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Comparative Study on the Complication of Post-Operative Cataract Surgery in Rural and Urban Areas: A Hospital-Based Study



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ABSTRACT

Purpose: To find out comparison for the complication of post-operative cataract surgery comparison between rural and urban areas. **Methodology:** A prospective, randomized, comparative, cross-sectional study, the sample size of 44, studied under two subgroups, urban and rural. Post-operative observation made on the astigmatic type of refractive error, corneal edema, iris prolapse, nuclear drop and retinal detachment. **Results:** 44 patients were concluding in the study, among them 21 (47.72 %) were from the rural area and 23 (52.27 %) from the urban area further 18 (40.90 %) males, 26 (59.09 %) females, respectively was there. VA (Visual Acuity) for maximum case selection was HM to 5/60 for 14 (31.81%) and 6/60 to 6/24 for 23 (52.27%) with the condition of normal fundus detail. The output VA was 6/18 to 6/12 for 14 (31.81%) cases and 6/9 to 6/6 was for 26 (59.09%). The operated case has PSC (Posterior Sub-Capsular Cataract) in 9 (20.45%), NS in 21(47.72%) and PSC with NS (Nuclear Sclerosis) in 14 (31.81%). The complications were recorded more in females of rural area. The total complications conclude astigmatism in 30 (68.18%), corneal edema in 4 (9.09%), iris prolapse in 1 (2.27%) and RD (Retinal Detachment) in 1 (2.27%) case. **Discussion:** There is a significant difference between patients of urban and rural areas. The patients above 60 years of age were most affected with cataract. The postoperative complications are supposed due to lack of basic facilities, proper hygiene, and social support either by their family or by the neighbours. **Conclusion:** In rural area patients, postoperative complications were noted more in comparison of urban areas.

INTRODUCTION:

A cataract is an opacification of the crystalline lens that leads to visual impairment.[1] According to National Blindness and visual impairment Survey India 2015-19, cataract is the leading cause of blindness in people above the age of 50 years. The data of the survey shows 66.2% blindness cases, 80.7% severe visual impairment cases, and 70.2% moderate cases [2], though it varies across the region.[3,4]

A patient's visual function is an essential measurement for the vision and on behalf of proper visual function; he or she can do social tasks independently. The cataract is one of the most affecting factors to the vision, and cataract surgery has its importance to the restoration of vision. The impact on visual function has become a significant factor in evaluating the outcome of surgical interventions.

Cataract surgery is the procedure that is most world widely performed. It may be considered among the most successful treatment. In India, near about 65 lakh, cataract surgeries are performed, and the data expresses the ratio of more than 5000 surgeries per million populations every year. [6]

However, globally in the most developing countries, the issues with poor outcomes are ranging from as low as 11.4% to as high as 44%. [9-24] Most of these study settings were rural [11-13,16,17,19,23], or mix of rural or urban population [14,15,18,20-22,24] and very few were urban. [9,10] Some risk factors identified in some studies included increasing age [12,15], having no education [15,17,18], female gender [9,14], presence of aphakia [9,17,18], operated in government sector [15,17], rural residence [14,15,17,18] and having free surgery. [12,17]

The maximum cases of blindness in both urban and rural areas were reported due to posterior segment disorder, uncorrected aphakia, and post-surgery-related complications. This was similar to other studies in India too. [9,14,17,18,25,28,29]

Regarding the poor outcome of cataract surgery, there are national policies to rehabilitate the patients and to chase the operating target. [9,14,25,26] The Postoperative complications are as endophthalmitis, iris prolapse, subluxated intraocular lens, or wound dehiscence after the cataract surgery, led to poor outcome, resulting in visual impairment. [27]

‘Camp based surgeries’ have given way to ‘hospital-based surgeries’ in India, which resulted in better outcomes after cataract surgery, over time.[12,14] Some of the studies, i.e., population-based [29,30] and camp or hospital-based, have been published on the same.[28,31,32]

However, recent decades have witnessed technological advances in cataract surgery.[7] Advancement started from intracapsular cataract extraction (ICCE) for aphakia to spectacle correction with phacoemulsification and small incision cataract surgery (SICS) including intraocular lens (IOL) implantation, and more recently, the elevated femtosecond laser-assisted cataract surgery (FLACS) is the most popular procedure.[8]

MATERIAL AND METHODS:

This prospective, randomized, comparative, cross-sectional study was conducted with the departmental approval in February 2020.

The study adult subjects were consecutively recruited, aged between 50-80 years who underwent evaluation for cataract surgery at Venu Eye Institute and Research Centre, New Delhi. Each individual was free to decide to participate in the study with informed consent.

