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Original article

Anterior segment configuration and retinal nerve fiber layer analysis post pediatric cataract surgery: A systematic review

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Abstract. *Background and aim:* Cataracts are the leading cause of visual impairment and blindness worldwide. Most children with cataracts require surgery, and only a few can be treated conservatively. Cataract surgery in pediatric patients presents distinct challenges and potential complications that differ from those encountered within the adult demographic. The surgical intervention for cataracts may markedly modify the inherent architecture of the anterior segment, thereby resulting in alterations to the thickness of the retinal nerve fiber layer (RNFL). This systematic review aims to determine the anterior segment configuration and RNFL analysis in post pediatric cataract surgery. *Methods:* This research is a systematic review study regarding anterior segment configuration and RNFL analysis in post-pediatric cataract surgery. The literature search used the PRISMA guidelines through PubMed, Science Direct, Cochrane, and Clinical Key, with the keywords "cataract," "anterior segment," and "RNFL thickness," alongside "children," and "post-surgery." *Results:* There were 10 final articles identified in this systematic review that met the inclusion criteria. The article discusses the anterior segment configuration and RNFL analysis in post pediatric cataract surgery. Of the 10 articles identified, those articles found changes in the central corneal thickness and anterior chamber depth. There is also a thinning in RNFL thickness, but other studies also stated no significant differences in RNFL thickness between preoperation, one month after surgery, and standard control. *Conclusions*: Cataract is still a health problem, especially in children. Cataract surgery can affect both the anterior segment and RNFL thickness. (www.actabiomedica.it)

Key words: cataract, anterior segment, Retinal Nerve Fiber Layer, children

Introduction

Cataracts are opacities in the lens of the eye that can interfere with vision, which can be complete or partial and can occur in both or one eyes. Cataracts are the leading cause of visual impairment and blindness worldwide. In Indonesia, the incidence of blindness attributable to cataracts remains significantly elevated, accounting for approximately 3% of the overall population. It is noteworthy that cataracts may also manifest in pediatric patients. Globally, approximately 70 million instances of visual impairment arise during early childhood, with 10 million cases (14%) attributable to cataracts. Pediatric cataracts are estimated to affect around 200,000 children worldwide, exhibiting a prevalence rate that ranges from 3 to 6 per 10,000 live births. Consequently, pediatric cataracts constitute the foremost cause of blindness among children (1). Cataracts are treatable, and their complications can be prevented if treated promptly. Most pediatric patients diagnosed with cataracts necessitate surgical intervention, with a limited number being amenable to conservative management (2,3). The performance of cataract surgery in children presents distinct challenges and possible complications that diverge from those encountered within the adult

population (4). Phacoemulsification is one of the most common cataracts surgery nowadays. During phacoemulsification, fluctuations in intraocular pressure (IOP) may manifest, potentially resulting in a temporary elevation of IOP, which in turn affects the thickness of the retinal nerve fiber layer (RNFL). IOP demonstrates variability throughout each phase of the phacoemulsification procedure (5). Post-cataract surgery glaucoma in children is a difficult condition to treat. Although pharmacological therapy has been used, it is often not enough to control high IOP. Therefore, surgical action to reduce IOP pressure is the main choice in the management of post-cataract surgery glaucoma in children (6). The advancements in surgical methodologies and the innovation of intraocular lenses (IOL) have markedly enhanced the prognoses associated with pediatric cataract surgery over the preceding decades. Nonetheless, postoperative complications, including amblyopia, posterior capsule opacification, axial growth, and secondary glaucoma, continue to present significant challenges to achieving favorable long-term visual outcomes. In contrast to the adult eye, the pediatric eye remains in a state of development, and the intervention of cataract surgery may substantially disrupt the normative architecture of the anterior segment. This situation necessitates prolonged surveillance of the anterior segment to evaluate the potential risk factors linked to postoperative complications (7).

