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STHE SYSTEMATIC REVIEW OF MANAGEMENT OF CATARACT SURGERY IN PATIENTS WITH DIABETES MELLITUS

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ABSTRACT

Background: *Diabetes mellitus (DM) is a chronic systemic disease whose prevalence has risen over time. Diabetes can impair all eye tissues, with cataracts being the most common complication.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2014 and 2024 were taken into account. Several different online reference sources, like Pubmed and SCIENCE DIRECT, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 679 articles, whereas the results of our search on SCIENCE DIRECT brought up 338 articles. The results of the search conducted for the last year of 2014 yielded a total 49 articles for PubMed and 15 articles for SCIENCE DIRECT. In the end, we compiled a total of 5 papers, 3 of which came from PubMed and 2 of which came from SCIENCE DIRECT. We included five research that met the criteria.*

Conclusion: *In summary, modern surgical and pharmacologic therapy may make diabetic patients' surgeries safer and more effective. This underlines the necessity of patient education prior to surgery.*

Keyword: *Catarat surgery, diabetes mellitu*

INTRODUCTION

More than 285 million individuals worldwide suffer with diabetes. The International Diabetes Federation predicts that this figure will nearly double to 439 million by 2030. An older population and greater patient life expectancy suggest that the prevalence of diabetes will approach 33% by 2050.[1]

Cataracts remain the major cause of blindness worldwide, impacting around 18 million people. Cataract is regarded as a major cause of visual impairment in diabetic individuals, as the incidence and progression of cataract are higher in those with diabetes. Several clinical trials have found that diabetics get cataracts more commonly and at an earlier age. It is believed that diabetic patients account for up to 20% of all cataract procedures.[1]

Diabetic cataracts have become more common as the prevalence of DM has increased. Cataract extraction is one of the most common surgical operations in the general population, and the number of cataract surgeries performed each year continues to rise. Recent advances in cataract surgery have resulted in better surgical outcomes. However, the extent of improvement in diabetes people is still debatable, and numerous research have revealed both the outcomes and risks of cataract surgery in diabetic patients.[1]

In low-income nations, cataracts account for over half of all blindness and have a significant influence on the physical, psychological, and socioeconomic development of countries, individuals, and society. Visual impairment is more common in low and middle-income countries (LMICs), accounting for approximately 80%-90% of all visually impaired people worldwide. The global causes of blindness due to eye illnesses excluding refractive errors were onchocerciasis (1%), trachoma (4%), congenital (4%), diabetic retinopathy (5%), corneal opacities (5%), age-related macular degeneration (9%), glaucoma (12%), cataracts (47%), and others (13%).[2]

Cataracts are the leading cause of blindness and visual loss worldwide, caused by retinal damage and age-related macular degeneration. Opacity in the normal human lens can occur due to congenital, developmental, or acquired reasons. Cataracts affect persons of all ages, but are more common in those over 50. However, they are highly preventable with proper intervention.[3]

The increased trend of earlier cataract surgery in diabetes patients has contributed to better visual outcomes. Visual outcomes are likely to be worse in patients who delay surgery until it is too late to identify or appropriately treat DME before cataract surgery. When cataract surgery is performed before lens opacities obstruct appropriate macular examination, preventing the detection of retinal thickness, the risk of DME is reduced and the visual prognosis may be significantly improved.[1]

Cataract surgery is a curative and cost-effective treatment. As a result, blindness programs are tasked with providing high-quality surgery and long-term assistance to satisfy current and future demands. This necessitates the equitable allocation of resources such as personnel, infrastructure, equipment, and materials. Multiple factors influence the output of existing cataract surgical services, many of which are provider-related, such as surgeon availability and support staff. Health facilities, consumable equipment.[3]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we review published literature contains the principles and guidelines of managing cataract with surgery in patients with diabetes. This is done to provide an explanation and improve the handling of treatment at the patient. As the main purpose of this paper, to show the relevance of the difficulties that have been identified as a whole.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "cataract surgery" and "diabetes mellitus" as keywords.The search for studies to be included in the systematic review was carried out using the PubMed and SCIENCE DIRECT databases by inputting the words: *(("cataract extraction"[MeSH Terms] OR ("cataract"[All Fields] AND "extraction"[All Fields]) OR "cataract extraction"[All Fields] OR ("cataract"[All Fields] AND "surgery"[All Fields]) OR "cataract surgery"[All Fields]) AND ("diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields])) AND ((clinicaltrial[Filter]) AND (fft[Filter]) AND (2014:2024[pdat]))* used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

