Sains Medika: Jurnal Kedokteran dan Kesehatan

journal homepage: http://jurnal.unissula.ac.id/index.php/sainsmedika/

RESEARCH ARTICLE

Drug Utilization of Corticosteroid in Post-Operative Cataract Patients at Klinik Mata Utama (KMU) Madura

Riyadatus Solihah[1*], Rizal Umar Rahmadani[2], Dianita Rahayu Puspitasari[3]

Department of Clinical Pharmacy and Community, STIKes Ngudia Husada, Madura, Indonesia
Corresponding author, email: riyads.lpm@gmail.com

ARTICLE INFO

Keywords:
Cataract
Dexamethasone
Methylprednisolone
Prednisone
Intraocular pressure
Surgery

ABSTRACT

A cataract is contributed to 51% of blindness in the world. Cataract surgery is needed to restore the normal eye function. Therapeutic management post cataract operative is generally carried out 1-4 weeks by administering antibiotics, corticosteroids or NSAIDs by oral or topical routes. Corticosteroids administration increase intraocular pressure (IOP), therefore should be taken into account in post-operative cataract. The aim of this study was to observe the pattern of corticosteroid use in post-cataract surgery patients at the *Klinik Mata Utama* (KMU) Madura. Observational retrospective research involved 153 patients who consumed corticosteroids during their post operative cataract period. The results showed that 122 patients (79.7%) received combination therapy of topical dexamethasone and oral methylprednisolone, while 31 (20.3%) received combination therapy of topical dexamethasone and oral prednisone. 140 Patients (91,6%) showed good recovery with corticosteroids, and 13 patients (8,4%) experienced the IOP as a side effect of topical corticosteroids. In conclusion, the corticosteroids therapy for post-operative cataract patients should be managed properly to prevent the side effects of increasing IOP.

1. Introduction

Cataract is a condition of cloudiness in the eye's lens, which causes the blur vision due to unfocus light on the yellow spot. Cataracts occur in the elderly, in some cases in children, or due to eye injury or inflammation. Risk factors of cataracts are certain eye diseases, diabetes, ultraviolet radiation, and smoking habits (WHO, 2018).

Cataract is contributed to the 51% risk of blindness followed by glaucoma and Age-related Macular Degeneration (AMD). In 2010, visual impairments were occurred in 285 million people (4.24% of the population worldwide), in which 39 million people (0.58%) were blind and 246 million people 3.65% had low vision. The Rapid Assessment of Avoidable Blindness (RAAB) survey in Indonesia reported that more than 900,000 people had blindness and 2 million people had a severe low vision (KEMENKES, 2013).

Cataract surgery can be performed by surgically removing the entire lens along with the capsule, or by removing the lens's contents through a hole in the anterior lens capsule (Mutiarasari and Handayani, 2011). Cataract surgery techniques have evolved over time. They range from cataract surgery techniques with corneoscleral incisions in Extra Capsular Cataract Extraction (ECCE) and Small Incision Cataract Surgery (SICS) to phacoemulsification (PHACO) with transcorneal incisions with superior and temporal variations in incision location (Bobrow, 2010). Typically, cataract surgery is performed in a single day and involves replacing the clouded lens with an artificial lens, or Intraocular Lens (IOL). The outcome of cataract surgery is highly dependent on the evaluation of the patient's condition prior to surgery, the precision of measuring the intraocular lens's strength, and the therapeutic management before and after surgery. Before cataract surgery is performed, an evaluation of the patient's overall eye health and an accurate calculation of the

https://doi.org/10.30659/sainsmed.v14i1.28054

intraocular lens's strength are required (Liu *et al.,* 2017).

After cataract surgery, antibiotics, corticosteroids, or Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are typically administered orally or topically for 1-4 weeks. When complications or inflammation are suspected after cataract surgery, the combination of corticosteroids and NSAIDs is used more frequently (Liu *et al.,* 2017). Both of these drug classes suppress the inflammatory response by inhibiting the production of pro-inflammatory prostaglandins in the cornea and sclera-protected middle vascular layer of the eye. Corticosteroids function by inhibiting the enzyme phospholipase A2 in order to prevent the formation of cyclooxygenase and lipooxygenation, thereby preventing the formation of inflammatory mediators. The ability of corticosteroids to inhibit mast cell degranulation, stabilize cell membranes, and reduce histamine synthesis makes topical corticosteroids an effective treatment for inflammation of the eye. Additionally, topical corticosteroids can raise intraocular pressure (IOP) (Sheppard *et al.,* 2016).