In response to the issues above, the present systematic review aims to analyze studies on anterior segment configuration and RNFL analysis post-cataract surgery in children. The review will provide updates on the current state of knowledge, with the objective of understanding anterior segment configuration and RNFL analysis in children post-cataract surgery and optimizing treatment strategies for future complications.

Materials and Methods

This systematic review aimed to thoroughly gather, assess, and summarise existing data on anterior segment configuration and RNFL analysis after pediatric cataract surgery. The methodology for the review was developed in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) requirements before the literature search and data collection were started (8) and registered in the PROSPERO under the registration number CRD420251002857. To formulate the study question and direct the search for applicable publications, the PICO framework—which stands for Participants, Intervention, Comparison, and Outcome—was used. This review used the following PICO framework:

P (Participants)	: Children undergoing cataract surgery
I (Intervention)	: Cataract surgery
C (Comparison)	: Control eyes
O (Outcome)	: Anterior segment configuration and RNFL analysis

Database search, study selection, and quality assessment

A literature search was conducted using four online databases: ScienceDirect, PubMed, Cochrane, and ClinicalKey. The search terms used were "Cataract," "Anterior Segment," and "RNFL thickness," as well as related keywords. To maintain coherence and eliminate bias, these phrases were used individually and in combination, with each database's specific search parameters and "AND" and "OR" operators. Moreover, the reference lists contained within the aforementioned articles were systematically scrutinized to ascertain additional pertinent scholarly works. The inclusion criteria encompassed articles published within the last ten years that used research designs such as randomised controlled trials, cohort studies (retrospective/prospective), quasi-experimental studies, case-control studies, and consecutive case series, with a focus on anterior segment configuration and RNFL analysis in children after cataract surgery. Advertorials, conference papers, studies with inappropriate demographics, and those not addressing the specific results of anterior segment configuration and RNFL analysis after cataract surgery in children were excluded. Only full-text, English-language articles were considered. Two reviewers (AG and MNR) conducted

separate searches on the four databases from their establishment until January 2024. Any differences among the reviewers were settled through discussion, and a third reviewer (RNM or NW) was available to assist whenever required. The final results were determined once all authors reached an agreement.

The search yielded 1,737 papers across four databases that used MeSH terms: 9 from PubMed, 2 from Cochrane, 492 from Science Direct, and 1,234 from Clinical Key. We examined full-text publications from potentially relevant research and removed irrelevant studies. We used the 2011 Level of Evidence from the Oxford Centre for Evidence-Based Medicine to assess the other studies. After adopting the Joanna Briggs Institute critical evaluation checklist for each study's category, we used it to screen for bias and ensure the studies were high quality.

Data extraction and analysis

Of the 1,737 articles found from our selected databases, 731 duplicate articles were removed, leaving 1,006 articles to be reviewed. Both reviewers independently evaluated the titles and abstracts of these 1,006 articles, further omitting 815 publications: 512 articles were published for more than ten years, 232 had irrelevant titles, and 62 were not in English. The remaining 191 articles were sought for retrieval, however 145 papers could not be found, leaving 46 final reports to be evaluated for eligibility. After further assessment, 36 articles were excluded: 22 articles failed to meet the inclusion and exclusion criteria, nine were secondary papers, and five were withdrawn. Ultimately, our systematic review included 10 final articles as the focus of our analysis (Figure 1).