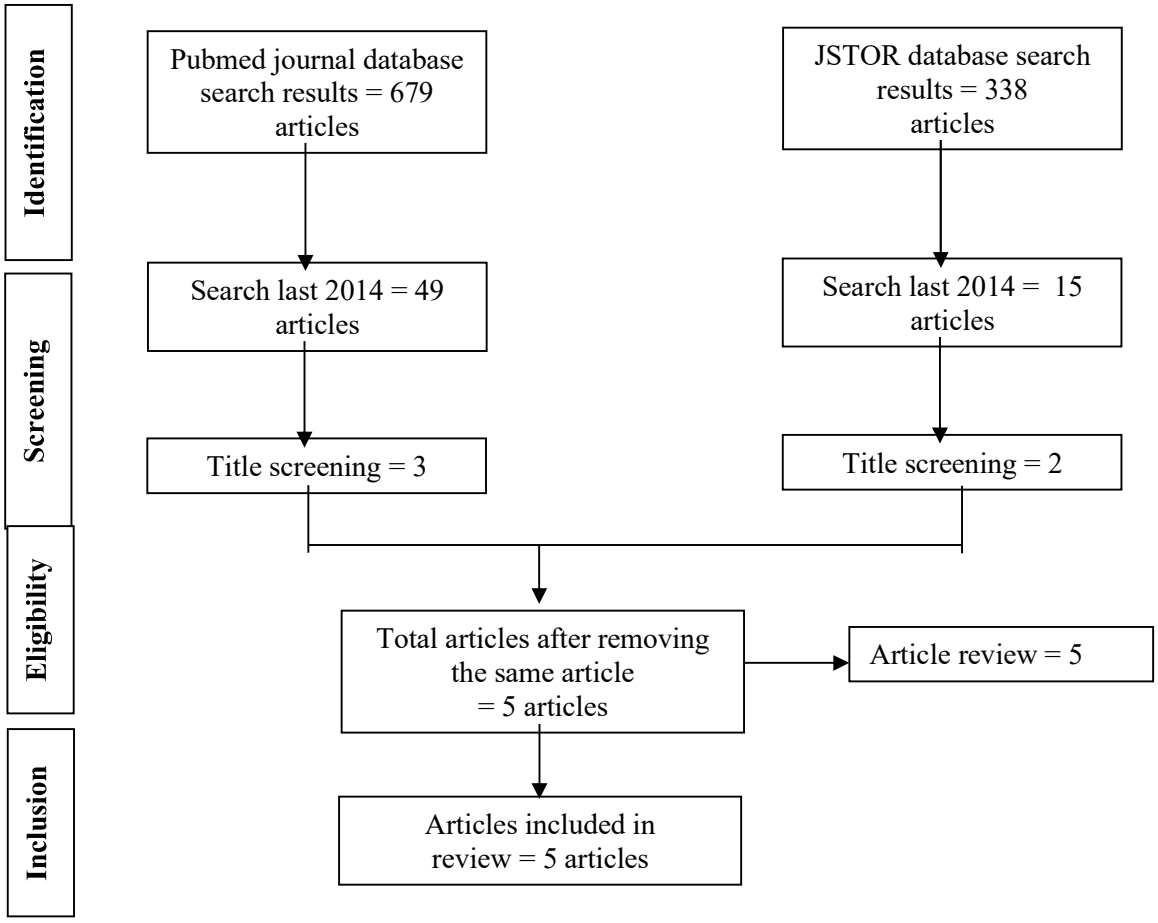

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 679 articles, whereas the results of our search on SCIENCE DIRECT brought up 338 articles. The results of the search conducted for the last year of 2014 yielded a total 49 articles for PubMed and 15 articles for SCIENCE DIRECT. In the end, we compiled a total of 5 papers, 3 of which came from PubMed and 2 of which came from SCIENCE DIRECT. We included five research that met the criteria.