Prednisolone acetate (1%) is the most common corticosteroid used to treat inflammation after cataract surgery, both alone and in combination with topical NSAIDs. It was stated that combination therapy with topical NSAIDs and prednisolone acetate was more efficacious than prednisolone acetate alone (Grzybowski and Jae, 2016). Each corticosteroid class has varying efficacy for reducing inflammation following cataract surgery and averting CME. The most efficacious drugs are betamethasone and dexamethasone, while fluorometholone and rimexolone are less potent (Flesner *et al.,* 2014). According to another study, the effectiveness of 0.1% dexamethasone phosphate and 0.1% diclofenac sodium in controlling postoperative inflammation following PHACO and IOL implantation was identical (Laurell, 2021).

When using corticosteroids, which can increase IOP (Kindle *et al.,* 2018), special care must be taken. Rimexolone is a new steroid drug that is safer and more effective than prednisolone or dexamethasone in reducing inflammation after cataract surgery, particularly in preventing increased IOP (Solomon *et al.,* 2001). After cataract surgery, loteprednol etabonate 0.5% eye medication can also be used as the treatment of choice for inflammation. Loteprednol etabonate is a corticosteroid with an ester form on the C-20 atom to reduce the drug's interaction with amino acid residues in the protein of the eye lens, which will eventually produce cataracts. Comstock *et al.,* (2011) reported that the structure of this substance makes it the treatment of choice for inflammation by reducing the risk of elevated IOP. To determine the effect of using corticosteroids in the form of eye drops and eye ointments on increasing intraocular pressure, routine controls are required (Tamagawa-Mineoka *et al.,* 2018).

Extensive research has been conducted on the use of corticosteroids in postoperative cataract patients. In spite of this, it has never been implemented in the Bangkalan Madura district, where cataracts are prevalent. On the basis of the preceding description, additional research is required regarding the use of corticosteroids in post-cataract surgery patients in order to provide optimal therapy and determine the presence of drug-related problems (DRP) in their use with other medications. Studies on the use of corticosteroid drugs have never been conducted at the Klinik Mata Utama (KMU) Madura, Indonesia; therefore, additional research is required regarding patterns of corticosteroid use in post-cataract surgery patients at the KMU Madura, including drug types, routes of administration, doses, frequency of administration, response to therapy, drug interactions, and side effects.

2. Materials and Methods

2.1. Study design

This study employed a retrospective observational approach that was descriptively analyzed. Researchers do not address or intervene in the sample; instead, they observe phenomena that have already occurred.

2.2. Population and Samples

This study's population included all patients of KMU Madura who underwent cataract surgery and received corticosteroid therapy after surgery. Patients who underwent cataract surgery and received corticosteroid therapy after surgery at the KMU Madura eye clinic comprised the research sample, which was collected using the purposive sampling technique with the following inclusion criteria: (1) Individuals who have had cataract surgery; (2) Aged 40 to 70; (3) Receive corticosteroid treatment, and (4) Conduct postoperative surveillance at KMU Madura. In this study, patients who did not undergo post-operative control at the KMU Madura were excluded.

2.3. Data Collection

The method of data collection consisted of searching for and collecting Health and medical records of patients who had cataract surgery and received corticosteroid therapy after cataract surgery at KMU Madura between April 4 and April 30, 2022, and who met the inclusion criteria. Then, the following is documented on the data collection sheet based on the medical record, including: (1) Patient identification (number of the medical record, name, age, and gender); (2) Date of cataract surgery; (3) The medical past and medical past; (3) Patient complaints,

clinical symptoms, and doctor's diagnosis; (4) Clinical data; (5) Cataract surgery (PHACO or ECCE) was performed; (6) Corticosteroid therapy incorporates corticosteroid varieties, dosage, route, and response, and (7) Response to treatment.

2.4. Data Analysis

Patient identity (medical record number, name, age, and gender), cataract surgery date, diagnosis, clinical symptoms, complaints, medical history, clinical data (body temperature, RR, pulse, blood pressure), therapy data (type of corticosteroid along with its dosage form, dose, route of administration, frequency of administration, and duration of therapy) after undergoing cataract surgery were entered into the master table.

3. Results

Table 1 depicts the characteristics of respondents. A total of 82 (53.6%) female patients underwent cataract surgery and received corticosteroid therapy, compared to 71 male patients, representing 46.0%. The majority (73.2%) of patients with cataract surgery at the KMU Madura were between the ages of 60 and 70 years old. The combination of dexamethasone and methylprednisolone was the most frequently prescribed corticosteroid for post-cataract surgery therapy in 112 patients (79.7%). Comparatively, dexamethasone and prednisone combination therapy were administered to 31 patients (20.3%).