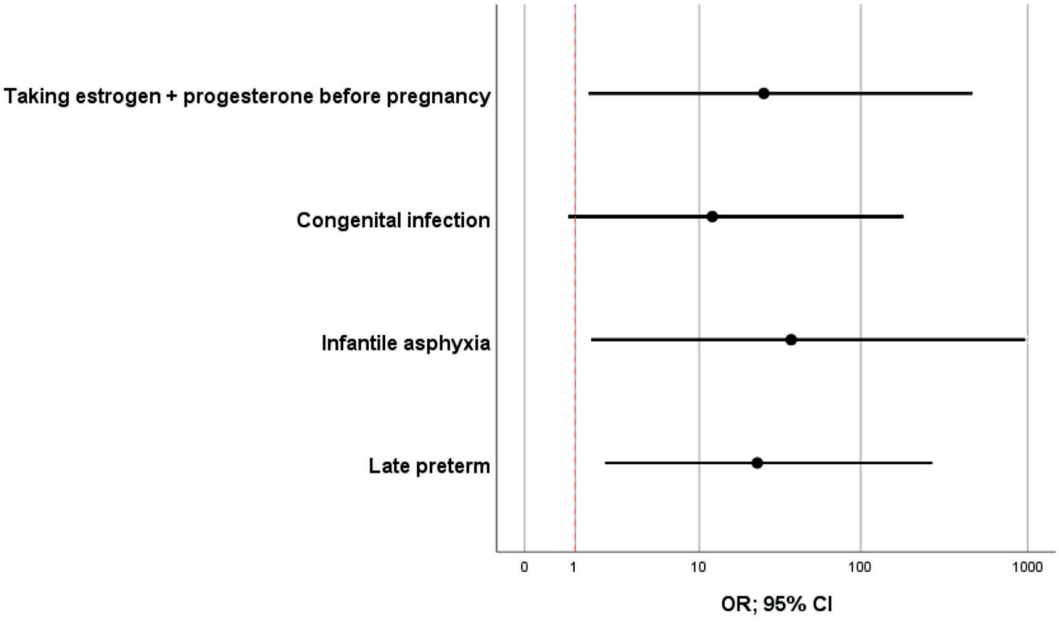

Figure 1. PRISMA diagram in systematic review search

Results

Comprehensive details of all the studies included in this systematic review are presented in Table 1.

Discussion

Cataracts, in a general sense, represent a opacification of the crystalline lens situated within the ocular structure, resulting in a diminished visual acuity (17). This condition may manifest as either partial or complete opacification and can present in one or both ocular entities. It stands as the predominant etiological factor for blindness and visual impairment on a global scale. Although cataracts usually occur in older people due to aging, pediatric cases are also not uncommon. An estimated 70 million children across the globe encounter vision impairment during early developmental stages, with 10 million (14%) of these instances attributable to cataracts. Pediatric cataracts influence approximately 200,000 children worldwide, exhibiting a prevalence rate that ranges from 3 to 6 cases per 10,000 live births. Consequently, cataracts emerge as the principal cause of blindness among the pediatric demographic (1,18,19). Cataract treatment consists of non-surgical and surgical therapy. There are several types of surgical therapy, the surgical techniques encompass Phacoemulsification, Intra Capsular Cataract Extraction, Small Incision Cataract Surgery, and Extra Capsular Cataract Extraction. The selection of surgical techniques to be performed on cataract surgery is based on the expertise and comfort of the operator, as well as the machine or technology available (20,21). As with any form of intraocular surgical intervention, pediatric cataract operations are accompanied by a unique set of complications, one of which is glaucoma, potentially necessitating further therapeutic measures. The continuous monitoring and management of complications associated with pediatric cataracts are paramount for attaining optimal visual outcomes (22). The surgical procedure for cataracts can substantially modify the inherent architecture of the anterior segment. This alteration demands prolonged surveillance of the anterior segment to evaluate the potential risk factors related to postoperative complications. Ultrasound biomicroscopy has been utilized in pediatric populations to evaluate the developmental characteristics of the anterior segment, including parameters such as central corneal thickness (CCT), angle-opening distance at 500 μm (AOD500), trabecular-iris angle (TIA), anterior chamber depth (ACD), and various structural anomalies (7,23). Chen et al. (2017) stated that no statistically significant differences were observed in TIA, AOD500, ACD, and CCT between pediatric pseudophakic patients and a normal control group. The mean CCT of glaucomatous pseudophakic individuals was greater than that of their non-glaucomatous counterparts ($p = 0.04$). Furthermore, the mean AOD500 of glaucomatous pseudophakia group was significantly lower than that of non-glaucomatous pseudophakia group ($p = 0.01$). However, no statistically significant differences were identified in TIA and ACD between non-glaucomatous and glaucomatous pseudophakia group ($p = 0.22$ and $p = 0.15$, respectively) (7). Memon et al. (2015) asserted that postoperative CCT values exhibited significant differences compared to preoperative measurements. The mean preoperative CCT was recorded at 514 ± 49.9 μm, whereas the mean CCT at the first postoperative month was 524.1 ± 25 μm ($p = 0.084$). Subsequently, at the third and sixth months postoperatively, mean CCT values were 527.3 ± 24.6 μm and 530 ± 24.5 μm, respectively. The mean CCT values at the third and sixth months postoperatively were significantly elevated compared to baseline CCT, yielding p values of 0.024 and 0.007, respectively (9). De Broff et al. (2018) noted a modification in ACD from preoperative to postoperative assessments following cataract surgery (10). In a study conducted by Ezegwui et al. (2018), it was reported that the average CCT was measured at 640.06 (± 67.2) μm (median 649 μm, range 450–714 μm) in glaucoma patients following cataract surgery. Among the unilateral cases, the mean CCT in the non-glaucomatous eye was determined to be 604.17 (± 38.8) μm (median 621 μm, range 534–633 μm) post-surgery (14). In cataract surgery, the inflammatory response elicited by the lens extraction significantly influences both the physiological and anatomical conditions of the eye. This alteration manifests in the structural configuration of the anterior chamber as well as the characteristics of the aqueous