The sample size was 44 patients, and a standardized protocol was used to interview the patients and to conduct a comprehensive ophthalmic examination.

The vision assessment (VA) was measured using a 6-meter Snellen’s acuity chart. All measurements were taken in full daylight with best-corrected visual acuity (BCVA). The pinhole vision was taken for those having VA, 6/18, or low. The slit-lamp examination was done for each patient, and cataract grading was recorded as per LOCS (Lens Opacities Classification System) III grading classification guidelines.

The exclusion criteria included refractive surgery, any active disease like uveitis, corneal or retinal pathology that could alter the aim of this study, and abnormal structure, such as phacodonesis, keratoconus, etc. Systemic illnesses such as diabetes mellitus, hypertension patients were involved in this study that did not have any fundal changes. After an extensive slit-lamp examination and ruling out other pathology, the patient was sent for biometry imaging. A single trained optometrist took all readings of biometric readings.

Surgery was done under proper sterilization. The Phacoemulsification was done with Zeiss Visalis 500, and the microscope used in this surgery was Zeiss Lumera. A post-operative regimen was prescribed. The patients were called regularly for follow up for the visual assessment, slit-lamp biomicroscopy, and non-contact tonometry (NCT). Post-operatively, on the 2nd follow up, the patient's subjective refraction was done to prescribe spectacle if needed.

Regarding the interventional part, involved in this study, and the patient who need services of the vitreoretinal, the super-speciality procedure, is covered by the ophthalmic surgeon. The related data of such patient is concluded here for making analysis only.

RESULTS:

The sample size was 44 patients and was distributed in different three age groups of 50 to 60, 61 to 70, and 71 to 80. The first age group concludes 12 subjects with 8 male including Mean±S Dev 0.72±1.14 and 4 females including Mean ± S Dev 0.36±0.57. The second age group concludes 17 subjects with 6 male including Mean±S Dev 1.20±0.44 and 11 females including Mean ± S Dev 1.57±0.78 and the third age group concludes 15 subjects with 4 male including Mean±S Dev 1.33±0.57 and 11 females including Mean ± S Dev 1.10±0.40. (Table 1 and 2).

Demographically 44 patients were concluding of 18 (40.90 %) males, 26 (59.09 %) females, among them 21 (47.72 %) were from the rural area and 23 (52.27 %) from the urban area. (Table-1 and 3), (Histogram-1 and 2).

In the demographic profile, the 23 urban group participants further subdivided into 10 (43.47 %) male and 13 (56.52%) female while 21 rural group subjects are subdivided into 6 (28.57 %) male and 15 (71.42 %) female. (Table-4 and 5), (Histogram-3 and 4).

The systemic disorders were observed in 19 patients, although their fundus study found normal. The Diabetic patients were 9 (20.45%), Hypertensive patients were 7 (15.90%) and affected with the other systemic disorders the patient count was 3 (6.81%). Rest 25 patients (56.81%) were found normal. (Table-6) (Histogram-5).

The pre-operative Visual Acuity status for the cataract surgery is observed under three subcategories, including with and without systemic illness and onward Hand Movement (HM) to 5/60 are 14 (31.81 %) cases, 6/60 to 6/24 are 23 (52.27 %), and 6/18 to 6/12 are 7 (15.90 %). In the pre-operative status

maximum frequency of 23 (52.27%) cases found in the category of visual acuity of 6/60 to 6/24. (Table-6), (Histogram 5).

The post-operative Visual Acuity status is also observed under three subcategories, including with and without systemic illness and onward 6/36 to 6/24 are 4 (9.09 %) cases, 6/18 to 6/12 are 14 (31.81 %), and 6/9 to 6/6 are 26 (59.09 %). The maximum frequency of visual acuity in postoperative is found in 26 (59.09%) cases for the category 6/9 to 6/6. (Table-6), (Histogram-6).

The total sample size of 44 patients has been subcategorized in different grades of three significant cataract subtypes observed by slit lamp on the bases of the LOCS III system. The PSC is counted 9 (20.45%), the NS is counted 21 (47.72%), and PSC with NS is counted 14 (31.81%). (Table-7), (Histogram-7).

The performed procedure for the total sample size includes phacoemulsification for 21 (47.72 %) patients among them 12 (60%) from urban and 9 (37.5 %) from the rural area, the SICS was for 19 (43.18 %) patients among them 8 (40 %) from urban and 11 (45.83 %) from the rural area, ECCE was for 3 (6.81 %) patients from the rural area. ICCE was for 1 (2.27%) patient from the rural area. (Table-8), (Histogram-8).