Beyene, et al[3] (2021) showed that the time to recover in the research area was slightly longer than the global cutoff time. This study found that patients who were middle-aged, lived in cities, had secondary cataracts, and were treated with additional capsular extraction surgery recovered faster. On the contrary, cataract patients who had diabetes as a comorbidity recovered faster. To enhance recovery time after cataract surgery, special attention should be placed on preventing and treating comorbidities.

Torabi, et al[4] (2019) showed that after phacoemulsification, diabetic eyes showed a rise in central macular thickness but a decrease in choroidal thickness. In contrast, non-diabetic eyes showed an increase in both. Reduced choroidal thickness can result from reduced blood flow and hypoxia, potentially leading to DR development. More research is needed to better understand this association and avoid choroidal thinning in diabetes patients after cataract surgery.

Cruz, et al[5] (2023) showed that diabetic patients with mild cataracts may be more likely to experience severe endothelial cell loss with PHACO than FLACS. Furthermore, there was no significant difference in the CDE across the groups, which leads us to assume that it is not the optimal criterion to analyze the delivery of ultrasound energy in surgery.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Beyene et al, 2021[3]	Ethiopia	Retrospective cohort study	223 patients	Two hundred twenty three cataract patients were recovered from cataract, 72.6% (95% CI 69.8%– 75.9%). The overall median survival time was 23 weeks (IQR = 16 to 35) with (95% CI, 21%–25%). aged between 16 and 30year (AHR = 1.20 CI; 1.07–2.36), age 31 to 45 (AHR = 1.24 CI; 1.08–1.54), urban dwellers (AHR = 1.59; 95% CI, 1.18–2.14), medium visual acuity (AHR = 4.14 CI; 2.57–6.67), high visual acuity (AHR = 5.23 CI; 3.06–8.93), Secondary cataract (AHR = 2.59 CI; 1.01–3.02), traumatic cataract (AHR = 1.75 CI; 1.01–3.02), extra capsular cataract extraction surgery (AHR = 1.43 CI; 1.07–1.94),and diabetes mellitus (AHR = 0.75, CI; 0.41–0.96) were notably associated with time to recovery.
Torabi et al, 2019[4]	Iran	Prospective study	63 patients	In total, 63 eyes from 63 patients were enrolled to this study, including 21 eyes in Group A, 22 eyes in Group B, and 20 eyes in Group C. After three months of follow-up of

				the patients, choroidal thickness in all measured points was decreased significantly, and central macular thickness was increased significantly following cataract surgery in diabetic eyes (Ggroup A); meanwhile, both choroidal thickness and central macular thickness were increased significantly in non-diabetic eyes (Group B). In Group C, choroidal thickness and central macular thickness had no significant changes, after three months. Conclusion: Unlike in non-diabetic eyes, choroidal thickness in d
Cruz et al, 2023[5]	Brazil	Randomized controlled study	95 patients	After three months, evidence is lacking between groups in the CCT measures; the difference was neither statistically nor clinically relevant. However, for ECD, a significant and clinically significant difference was found; if all patients were treated with laser, the mean ECD would be 423.55 greater (RSE: 86.09; p-value < 0.001; 95% CI: 254.81–592.29) than the ECD potential means of 1656.423 among the conventional group (RSE: 74.90; p-value < 0.001; 95% CI: 1509.62–1803.23).
Ikegami et al, 2020[6]	Japan	Prospective randomized study	59 patients	The postoperative CMT continued to increase significantly until 3 months in both groups. Although the CMT was more in patients with diabetes than in patients without diabetes during the follow-up period, there was no significant difference between the two groups. The aqueous flare value increased until 3 months after surgery in both groups. Although the increase was significant at 3 months after surgery in patients with diabetes, the increase in controls was not significant. The aqueous flare values differed significantly between the two groups before and at 3 months after surgery. There was no significant within-group or between-group difference in pre- and postoperative SCT values.