Table 1. Characteristics of respondents

Characteristics	Frequency (%)
Sex	
• Female	82 (53,6)
• Male	71 (46,4)
Age (years)	
• 40 – 50	18 (11,7)
• 50 – 60	23 (15,1)
• 60 – 70	112 (73,2)
Type of Corticosteroids	
• Deksametason and Prednison	31 (20,3)
• Dexamethasone and Methylprednisolone	122 (79,7)

Table 2. Increasing Intraocular Pressure (IOP) risk among patient

Increasing IOP	Average of IOP (mm/Hg)	Frequency (%)
Yes	29,4	13 (8.4)
No	16,7	140 (91.6)

The post-operative therapy was including dexamethasone as aye drop at dose of 1 mg/day, prednisone at 5 mg/ 2 days for oral consumption, and methylprednisolone for oral consumption at the dose of 8 mg/2 days. Table 2 shows the intraocular pressure (IOP) increased until 29.4 mm/Hg in 13 out of 153 patients (8.4%) who received the therapy.

4. Discussion

Female patients of cataract was higher than male, because sex is one of risk factors of cataracts. Menopausal women have a greater risk of cataracts than men as a result of their lower estradiol levels (Gupta *et al.,* 2014). Cataracts are a degenerative disease that can be affected by a number of variables, including age. It can be seen that patients with ages of 60-70 years old was the majority gropus who received the cataract surgery at KMU, Madura. Cataracts are an eye disorder caused by clouding of the normally transparent and translucent lenses. The result is impaired vision due to distorted objects. Vision disturbances that are not spontaneous. But gradually and can lead to blindness. Cataracts can be caused by a variety of factors and have varying densities, but they are typically associated with aging (Liu *et al.,* 2017).

The combination of dexamethasone and methylprednisolone was the most frequently prescribed corticosteroid for post-cataract surgery therapy, comparatively with the combination of dexamethasone and prednisone. After cataract surgery, topical corticosteroids are routinely used to treat inflammation Corticosteroids are reported to be more effective when there are no symptoms of inflammation detected by counting the number of flares in the anterior chamber. Corticosteroids decrease intraocular inflammation, as measured by the presence of frontal cells and flare reactions. Corticosteroids suppress cellular infiltration, capillary dilation, fibroblast proliferation, collagen depots, and, ultimately, scar formation as an anti-inflammatory mechanism at the tissue level. Corticosteroids stabilize intracellular and extracellular membranes and enhance the synthesis of the anti-inflammatory agent lipocortin at the cellular level. Lipocortin inhibits the enzyme phospholipase A2, preventing the formation of arachidonic acid from phospholipids (Pleyer *et al.,* 2013).

Corticosteroids' effectiveness as intraocular topical preparations are determined by their ability to permeate the cornea and the rate of intraocular metabolism. Corticosteroids must bind to intraocular target cells to accomplish this. Attachment of dexamethasone to the nuclear portion of conjunctiva and corneal epithelial cells was identified. Researchers discovered that dexamethasone binds to keratocytes

 https://doi.org/10.30659/sainsmed.v14i1.28054

and endothelial cells in blood vessels. By intravenous administration, dexamethasone can reach the trabecular meshwork, iris muscle, conjunctiva, choroid, retina, and sclera (Sherif and Pleyer, 2002).

Increased intraocular pressure (IOP) is a drug-related problem (DRP) which occurs after corticosteroid therapy in post-operative cataract patients. Utilisation of topical corticosteroids as post-cataract surgery caused an increase of intraocular pressure (IOP) at 8% patients. The IOP occurs within a week after treatment of highly potent corticosteroid, or after a month for less potent corticosteroid treatment. Cataracts can also be caused by topical, inhaled, or intranasal corticosteroids in the eye. Long-term corticosteroid use can be a risk factor of cataract in infants (Sen *et al.,* 2016).

Long-term use of topical corticosteroids on the face increase IOP and the risk of developing glaucoma. Continuous IOPelevation is an early indicator of glaucoma. Additionally, intraocular pressure can be used as an indicator of the efficacy of corticosteroid therapy without the adverse effect of elevated intraocular pressure—timolol therapy (Zhang G *et al.,* 2018).

In order to accomplish the desired therapeutic response, the administration of corticosteroid therapy in post-cataract surgery patients requires careful consideration of the corticosteroid type, dose, frequency, and route of administration. In order to enhance patient care, it is necessary to increase collaboration between physicians, pharmacists, and other health professionals in optimizing the use of corticosteroids after cataract surgery. The limitations of this study is the factors which are related to the IOP were not obeserved in this study.

5. Conclusions

The corticosteroids therapy for post-operative cataract patients should be managed properly to prevent the side effects of increasing intraocular pressure (IOP).

References

Bobrow, J.C. (2011). *Lens and Cataract.* American Academy of Ophthalmology, United States of America, 5-74.