The conducted procedures, like Phacoemulsification, SICS, and ECCE for IOL implantation make success over the 42 (95.45 %) subjects while remaining 2 (4.54 %) considered as for the aphakia. However, one case of them can be managed for implantation through ACIOL. This way, the total cases 43 (97.7 %) are managed for IOL implantation and 1 (2.27%) case could not be arranged for the implantation. (Table-9), (Histogram-9,10).

The Post-Operative complications are noted in the form of astigmatic type of refractive error, corneal edema, Iris Prolapsed, Nuclear Drop and Retinal Detachment. (Table-10), (Histogram-11).

Out of 21 (47.72 %) cases handled with phacoemulsification, the astigmatic error is noted in 11 (25.0%) subjects of Urban and Rural areas. Other 5 (45.45 %) urban area cases conclude 3 males and 2 females, while 6 (54.54 %) rural area cases conclude 2 males and 4 females. (Table-11).

The 19 (43.18 %) cases were handled with SICS the astigmatic error is noted in 15 (34.09%) subjects of Urban and Rural areas. Other 9 (60.00 %) urban area cases conclude 3 males and 5 females, while 6 (40.0 %) rural area cases conclude 2 males and 1 female. (Table-11)

The 3 (6.81 %) cases were handled with ECCE, and the astigmatic error is noted in all the 3 (6.81 %) subjects of the Urban and Rural areas. Further 1 (33.33 %) urban area case concludes 1 male, while 2 (66.66 %) rural area cases conclude 2 females. (Table-11)

Out of 19 (43.18 %), the corneal edema is noted with SICS in 2 (4.54 %) cases, among them Urban and Rural area cases are 1(100 %) for each, respectively. Further 1 (100 %) male in the urban area and 1 (100 %) female in the rural areas. The cases of ECCE 3 (6.81 %) and ICCE 1 (2.27%) also exhibit 1 (100 %) female case in rural areas. (Table-12)

The complication of Iris Prolapsed has concerned with 2 (4.54%) subjects, and both are females of rural area. Iris repositioning with centration of IOL was done in the patients. The nuclear drop has a concern for 1 female patient in a rural area. (Tab 14) and it was managed by pars plana vitrectomy (PPV) with silicone oil insertion (SOI) because of retinal detachment in the same eye, after a few days later of pars plana vitrectomy (PPV). (Table-13, -14 and 15)

So, among 44 subjects, surgical complications were seen in 8 (18.18 %), and postoperative astigmatic refractive error is seen in 30 (68.18 %) cases. (Table-17) Furthermore, rural subjects outnumbered urban subjects. The most common complications among them were astigmatism and corneal edema with slight pain and congestion. The Phacoemulsification procedure was fewer complications among all. (Table-16)

DISCUSSION:

The Post-Operative surgical complications of cataract surgery depend on the lens calculation, applied surgical methods, the skill of the surgeon, and the care taken by the patient for himself.

Post-operatively, corneal edema is very common and usually becomes mild and transient, but if the endothelial cells layer causes the improper function of the cells due to damage, then clarity of the cornea and vision is decreased. In the study, it is observed that 4 (9.09 %) cases were affected by corneal edema, and it was recovered within a week.

Posterior capsular rent (PCR) is the most common issue, potentially sight-threatening intra-operative complication during cataract surgery. With the additional surgical procedures and on postoperative follow-up visits, the patient's vision may impair. Unfortunately, there was no case of posterior capsular rent.

Post-operative retinal detachment is uncommon, and the risk can be avoided if a preoperatively thorough fundus examination is done to observe lattice degeneration and other retinal changes. In our study on the bases of the pre-operative aspect, there was no case for retinal detachment, but it was found post-operatively due to other reasons.

A nucleus drop is caused due to an anterior capsule rim tear that can extend up to the posterior capsule to cause a posterior tear. Posterior capsule tears are associated with deepening of the anterior chamber, an unstable lens, dilating, or irregular shape pupil contour. In our study, one case of aphakia is presented due to nuclear drop. However, it was managed by pars plana vitrectomy (PPV), after a few days later fundus examination confirmed the retinal detachment so silicone oil insertion (SOI) is done. After completing the total recovery time, it was decided to leave that eye as an aphakic.

Hyphema with keratitis with high IOP (>25 mm hg) for more than 5 days causes corneal blood staining and causes the poor visual outcome. In the case of hyphema, maximal medical and surgical effort should be made to prevent corneal blood staining as it would lead to corneal opacity, and the severe case can lead to corneal implantation. There was no issue related to the hyphema in our study.