Table 1. Summary of studies assessing anterior segment configuration and RNFL analysis after pediatric cataract surgery.

Reference (author, year)	Design	Methods	Location	Subject	Results
Chen et al, 2017 (7)	Observational retrospective, case series	Children diagnosed with acquired cataracts or congenital received cataract surgical intervention and IOL implantation. Patients that were followed for at least five years were included in this study. UBM was performed to children underwent pediatric cataract surgery. The measurement of IOP, IOL positioning, structural abnormalities, CCT, TIA, AOD500, ACD, and the prevalence of glaucoma were systematically assessed.	China	A total of 40 ocular interventions were performed on 26 pediatric patients, which involved cataract extraction and intraocular lens implantation. Additionally, 24 ocular assessments were conducted on 12 age-matched healthy phakic individuals who served as control participants.	There was no statistically significant disparity in TIA, AOD500, ACD, and CCT when comparing pediatric pseudophakia group with the normal control group. The mean CCT observed in glaucomatous pseudophakia group surpassed that of non-glaucomatous pseudophakia group ($p = 0.04$). The mean AOD500 for glaucomatous pseudophakia group was markedly lower than that of non-glaucomatous pseudophakia group ($p = 0.01$). No statistically significant differences were detected in TIA and ACD when comparing non-glaucomatous with glaucomatous pseudophakia group ($p = 0.22$, 0.15, respectively).
Memon et al, 2015 (9)	Quasi Experimental study	CCT and ECC were meticulously documented prior to the surgical intervention and at the intervals of one month, three months, and six months post-operatively, with an assessment of the impact of the contemporaneously employed surgical methodology on both ECC and CCT being conducted.	Pakistan	A total of fifty-two ocular assessments from thirty-seven pediatric patients diagnosed with cataracts were incorporated into the research study.	The post-operative measurements of CCT and ECC exhibited statistically significant deviations from their pre-operative counterparts. The average pre-operative CCT was recorded at 514±49.9 μm, whereas the initial post-operative mean CCT after one month was noted as 524.1±25 μm ($p = 0.084$). The mean values observed at the third- and sixth-months post-operative were markedly elevated compared to the baseline CCT, with p-values of 0.024 and 0.007, respectively.
De Broff et al, 2018 (10)	Prospective cohort	Examination under anesthesia was conducted to axial length and acquire keratometry assessments via A-Scan, and measurements of ACD through UBM. Three distinct UBM assessments to ascertain ACD were executed in each ocular unit prior to and subsequent to cataract surgical intervention. The mean of the three measurements obtained in each ocular unit was employed for statistical evaluation.	America	A cohort of three individuals (one male and two females), with ages varying from 7 months to 43 months, was subjected to analysis.	Case 1 exhibited a variation in ACD of the right eye (OD) amounting to 0.94 mm ($p=0.0019$) when comparing preoperative to postoperative assessments subsequent to cataract surgery involving posterior capsulorhexis with optic capture. The postoperative ACD disparity between the right eye (OD) and left eye (OS) was measured at 1.05 mm ($p=0.0010$). Case 2 demonstrated a modification in ACD of the right eye (OD) of 1.48 mm ($p=0.0003$) from preoperative to postoperative evaluations. The postoperative ACD difference, following bilateral cataract surgery that included posterior capsulorhexis with optic capture, between the right eye (OD) and left eye (OS) was found to be statistically insignificant: 0.23 mm ($p=0.1058$). Case 3 revealed an ACD alteration of the left eye (OS) of 0.29 mm ($p=0.0157$) from baseline preoperative to postoperative evaluations.