DCCT, 2015[7]	USA	Randomized controlled study	711 patients	Over a median follow-up of 23 years, 130 ocular operations were performed in 63 of 711 patients assigned to intensive therapy (8.9%) and 189 ocular operations in 98 of 730 patients assigned to conventional therapy (13.4%) (P<0.001). After adjustment for DCCT baseline factors, intensive therapy was associated with a reduction in the risk of any diabetes-related ocular surgery by 48% (95% confidence interval [CI], 29 to 63; P<0.001) and a reduction in the risk of all such ocular procedures by 37% (95% CI, 12 to 55; P = 0.01). Forty-two patients who received intensive therapy and 61 who received conventional therapy underwent cataract extraction (adjusted risk reduction with intensive therapy, 48%; 95% CI, 23 to 65; P = 0.002); 29 patients who received intensive therapy and 50 who received conventional therapy underwent vitrectomy, retinal-detachment surgery, or both (adjusted risk reduction, 45%; 95% CI, 12 to 66; P = 0.01). The costs of surgery were 32% lower in the intensive-therapy group. The beneficial effects of intensive therapy were fully attenuated after adjustment for mean glycated hemoglobin levels over the entire follow-up.

Ikegami, et al[6] (2020) showed that even small-incision cataract surgery in diabetic eyes with early stages of retinopathy can cause increased aqueous flare and macular thickening for up to three months, despite no significant change in choroidal thickness. Further research is required to investigate choroidal alterations following cataract surgery in diabetic eyes.

DCCT[7] (2015) showd that intensive insulin therapy during the DCCT significantly reduced the long-term risk of eye surgery among type 1 diabetes patients. Reduced glycated hemoglobin levels account for nearly all of the advantages of intensive therapy over conventional therapy, and these findings emphasize the need of early, intense diabetes control. Intensive diabetes therapy has the potential to significantly reduce morbidity and the large societal, economic, and health-care consequences of ocular surgery among people with type 1 diabetes.

DISCUSSION

This systematic review involved a total of 1.161 data of patients with diabetes mellitus that had cataract surgery in 5 observational studies. Diabetes mellitus (DM) is a chronic systemic disease whose prevalence has risen over time. Diabetes can impair all eye tissues, with cataracts being the most common complication. Cataracts are the primary cause of blindness worldwide. Diabetics are more likely to develop cataracts due to a variety of factors. Technology has advanced to the point that cataract surgery is both common and safe. However, diabetics continue to face vision-threatening problems such as diabetic macular edema (ME), postoperative ME, diabetic retinopathy development, and posterior capsular opacification.[8]

Approaches regarding the scheduling of cataract surgery in diabetes individuals appear to be shifting worldwide. Whereas formerly a more conservative approach was used, there is now an increasing trend toward early surgery. The increased trend of earlier cataract surgery in diabetes patients has contributed to better visual outcomes. This method provides panretinal photocoagulation (PRP) and allows for the detection and treatment of diabetic macular edema (DME) prior to cataract surgery. Furthermore, if surgery is performed before lens opacities make it more difficult to detect retinal thickening via macular evaluation, the risk of ME is reduced, and visual outcomes may be significantly improved.[8]

Diabetic patients develop a variety of lens abnormalities. Snowflake cataract is a prevalent kind of cataract among kind 1 diabetes. However, diabetics are more likely to develop senile cataracts. Several research have been conducted to investigate the kind of cataract related with diabetes. Diabetes has been linked strongly to posterior subcapsular cataracts. In fact, several authors have linked higher levels of glycated hemoglobin to an increased risk of nuclear and cortical cataracts. Further investigation revealed that diabetic patients were more likely to develop cortical cataracts, which were connected with the length of the diabetes.[1]

