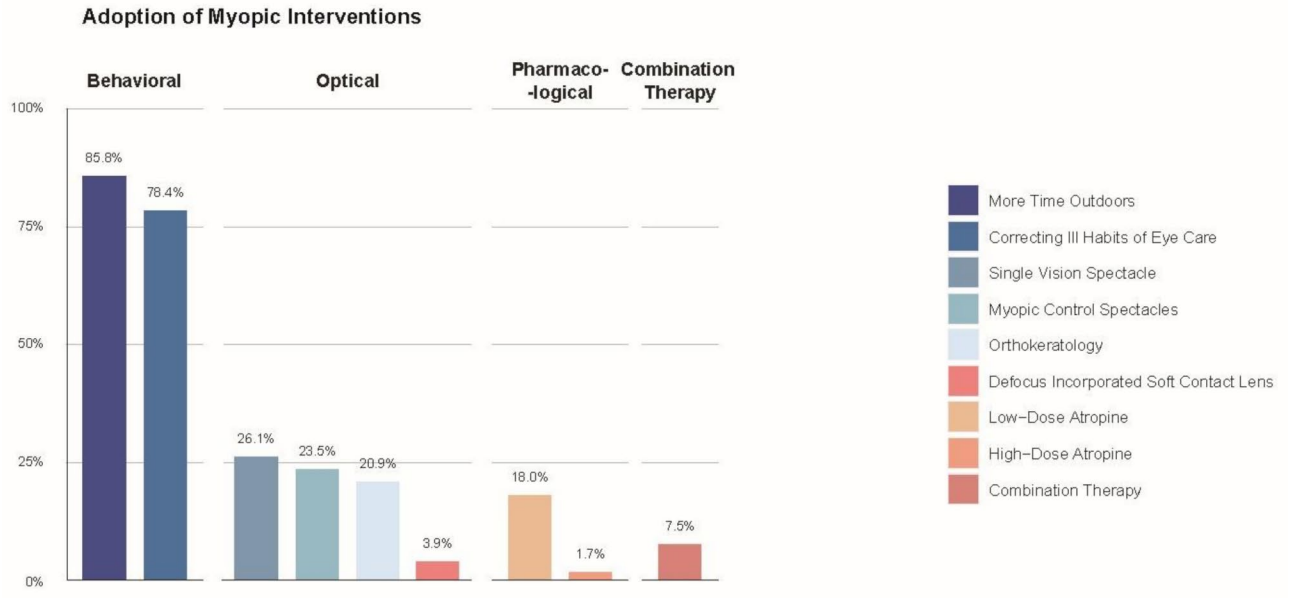

Fig. 3 The adoption rate of myopic interventions. Total respondents: $n = 1266$. The number of respondents selecting each option: "More Time Outdoors" ($n = 1086$); "Correcting Ill Habits of Eye Care" ($n = 993$); "Single Vision Spectacle" ($n = 331$); "Myopic Control Spectacles" ($n = 297$); "Orthokeratology" ($n = 264$); "Defocus Incorporated Soft Contact Lens" ($n = 50$); "Low – Dose Atropine" ($n = 228$); "High – Dose Atropine" ($n = 22$); "Combination Therapy" ($n = 95$)