Table 1 (*Continued*)

Reference (author, year)	Design	Methods	Location	Subject	Results
Bansal et al, 2016 (11)	Case-control study	Phacoaspiration accompanied by intraocular lens implantation was performed on pediatric patients diagnosed with cataract. The measurement of CMT and RNFLT was conducted utilizing OCT in a cohort of normal controls and at a three-month postoperative interval in children presenting with bilateral and unilateral cataract.	America	A cohort comprising forty-five pediatric individuals (90 ocular organs) aged between 4 and 16 years was examined: this included subjects diagnosed with developmental cataract or unilateral congenital (n = 15), bilateral cataract (n = 15), and age-matched controls devoid of any ocular abnormalities (n = 15).	Children diagnosed with unilateral cataract exhibited a significantly reduced RNFL thickness in the affected eye (85.46 ± 8.16 μm) in comparison to the fellow eye (93.93 ± 13.12 μm; p = .036). The mean RNFL thickness in the surgically treated eyes of individuals with unilateral cataract was markedly lower (85.46 ± 8.16 μm) when juxtaposed with the control group (94.6 ± 12.51 μm; P = 0.004). The average RNFL thickness in patients with bilateral cataract was found to be comparable in both eyes, yet significantly diminished relative to the control group.
Zhang et al, 2020 (12)	Prospective cohort	OCTA was conducted to visualize the retinal vascular architecture in the optic disc regions and macular prior to and following the surgical intervention. The variations in retinal thickness and vessel density among the groups were analyzed for comparative assessment.	China	A total of 35 pediatric subjects diagnosed with unilateral congenital cataract underwent successful surgical intervention involving congenital cataract extraction and subsequent implantation of an IOL.	Regarding the RNFL thickness, the mean thickness exhibited no statistically significant alteration postoperatively (t=–0.472, p=0.671). Furthermore, there was a lack of significant disparity in the mean thickness among the three cohorts (preoperative, one-month post-surgery, and normal control).
Hansen et al, 2022 (13)	Prospective Cohort study	Three-dimensional swept-source OCT scans of the optic disc and macula were acquired utilizing the Triton OCT system. The contralateral healthy eyes of the unilateral cohort were employed as control specimens.	Denmark	A cohort of 56 pediatric subjects, aged between 7 and 18 years, who underwent surgical intervention for either bilateral or unilateral cataract conditions.	In the bilateral cohort, there was a non-significant increase in the average retinal thickness of the central subfield and overall mean ganglion cell layer and RNFL-thickness within the macula of the eyes exhibiting optimal vision in comparison to those with inferior visual acuity. There were no statistically significant variances in pRNFL thickness; however, pRNFL appeared to be diminished in the surgical eyes of the unilateral group relative to the control eyes, and the eyes with poorer vision also demonstrated a reduced overall pRNFL compared to the eyes with superior vision in the bilateral group.