Comstock, T.L, Paterno, M.R., Singh, A., Erb, T., and Davis, E. (2011). Safety and efficacy of loteprednol etabonate ophthalmic ointment 0.5% for the treatment of inflammation and pain following cataract surgery. *Clinical Ophthalmology,* 5(1): 177–186. Doi: 10.2147/OPTH.S16832.

Flesner, P., Andresen, J. L. and Hjortdal, J. (2014). Post-cataract prevention of inflammation and macular edema by steroid and non-steroidal anti-inflammatory eye drops: A systematic review. *Ophthalmology*, 121(10): 1915–1924. Doi: 10.1016/j.ophtha.2014.04.035.

Grzybowski, A. and Stephen Jae, K. (2016). Corticosteroids substituted by non-steroidal anti-inflammatory drugs: Is it justified by evidence-based medicine? *Journal of Cataract & Refractive Surgery,* 42(3): 510–511. Doi: 10.1016/j.jcrs.2016.02.028.

Gupta, V., Rajagopala, M. and Ravishankar, B. (2014). Etiopathogenesis of cataract: An appraisal. *Indian Journal of Ophthalmology,* 62(2): 103-110. Doi: 10.4103/0301-4738.121141.

Kindle, T., Ferguson, T., Ibach, M., Greenwood, M., Schweitzer, J., Swan, R., Sudhagoni, R.G, and Berdahl, J.P. (2018). Safety and efficacy of intravitreal injection of steroid and antibiotics in cataract surgery and trabecular micro bypass stent. *Journal of Cataract and Refractive Surgery,* 44(1): 91–97. Doi: 10.1016/j.jcrs.2017.10.040.

Laurell, C. (2002). Inflammatory response after cataract surgery. *Acta Ophthalmologica Scandinavica,* 76: 632-633. https://doi.org/10.1034/j.1600-0420.1998.760528.x

Liu, Y.C., Wilkins, M., Kim, T., Malyugin, B., and Mehta, J.S. (2017). Cataracts. *The Lancet*, 390(10094): 600–612. Doi: 10.1016/S0140-6736(17)30544-5.

Mutiarasari, D and Handayani, F. (2011). Katarak Juvenil. *INSPIRASI*, Xiv: 37–50.

Pleyer, U., Ursell, P. G. and Rama, P. (2013). Intraocular pressure effects of common topical steroids for post-cataract inflammation: Are they all the same?. *Ophthalmology and Therapy,* 2(2): 55–72. Doi: 10.1007/s40123-013-0020-5.

Riskesdas. (2013). Riset Kesehatan Dasar. Kementerian Kesehatan Republik Indonesia.

Sen, H.N., Abreu, F.M., Louis, T.A, Sugar, E.A, Altaweel, M.M, Elner, S.G., Holbrook, J.T., Jabs, D.A., Kim, R.Y., Kempen, J. H. (2016). Cataract surgery outcomes in Uveitis: The multicenter uveitis steroid treatment trial, *Ophthalmology*, 123(1): 183–190. Doi 10.1016/j.ophtha.2015.09.022.

Sheppard, J. D., Comstock, T. L. and Cavet, M. E. (2016). Impact of the topical ophthalmic corticosteroid loteprednol etabonate on intraocular pressure, *Advances in Therapy,* 33(4): 532–552. Doi: 10.1007/s12325-016-0315-8.

Sherif, Z. and Pleyer, U. (2002). Corticosteroids in ophthalmology: Past – present – future.

Ophthalmologica, 216(5): 305-15. Doi: 10.1159/000066189.

Solomon, K.D., Vroman, D.T., Barker, D., and Gehlken, J. (2001). Comparison of ketorolac tromethamine 0.5% and rimexolone 1 % to to control inflammation after cataract extraction Prospective randomized double-masked study. *Journal of Cataract & Refractive Surgery,* 27(8): 1232-1237. Doi: 10.1016/S0886-3350(00)00832-4.

Tamagawa-Mineoka, R., Yasuoka, N., Ueta, M., and Katoh, N. (2018). Influence of topical steroids on intraocular pressure in patients with atopic dermatitis. *Allergology International,* 67(3): 388–391. Doi: 10.1016/j.alit.2018.01.004.

World Health Organization (WHO). (2018). Blindness & vision impairment prevention. http://www.who.int/blindness/causes/priority/en/index1.html. Accessed 26 June 2022.

Zhang G, Liu S, Yang L, and Li Y. (2018). The role of dexamethasone in clinical pharmaceutical treatment for patients with cataract surgery. *Experimental and Therapeutic Medicine*, 15(2): 2177-2181. https://doi.org/10.3892/etm.2017.5639.