



ASSESSMENT OF CHANGE IN INTRAOCULAR PRESSURE WITH TOPICAL DEXAMETHASONE THERAPY AFTER UNEVENTFUL PHACOEMULSIFICATION SURGERY.

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ABSTRACT

INTRODUCTION: Cataract surgery elicits a surgical inflammatory response. While often of a temporary nature, ocular inflammation that occurs after cataract surgery has the potential to result in problems. Prophylactic administration of anti-inflammatory drugs is often used. Topical corticosteroids are often used as anti-inflammatory medicines during cataract surgery. **OBJECTIVE:** To measure the mean change in intraocular pressure with topical dexamethasone therapy after uneventful phacoemulsification surgery. **METHODOLOGY:** The cross-sectional research was conducted at the Khyber Institute of Ophthalmic Medical Sciences KIOMS, located inside the Hayatabad Medical Complex in Peshawar, Pakistan. The investigation took place between May 01, 2017, and October 31, 2017. The research consisted of individuals who had phacoemulsification, a surgical procedure including the removal of the lens and implantation of an intraocular lens, all performed by a single surgeon. The measurement of intraocular pressure IOP was conducted on the preoperative day using a Goldmann applanation tonometer, which served as the baseline assessment. The patients were administered topical eye drops containing dexamethasone 0.1% and moxifloxacin 0.5% in order to effectively control postoperative inflammation. A further evaluation was conducted on the 30th day after the surgical procedure, during which the intraocular pressure IOP was reassessed. **RESULTS:** The study included a cohort of 182 individuals, including 106 men and 76 females, resulting in a male-to-female ratio of 1.4:1. The mean age was determined to be 59.93 ± 5.961 years using calculations. The initial intraocular pressure IOP values varied between 12.00 mmHg and 20.00 mmHg, with an average IOP of 15.12 ± 1.992 mmHg. On the thirtieth day after the surgical procedure, the intraocular pressure IOP was observed to vary between 12.00 mmHg and 28.00 mmHg, with an average value of 17.04 ± 3.392 mmHg. In the present investigation, a total of 12 patients had a rise in intraocular pressure IOP over 10 mmHg compared to their baseline levels before to the surgical intervention. A statistically significant rise in mean intraocular pressure IOP of 1.923 ± 3.253 mmHg was detected compared to the baseline measurement $p < 0.05$. **CONCLUSION:** The findings of this investigation demonstrate a correlation between the use of topical dexamethasone during cataract surgery and a heightened likelihood of high intraocular pressure. Therefore, it is crucial to investigate alternate options that are more secure.

KEYWORDS: Intraocular pressure, topical dexamethasone, phacoemulsification.

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INTRODUCTION

Phacoemulsification, which is now the predominant technique for cataract removal in both industrialized and many developing nations, is known to elicit a surgical inflammatory reaction that may result in ocular problems after the procedure¹. The

consequences associated with this condition are corneal edema, spikes in intraocular pressure IOP, cystoid macular edema CME, and posterior capsule opacification. In order to get the most favorable results after a surgical procedure, it is customary to provide prophylactic anti-inflammatory drugs^{2,3}.

Currently, there are two primary classifications of medicines used for the treatment of ocular inflammation: corticosteroids and nonsteroidal anti-inflammatory drugs NSAIDs². Although topical corticosteroids play a crucial role in the management of post-operative inflammation, their extended use is associated with potential adverse consequences, including increased intraocular pressure IOP, development of cataracts, and reduced susceptibility to infections⁴. Corticosteroids elicit physiological alterations within the trabecular meshwork, resulting in heightened resistance to aqueous outflow and consequent rise of intraocular pressure IOP⁵. If left unregulated, this condition may progress to corticosteroid-induced glaucoma⁶.

Previous studies have shown diverse intraocular pressure IOP results in individuals who have cataract surgery and receive topical dexamethasone treatment⁷. Merkoudis et al, along with other researchers, conducted studies that revealed no disparities in the average intraocular pressure IOP over a one-month period of topical dexamethasone administration in comparison to the initial measurements⁸. On the other hand, several investigations have emphasized the presence of statistically significant increases in intraocular pressure IOP after surgical procedures. Several factors may influence changes in intraocular pressure IOP, including the selection of steroid medication and the concurrent use of nonsteroidal anti-inflammatory drugs NSAIDs⁹.