Ezegwui et al, 2018 (14)	Retrospective cohort	A comprehensive examination of the medical documentation pertaining to a series of patients evaluated consecutively at the glaucoma and pediatric ophthalmology clinic of the institution, each diagnosed with glaucoma resulting from aphakia or pseudophakia within a five-year timeframe.	India	A total of 21 eyes from 14 children developed glaucoma, while 23 eyes from 12 children were chosen as the control group.	Multivariate analysis identified that undergoing surgery at an age younger than 12 months, in conjunction with ocular anomalies predominantly characterized by microcornea, serves as significant risk factors for the subsequent development of glaucoma following pediatric cataract surgery. The mean CCT recorded was 640.06 (± 67.2) μm (median 649 μm; range 450–714 μm). In the subset of unilateral cases, the average CCT in the non-glaucomatous eye was determined to be 604.17 (± 38.8) μm (median 621 μm; range 534–633 μm).
Zhang et al, 2022 (15)	Retrospective cohort	Cataract extraction was conducted within the first six months of life for both bilateral and unilateral cataract-affected pediatric patients, and for bilateral cataract cases, the procedure was executed between six months and 1.5 years of age, followed by secondary IOL implantation approximately at the age of two years. Initial IOL implantation was undertaken for patients exceeding six months of age with unilateral cataract and for those over two years of age with bilateral cataract.	China	A total of 259 eyes specimens from 174 individuals (surgical age ≤ 7 years) who received surgical intervention for congenital cataracts were analyzed.	A familial predisposition to preoperative lens thickness (LT) [HR, 3.745; P = 0.012], preoperative CCT [HR, 1.021; P = 0.001], preoperative HCD [HR, 3.922; P = 0.004], and congenital cataract [hazard ratio (HR), 50.463; P < 0.001] were determined to be significant predictors of postoperative glaucoma-associated adverse outcomes.
Gawdat et al, 2017 (16)	prospective nonrandomized study	All participants in the study underwent extraction of lens material via an anterior surgical approach, while the implantation of primary IOL was conducted at the chronological ages of 1 and 2 years for bilateral and unilateral cases, respectively. IOP was assessed at intervals of 1 week, 1 month, 3 months, 6 months, 9 months, and 1 year post-operatively. For subjects who subsequently developed glaucoma, the timing of diagnosis along with associated risk factors were meticulously documented.	Egypt	A total of one hundred and fifty ocular observations from eighty-eight pediatric participants were incorporated into the framework of this investigation.	The prevalence of glaucoma suspect was noted at 0.67% (1 out of 150 eyes) during the initial year subsequent to cataract surgery. A significant proportion of the cases (66.7%) were identified within the first three months following the cataract surgical procedure. The diagnosis of glaucoma was established when the IOP exceeded 21 mm Hg in conjunction with one or more of the following criteria: an increase in HCD, progressive optic disc cupping, heightened myopic shift, and the necessity for surgical intervention to regulate IOP.

Table 1 (*Continued*)