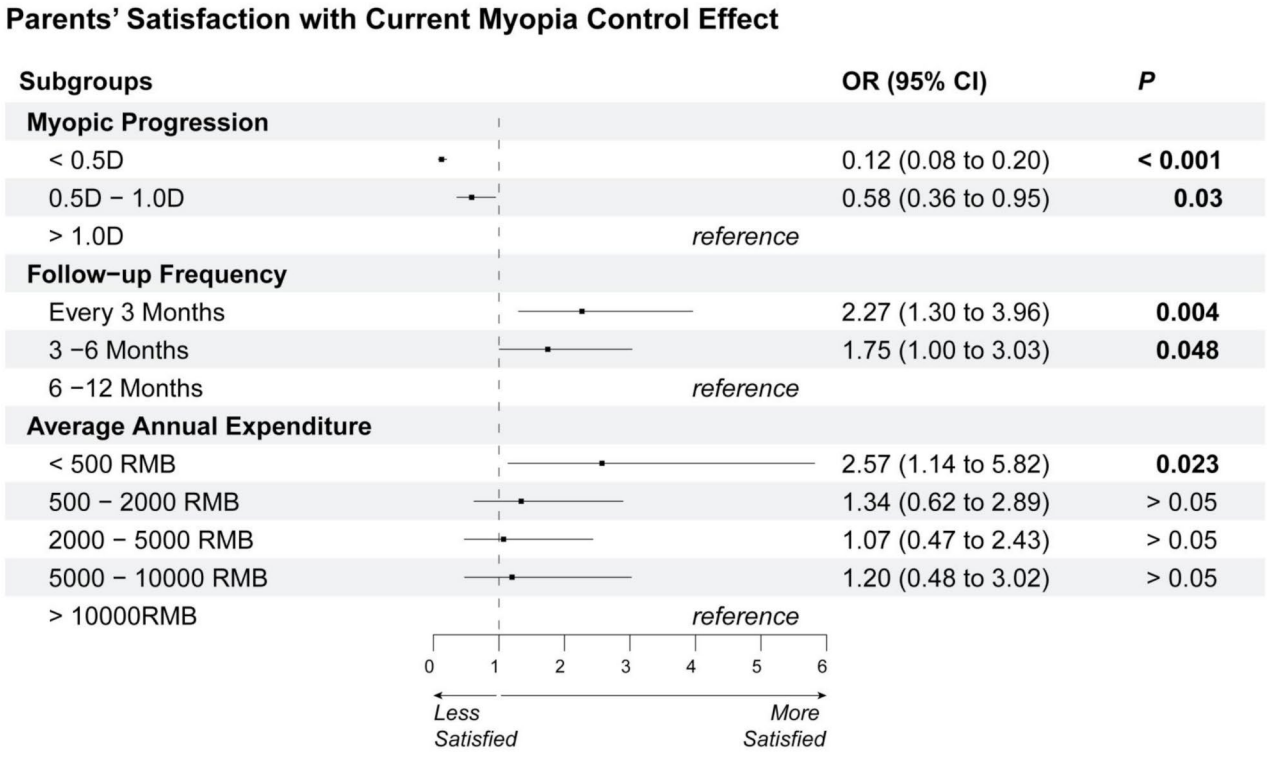

Fig. 4 The correlation between parents' satisfaction with current myopia control effect and children's myopic progression, follow-up frequency and the average annual expenditure. Multinomial logistics regression was used to analyze the correlation

myopia at a significantly younger age. Despite the proven earlier myopic onset of children with myopic parents [42, 43], this finding further underscores the importance of parental awareness in early detection and diagnosis of myopia. However, for most parents in our study, concerns were raised due to abnormal refractive screening results, changes in children's behavior, and self-reported blurry vision from children. Therefore, early and voluntary parental awareness should be emphasized in education on myopia.

In terms of anticipation for myopia treatment, most parents were reasonable, and parents of highly myopic children mainly set their goal of reducing the risk of complications. However, over half of the parents still wished for a reduction in myopic diopters, with no significance observed in different city tiers, educational backgrounds, or children's refractive status, suggesting a general misconception among Chinese parents. Hence, practitioners should help establish appropriate expectations from parents so as to improve the implementation and compliance of myopia interventions.

Concerning parents' knowledge toward myopia intervention, the perceived efficacy of behavioral interventions was ranked first, which was in line with the study of Yang et al. [44]. In consistency, the adoption of behavioral interventions including spending more time outdoors and correcting ill visual habits of near work ranked much higher than the other interventions. Single-vision spectacles were the most used correction modality, which was consistent with domestic and overseas studies [23, 28, 45]. The accessibility, availability, and affordability may account for the high adoption rate of behavioral interventions and single-vision spectacles. However, behavioral interventions were proven to exert a marginal effect to retard myopia progression in already myopic children [10–14, 46]. Therefore, the efficacy of various myopia interventions should be comprehensively explained to parents for proper application.

As for the practice of myopia interventions, the proportion of parents opting for myopic control spectacles was slightly higher than that of orthokeratology, being similar to the other surveys [23, 41, 44]. Lower expense and greater convenience may be the main reasons for the relatively higher implementation of myopia control spectacles in China [45]. According to our study, the reported average annual cost of myopia control spectacles mostly fell within the range of 500–2000 RMB compared with > 10,000 RMB in orthokeratology. Additionally, children wearing orthokeratology contact lenses should comply with the relatively rigorous lens wear and care procedures [47], and parents were reported to prefer delaying the utilization of orthokeratology for safety concerns [26]. However, it should be noted that orthokeratology was deemed to have the highest myopia control efficacy in Asian practitioners [45, 48, 49]. Being consistent, high efficacy was the primary reason for parents to choose orthokeratology in our study, which was in accordance with previous studies in China [27, 50]. Moreover, a recent study revealed that orthokeratology was the preferred option among Chinese parents who chose single-vision spectacles [23]. While a comprehensive meta-analysis has doubted the efficacy of optical interventions [51], the results of our study indicated that most parents of myopic children hold a positive attitude towards orthokeratology.

The current study also questioned parents on their satisfaction with the current myopia control effect and analyzed the relevant factors. The majority of the parents responded with positive feedback. Their level of satisfaction was positively correlated with the frequency of follow-up visits, whereas negatively correlated with the level of children's myopic progression. This finding, along with the reported negative correlation between myopic progression and the frequency of follow-up [52], highlights the importance of setting regular follow-up plans for children. Additionally, although an average annual cost of below 500 RMB was correlated with higher parental satisfaction, no correlation was observed between the cost and satisfaction rate among the rest of the parents who spent over 500 RMB per year, suggesting that most of the parents were not price-sensitive and mainly concerned with the outcome of myopia interventions.

There are limitations in this study. First, children's refractive status and the implementation of myopia interventions were solely based on parents' reports, without verification from children's medical records. Second, this survey was conducted only in hospitals and eye clinics, among parents with the intention of seeking professional advice. Therefore, the results are subject to selection bias and may not exactly represent real-world community-based situations.

Conclusion

In conclusion, insufficient awareness of myopia and myopia control was identified among parents of myopic children in China. Efforts should be made to enhance parents' knowledge, raise their awareness, and improve the accessibility and affordability of effective myopia control interventions.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-22003-z.

Supplementary Material 1

Supplementary Material 2

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Author contributions
Biyun Zhan: Conception and design; Data analysis and interpretation; Drafting of the manuscript; Critical revision of the manuscript. Yangyi Huang: Conception and design; Data analysis and interpretation; Drafting of the manuscript; Critical revision of the manuscript. Bingjie Wang: Critical revision of the manuscript. Jing Zhao: Data collection. Jianmin Shang: Data collection. Zhi Chen: Conception and design; Data collection; Data analysis and interpretation; Drafting of the manuscript; Critical revision of the manuscript. Xingtao Zhou: Administrative support; Supervision. All authors read and approved the final manuscript.

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Data availability
The data sets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study complied with the Declaration of Helsinki and was authorized by the Ethics Committee of the Fudan University Eye and ENT Hospital (No. 2023026).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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