Recent research findings suggest that newer steroids, such as rimexolone and loteprednol etabonate, are less likely to cause a clinically significant increase in intraocular pressure IOP compared to older-generation steroids¹⁰. Moreover, empirical research suggests that the use of topical nonsteroidal anti-inflammatory drugs NSAIDs, such as bromfenac sodium, is efficacious in the prevention of inflammation and macular edema, while exhibiting a comparable safety profile to that of steroids¹¹. These data indicate a possible transition towards the use of nonsteroidal anti-inflammatory drugs NSAIDs in post-operative care. The purpose of this research is to quantify the average change in intraocular pressure IOP resulting from the use of topical dexamethasone treatment after simple phacoemulsification surgery. The justification for this rests in comprehending the possible intraocular pressure IOP influence of dexamethasone, a medication often used after cataract surgery. Acknowledging the potential for raised intraocular pressure IOP to give rise to various consequences, the findings of this research possess the capacity to contribute to health planning efforts and promote the use of alternative therapeutic approaches, such as loteprednol and non-steroidal anti-inflammatory drugs NSAIDs, which are recognized for their comparatively safer IOP profiles.

MATERIALS and METHODS

Setting: The research was carried out at the Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences KIOMS, located inside the premises of Hayatabad Medical Complex in Peshawar.

Duration of Study: The study was conducted between May 01, 2017, and October 31, 2017.

Study Design: A Cross-Sectional Study was conducted to examine the effects of topical dexamethasone medication on intraocular pressure after uneventful phacoemulsification surgery.

Sampling Technique: The researchers used a non-probability sequential sampling method to recruit volunteers.

Sample Size: The determination of the sample size was conducted using the World Health Organization WHO calculator, taking into account essential parameters such as the mean baseline intraocular pressure 14.60 ± 2.366 , the mean intraocular pressure one month after phacoemulsification with topical dexamethasone therapy 15.39 ± 2.986 , a significance level of 5%, and a statistical power of 80%. The necessary sample size for this study was determined to be 182 individuals.

Inclusion Criteria:

Individuals diagnosed with primary age-related cataract, falling within the age bracket of 40 to 70 years.

- Individuals of both sexes.
- Instances of uncomplicated phacoemulsification surgical procedures.
- The pre-operative intraocular pressure IOP is within the established normal range of 11-21 mmHg.

Exclusion Criteria:

- Individuals diagnosed with glaucoma.
- Individuals who possess other ocular comorbidities in addition to cataract.
- Individuals who have a documented hypersensitivity to dexamethasone.

The aforementioned circumstances were regarded as possible confounding factors that may induce bias into the findings of the research if they were included.

Data Collection Procedure:

Prior to commencement, the research obtained ethical clearance from the institutional ethics committee at the hospital. Patients who met the specified inclusion and exclusion criteria and were deemed eligible were recruited from the outpatient department. Prior to their participation, informed written agreement was obtained from these patients. The collection of personal biodata was conducted using a pre-designed proforma.

A thorough medical history was obtained, followed by detailed exams of the anterior segment and fundus with slit lights and indirect ophthalmoscopy. The baseline reference for pre-operative intraocular pressure IOP was determined by measuring it using the Goldmann applanation tonometer. The phacoemulsification procedures were conducted by a single skilled surgeon, who also performed intraocular lens insertion, while the patients were under peribulbar anesthesia. Following the surgical procedure, patients were administered topical dexamethasone 0.1% drops for a duration of 30 days. The administration schedule included applying the drops every 2 hours during the first three days after surgery, followed by four times a day until the 30th day after the operation in order to

mitigate inflammation. In addition, a regimen of topical moxifloxacin 0.5% eye drops was provided at a frequency of four times per day for a period of 30 days. Intraocular pressure measurements were performed on the 30th day after the surgery using the Goldman applanation tonometer. The researcher obtained measures of intraocular pressure both before and after the surgical procedure.

Data Analysis

The data were subjected to analysis using SPSS software, specifically version 20. Categorical and continuous variables were subjected to descriptive statistical analysis, which included the calculation of frequency, percentages, mean, and standard deviation. The use of paired t-tests was performed in order to evaluate the statistical significance of comparisons between means. A p-value below the threshold of 0.05 was deemed to possess statistical significance. The results were shown using visual aids such as graphs, tables, and figures.