Reference (author, year)	Design	Methods	Location	Subject	Results
Nystrom et al, 2019 (6)	Retrospective cohort	Medical records were retrospectively analyzed for children with primary implantation with BIL-IOL.	Sweden	The study included 109 eyes in children undergone cataract surgery	Patients who subsequently developed glaucoma underwent cataract surgery at an average of 3.5 ± 1.1 weeks (mean ± SD), in contrast to non-glaucoma patients who had surgery at 5.7 ± 3.3 weeks ($p = 0.024$). Within the entire study population, 21 eyes (19.3%) exhibited conditions linked to glaucoma; among these, 57.1% progressed to glaucoma, compared to merely 3.4% in the absence of such conditions ($p < 0.001$). A CDVA of ≥ 0.5 (decimal) was observed in 50 eyes (48.5%), with a median of 0.63 in the late surgery group and 0.15 in the early surgery group. Eyes diagnosed with glaucoma in the early surgery cohort (operated at 3.5 weeks) attained a median CDVA of 0.56 (range, 0.4-1.0), while non-glaucoma eyes (operated at 5.7 weeks) achieved a median CDVA of 0.89 (range 0.7-1.6); $p = 0.016$. The incidence of glaucoma development in infants aged between 5 weeks and 2 years was recorded at 6.7% (n = 2/30).

Abbreviations: IOP, Intraocular pressure; RNFL, retinal nerve fiber layer; IOL, intraocular lens; pRNFL, peripapillary RNFL; ACD, anterior chamber depth; UBM, Ultrasound biomicroscopy; AOD500, angle-opening distance at 500 μm; TIA, trabecular-iris angle; CCT, central corneal thickness; ECC; Endothelial Cell Count; RNFLT, retinal nerve fiber layer thickness; CMT, central macular thickness; OCT, optical coherence tomography; OCTA, Optical coherence tomography angiography; HCD, horizontal corneal diameter; CDVA, corrected distance visual acuity.

humour. The eye's anterior chamber is crucial for regulating aqueous humour dynamics. Within the anterior chamber, without impediments to the trabecular meshwork, the aqueous humour is expected to flow and be reabsorbed efficiently. Conversely, if the anterior chamber is characterized by an acute angle or if obstructions are affecting the trabecular meshwork, the aqueous humour's flow will encounter resistance. This phenomenon subsequently leads to an elevation in IOP. Consequently, cataract surgery has the potential to profoundly modify the morphological attributes of the anterior segment, particularly concerning ACD, and to affect variations in IOP across different individuals (24,25). The existence of secondary glaucoma, the presumption of glaucoma, and unilateral surgical intervention serve as critical predictors of elevated CCT. Numerous investigations have documented increased CCT in both aphakic and pseudophakic pediatric eyes devoid of secondary glaucoma when juxtaposed with normative ocular health. A prevailing hypothesis suggests that the augmentation of CCT may be attributable to cataract surgical procedures (26). There exists a degree of conjecture regarding the phenomenon of corneal thickening after cataract surgery. In their 2022 research, Zhang et al. identified preoperative CCT [HR, 1.021; P = 0.001], preoperative lens thickness (LT) [HR, 3.745; P = 0.012], and preoperative horizontal corneal diameter (HCD) [HR, 3.922; P = 0.004] as significant predictors of adverse glaucoma-related outcomes postoperatively (15). Although most lensectomy procedures are uncomplicated, endothelial cells are susceptible to damage due to idiopathic surgical interventions or various other factors. Alterations in corneal physiology that transpire long after the surgical intervention may likewise contribute to this condition (27). The RNFL and optic disc represent the principal loci of glaucomatous injury that precede the manifestation of glaucomatous visual field deterioration. The precise early identification and ongoing assessment of defects in the optic nerve head (ONH) and RNFL have emerged as the predominant emphasis in the efficacious management of glaucoma (28). Gawdat et al. (2017) articulated in their investigation that the prevalence of glaucoma was documented at 11.33% (17 out of 150 eyes), while the prevalence of glaucoma suspects was recorded at 0.67% (1 out of 150 eyes) within the initial year after cataract surgery. A significant portion of the cases (66.7%) was identified within the first three months following cataract surgery (16). In isolation, RNFL analysis demonstrates considerable diagnostic efficacy in identifying early-stage glaucoma. Focal RNFL thinning as visualized through Optical Coherence Tomography (OCT) is well-established to correlate significantly with RNFL defects and the thinning of the neuroretinal rim as observed via ophthalmoscopy, both of which are indicative of glaucomatous injury (29,30). On the other hand, data on the condition of RNFL thickness in pediatric cataract patients after cataract surgery are still limited. In a research investigation executed by Bansal et al. (2016), focusing on pediatric subjects aged 4 to 16 years afflicted with cataracts, it was determined that a notable reduction in RNFL thickness was observed in unilateral cataract patients three months post-operatively, particularly when juxtaposed with healthy ocular counterparts. Furthermore, the investigation revealed that the mean RNFL thickness in bilateral cataract subjects was significantly diminished compared to the group comprising healthy eyes (11). However, in another study conducted by Zhang et al. (2020), it was reported that the mean RNFL thickness did not exhibit any statistically significant alterations following surgical intervention ($p=0.671$, $t=-0.472$). There was no notable distinction in the average thickness among the three cohorts (preoperative, one month postoperative, and normal control) (12). In a subsequent study by Hansen et al. (2022), it was similarly indicated that there were no substantial differences in the thickness of the peripapillary RNFL (pRNFL); notwithstanding, pRNFL demonstrated a tendency to be diminished in the surgical eyes of the unilateral group relative to the control eyes, while the eyes with poorer visual acuity exhibited a thinner overall pRNFL compared to those with superior visual acuity in the bilateral group (13). Damage sustained by ganglion cells and their axonal projections will result in the attenuation of the peripapillary RNFL, which is correlated with a decline in the visual field. Nystrom et al. (2019), in their research, noted that a corrected distance visual acuity (CDVA) (decimal) of ≥ 0.5 was observed in 50 eyes (48.5%), with a median of 0.63 in the late group, contrasting with 0.15 in the early group