Several theories have been postulated to explain the pathophysiology of cataracts in diabetes. In the lens, sorbitol is created quicker than it is converted to fructose by the enzyme sorbitol dehydrogenase, a process that is more common in diabetics than in nondiabetics.The increased concentration of sorbitol causes a hyperosmotic effect, resulting in a fluid infusion to counteract the osmolality gradient. Hyperglycemia may also contribute considerably to fluid retention in lens fibers, resulting in osmotic stress, which is exacerbated by increased intracellular cytokine/growth factor production and oxidative damage. Due to significant swelling of cortical lens fibers, osmotic stress plays a critical role in the fast production of cataracts in young individuals with Type 1 diabetes mellitus.

Currently, the primary approach of treating diabetic cataracts is surgical excision of the cataract and intraocular lens implantation. Diabetic patients account for approximately 20% of all cataract procedures. Although cataract surgery is generally effective and the implantation of an artificial lens prevents the chance of refractive alterations, diabetes patients are more likely to experience intraoperative and postoperative problems than non-diabetic patients. It has been established that phacoemulsification in diabetic individuals can cause a very quick progression of diabetic retinopathy, accelerate vitreous hemorrhage, and increase the thickness of the central retina.[9]

Even uncomplicated cataract surgery causes an increase in inflammatory cytokines such as vascular endothelial growth factor (VEGF), hepatocyte growth factor, interleukin-1 (IL-1), and pigment-epithelium-derived factor. It is not unexpected that diabetic persons have a higher chance of acquiring endophthalmitis. As a result, both the underlying condition and the need to undergo surgery constitute a considerable health and economic burden for individuals, especially in underdeveloped nations where diabetes medication is insufficient and cataract surgery is frequently unavailable.[9]

All individuals identified with NPDR should have a thorough retinal examination within three months of cataract extraction. Patients with diabetes, particularly those with proliferative retinopathy or who had an unsatisfactory view of the retina prior to cataract extraction, should be continuously monitored for retinal status after surgery.

Diabetic people are more likely to have corneal epithelial abnormalities and chronic erosions as their diabetes progresses. Diabetic patients' eyes had more severe corneal endothelial cell loss following cataract surgery, as well as delayed recovery from corneal edema, as previously observed. Other anterior-segment problems, such as severe iritis, posterior synechiae, pupillary block, and pigmented precipitates on the IOL, are more common in diabetes patients. The incidence of NVI, the most dreaded anterior segment consequence in diabetic patients after cataract surgery, has been lowered by current cataract surgery, which is less stressful than older approaches. In addition, PRP and intravitreal injections of anti-VEGF medicines have been shown to suppress NVI, albeit for brief periods. Diabetic patients may be more likely to develop surgical endophthalmitis, which can lead to a poor visual prognosis.[1]

Hyperglycemia causes oxidative stress, which results in the creation of reactive oxygen species, increased cell metabolism, intensified polyol pathway conversions, and the formation of advanced glycation end products (AGEs). All of these activities are linked together and operate on the feedback loop principle. Understanding these systems is also useful in regular ophthalmology practice. The number of diabetic patients is always increasing, and as a result, so is the number of cataract surgery referrals. As a result, the question arises as to whether we can provide nonsurgical therapy options. This is especially relevant because cataract surgery in diabetic patients is associated with a higher risk of intraoperative and postoperative complications. Qualifying a patient for cataract surgery is frequently one of the stages of diabetic eye disease therapy, whereas lens translucency is critical in the detection and treatment of diabetic eye problems such as diabetic macular edema or diabetic retinopathy.[9]

CONCLUSION

In summary, diabetic patients with visually significant cataracts face specific obstacles during surgery and subsequent rehabilitation, which differ depending on the severity of the DR. However, with proper pretreatment of the DR and minimally invasive surgical procedures, these patients do well and recover great vision, exactly like other cataract patients

without diabetes. Special attention is required for systemic and ocular disorders. Modern surgical and pharmacologic therapy may make diabetic patients' surgeries safer and more effective. This underlines the necessity of patient education prior to surgery.

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