RESULTS

The present investigation was carried out at the Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar. A cohort of 182 patients was included in the research for observation and analysis. The individuals in question underwent a surgical procedure known as phacoemulsification. The computed mean age of the patients was 59.93 ± 5.96 years. The age distribution is shown in Table 1.

The analysis of gender distribution revealed that out of the total sample size of 182 patients, 106 were

identified as men, accounting for 58% of the population. Conversely, the remaining 76 patients were identified as females, constituting 42% of the population. This results in a male to female ratio of 1.4:1, as visually shown in Figure 1. There were no instances in which a patient was removed from the research.

The pre-operative intraocular pressure IOP was assessed using the Goldman applanation tonometer and served as the baseline measurement. The baseline intraocular pressure IOP fell within the established normal range of 11.00 mmHg to 21.00 mmHg, specifically ranging from 12.00 mmHg to 20.00 mmHg. The average IOP was calculated to be 15.12 ± 1.99. The intraocular pressure IOP was reassessed on the 30th day after the surgery, using the Goldman applanation tonometer, with the measurement being conducted by the same operator. The recorded readings exhibited a range of values spanning from 12.00 mmHg to 28.00 mmHg, with a calculated mean of 17.04 ± 3.39. A total of 12 patients exhibited a clinically significant increase in intraocular pressure IOP on the 30th day after their surgical procedure, with an IOP elevation above 10 mmHg compared to their preoperative baseline measurement.

The average baseline intraocular pressure IOP and average IOP on the 30th day after surgery are shown in Table 2. A statistically significant rise in intraocular pressure IOP was observed, with a mean change from baseline of 1.92 ± 3.25 mmHg p = 0.000 as shown in Table 2.

Table 1: Age wise distribution of the participants

Age Years	Frequency	Percentages
51-55	52	28.6%
56-60	48	26.4%
61-65	41	22.5%
66-70	41	22.5%
Total	182	100%

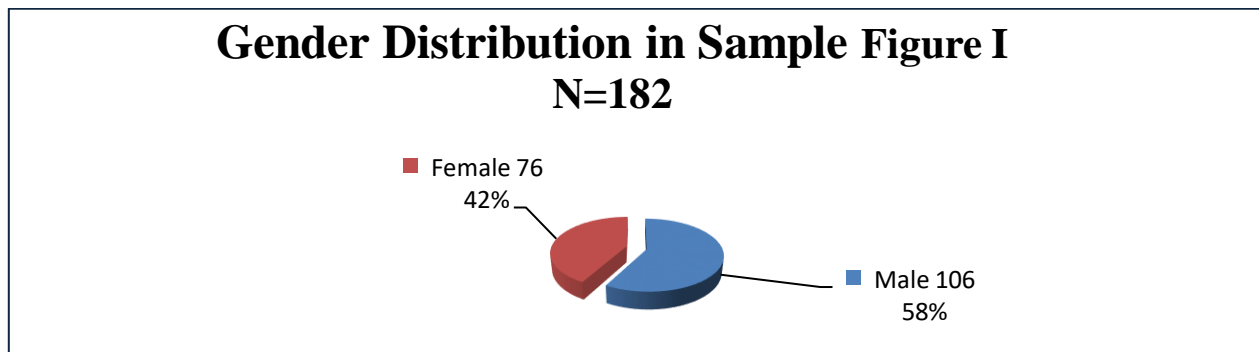


Figure 1: Gender wise distribution of the participants

Table 2: Paired Sample T-Test of Baseline and Post-Op IOP

Baseline/Post-op	Mean IOP mmHg	Std. Deviation	P-value
IOP Baseline	15.12	1.99	0.00
IOP 30 th post-Op Day	17.04	3.39	
Mean Change Post-Op – Baseline	1.92	3.25	

DISCUSSION

Cataract surgery, a frequently performed ophthalmic operation, initiates a surgical inflammatory reaction that, although often resolving on its own, has the potential to result in post-operative problems including corneal edema, spikes in intraocular pressure IOP, cystoid macular edema CME, and posterior capsule opacification¹². The practice of administering preventive anti-inflammatory medicines after uncomplicated cataract surgery has been widely accepted and established¹³. Currently, ocular inflammation is managed by the use of two main medication categories: corticosteroids and nonsteroidal anti-inflammatory medicines NSAIDs¹⁴. The use of topical corticosteroids is widespread in the management of inflammation affecting the ocular surface and anterior region. Nevertheless, the prolonged use of topical steroids may lead to negative consequences, such as increased intraocular pressure IOP, the development of cataracts, and diminished ability to fight infections¹⁰. The rise of intraocular pressure IOP generated by corticosteroids is attributed to the structural modifications occurring in the trabecular meshwork, which subsequently increase the resistance to aqueous outflow. This phenomenon has the potential to cause corticosteroid-induced glaucoma¹⁵.