following cataract surgery. Glaucomatous eyes in the early cohort (surgery performed at 3.5 weeks) achieved a median CDVA of 0.56 (range, 0.4-1.0), whereas non-glaucomatous eyes (surgery at 5.7 weeks) recorded a median CDVA of 0.89 (range 0.7-1.6; p = 0.016) (6). This scenario presents a significant challenge for clinicians, as this condition has the potential to inflict irreversible damage. Elevated IOP exerts direct compression on the axonal fibers and the supportive architecture of the anterior optic nerve. Additionally, it compromises the lamina cribrosa and disrupts axoplasmic transport, which may precipitate the necrosis of ganglion cells and ultimately result in the thinning of the RNFL (31). This phenomenon may also be elucidated by the potential for retardation induced by the cataract, or it could stem from the effects of the IOL material. Nevertheless, the former is the more plausible explanation for this observable alteration (32). Limitations of the study include (1) the review only included full-text articles published in English, which might have excluded relevant research in other languages. (2) The review might have missed important findings from unpublished studies by focusing solely on published articles, particularly those available in full text. (3) The literature search was limited to four databases (PubMed, Science Direct, Cochrane, and Clinical Key), which may not capture all available studies. (4) The selected studies varied in design (e.g., cohort studies, randomized controlled trials, case series) and the methods used to assess anterior segment and RNFL changes, making it challenging to draw unified conclusions. (5) With only 10 articles meeting the inclusion criteria, the findings might not be generalizable or robust enough to draw definitive conclusions.

Conclusion

Cataract is still a health problem, especially in children. Cataract surgery can affect both the anterior segment and RNFL thickness. After cataract surgery, there are changes in the CCT and anterior chamber depth. There is also a thinning in RNFL thickness. Still, other studies also stated no significant difference in RNFL thickness between preoperation, one month after surgery, and normal control.

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Authors Contribution: AG (Concept, Design, Resources, Materials, Data Collection and Processing, Analysis and Interpretation, Literature Search, Writing Manuscript), MNR (Concept, Design, Supervision, Analysis and Interpretation, Literature Search), RNM (Concept, Design, Supervision, Analysis and Interpretation, Literature Search), and NW (Concept, Design, Analysis and Interpretation, Critical Review). All authors read and approved the final version of the manuscript.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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