The objective of this research was to investigate the effects of topical dexamethasone medication on intraocular pressure subsequent to a thirty-day period after uneventful phacoemulsification surgery. The research included a total of 182 participants, with a male-to-female ratio of 1.4:1 and an average age of 59.93 ± 5.961 years. The preoperative baseline intraocular pressure IOP was recorded, after which uncomplicated phacoemulsification procedures were performed, including intraocular lens installation. The intraocular pressure IOP after surgery was measured and documented on the 30th day. The findings of the study revealed that the initial intraocular pressure IOP measurements varied between 12.00 mmHg and 20.00 mmHg, with an average value of 15.12 ± 1.992 mmHg. On the 30th day after the surgical procedure, the intraocular pressure IOP was observed to vary between 12.00 mmHg and 28.00 mmHg, with an average value of 17.04 ± 3.392 mmHg. It is worth mentioning that a total of 12 participants in the study had a clinically significant increase in intraocular pressure IOP of more than 10 mmHg compared to their first baseline measurement. The research revealed a statistically significant average rise in intraocular pressure IOP compared to the first measurement, with a mean increase of 1.923 ± 3.253 mmHg $p < 0.001$.

The outcomes of this study are consistent with previous research. Laurell and Zetterstrom year documented a statistically significant rise in the average intraocular pressure IOP subsequent to the administration of dexamethasone treatment subsequent to phacoemulsification surgery, which aligns with the findings seen in the present investigation^{16,17}. Holland et al. have also reported the occurrence of high intraocular pressure IOP after surgical procedures, indicating the presence of similar patterns¹⁸. Merkoudis et al. year observed a lack of statistical significance in the average

intraocular pressure IOP when comparing pre- and post-cataract surgery conditions in patients treated with topical dexamethasone treatment¹⁹. Several other studies have reported similar findings, showing that the mean intraocular pressure IOP changes ranged from 14.60 ± 2.36 to 15.39 ± 2.98 . Additionally, these investigations observed instances when the IOP exceeded normal levels²⁰. Various comparative studies have shown that early-generation steroids, such as dexamethasone and prednisolone, have a higher propensity to cause clinically significant elevations in intraocular pressure IOP when compared to more recent steroids like rimexolone and loteprednol etabonate. According to Kessel et al, the authors suggest the use of topical nonsteroidal anti-inflammatory drugs NSAIDs rather than steroids after cataract surgery. They argue that topical NSAIDs are effective in reducing inflammation and macular edema without a significant increase in the likelihood of adverse effects²¹. Furthermore, the study conducted by Wang et al. yielded the conclusion that bromfenac sodium, classified as a nonsteroidal anti-inflammatory drug NSAID, exhibited superior efficacy and safety compared to alternative corticosteroids. This finding emphasizes the need of assessing novel corticosteroids and NSAIDs to ensure optimum levels of safety²².

Conclusively, this research highlights the possible increase in intraocular pressure IOP that may occur as a result of using topical dexamethasone treatment after cataract surgery. The results are consistent with previous studies, highlighting the need of evaluating changes in intraocular pressure IOP and investigating alternate treatment options. It is advised that further research be conducted on newer corticosteroids and nonsteroidal anti-inflammatory drugs NSAIDs in order to determine the optimal and most secure therapeutic alternatives for treating ocular inflammation.

CONCLUSION

In summary, this research emphasizes the possible hazard of increased intraocular pressure linked to the use of topical dexamethasone after cataract surgery. The aforementioned results underscore the need of investigating other methods for managing post-operative inflammation that are less hazardous. Given the potential impact on visual health, it is essential for healthcare professionals to thoroughly evaluate the advantages and drawbacks associated with dexamethasone treatment in relation to ocular issues resulting from heightened intraocular pressure. This study highlights the significance of continuous research in the identification of different anti-inflammatory solutions that mitigate the potential increase in intraocular pressure. This research contributes to making informed decisions and enhancing patient outcomes in the context of cataract surgery.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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