In developed countries, Phacoemulsification (PHACO) is considered as the standard method for cataract surgery. Conventional extra-capsular cataract extraction (ECCE) has more rate of induced astigmatism than small- incision cataract surgery (SICS) and less often used nowadays. Our study also reflects the positive outcome of 'phaco' is more than that in comparison with other techniques.

The surgical technique to be used and the choice of the intraocular lens to be implanted should be tailored to patients' parameters and refractive needs that can be determined by a good history and comprehensive eye examination followed by appropriate IOL power measurements. The postoperative aim should be emmetropia for the majority of cases. In this study, it is found that 68.18% of subjects have an astigmatic type of error, while most of the cases get operated through phacoemulsification and SICS technique. Rest 31.81 % of subjects are found free of refraction for their distance vision or with a lower amount of alone spherical or alone cylindrical value and not considered in this study.

So, as to the medical concern, it is important to aware of peoples for the postoperative complications; therefore, complications may be managed to emphasize the visual acuity and to make help decrease of global blind ratio.

The posterior segment disorder, uncorrected aphakia, and surgery-related complications are considered as the unique cause of blindness in both urban and rural areas. This was similar to other studies in India too. [9,14,17,18] Our study findings emphasize those reported by the other studies [9,14,25], recapitulating the need for appropriate refraction and prescription of glasses following cataract surgery. Poor outcomes due to the uncorrected refractive error will remain a major cause of poor post-operatively visual outcome after cataract surgery.

Finally, we found that cataract is the most commonly performed surgery nowadays had some complications in every method. As the technology is advancing and newer techniques are coming, the rate of complications is also decreasing. The urban area patients above 60 years of age were most affected may be due to their lifestyle, and they felt more prone to develop a cataract. In rural area patients, complications were noted more in comparison of urban areas, and it is supposed to lack necessary facilities and support which should be provided by their families and surroundings.

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Table No. 1: Details of different age groups

AGE GROUPS	TOTAL COUNT	MALE	FEMALE
50-60	12	8	4
61-70	17	6	11
71-80	15	4	11
TOTAL	44	18 (40.90 %)	26 (59.09 %)

Table No.2: volumetric analysis of age groups

AGE GROUPS	GENDER	MEAN ± STD DEV
50-60	MALE	0.72±1.14
	FEMALE	0.36±0.57
61-70	MALE	1.20±0.44
	FEMALE	1.57±0.78
71-80	MALE	1.33±0.57
	FEMALE	1.10±0.40

Table No.3: Demographic details

Total Number of patients	Urban	Rural
44	23 (52.27 %)	21 (47.72 %)

Table 4: Urban Area Details

Patient count in Urban Area	Male	Female
23	10 (43.47 %)	13 (56.52 %)

Table No.5: Rural Area Details

Patient count in Rural Area	Male	Female
21	6 (28.57 %)	15 (71.42 %)

Table No. 6: Systemic state with Pre- and Post- Operative Visual Acuity

Systemic illness	Total	Pre Op Visual Acuity			Post Op Visual Acuity		
		H.M.-5/60	6/60-6/24	6/18-6/12	6/36-6/24	6/18-6/12	6/9-6/6
Diabetes mellitus	9 (20.45%)	3 (21.42%)	4 (17.39%)	2 (28.57%)	1 (25 %)	5 (35.71%)	3 (11.53%)
Hyper tension	7 (15.90%)	2 (14.28%)	4 (17.39%)	1 (14.28 %)	1 (25 %)	2 (14.28%)	4 (15.38%)
Other	3 (6.81%)	2 (14.28%)	1 (4.34%)	0 %	0%	2 (14.28%)	1 (3.84%)
Normal	25 (56.81%)	7 (50.0%)	14 (60.86%)	4 (57.14 %)	2 (50%)	5 (35.71%)	18 (69.23%)
TOTAL	44 (100%)	14 (31.81%)	23 (52.27%)	7 (15.90%)	4 (9.09%)	14 (31.81%)	26 (59.09%)

Table No.7: Different Types of Cataract

Types of Cataract	PSC	NS	PSC with NS
numbers	9 20.45%	21 47.72%	14 31.81%

Table No. 8: Different Procedures for Cataract surgery

Pseudophakic Eye	42 95.45 %
Aphakic Eye	2 4.54 %

Table No. 9: Postoperative Status of the eye

Types of surgery	PHACO	SICS	ECCE	ICCE
Total patients	21 47.72 %	19 43.18 %	3 6.81 %	1 2.27 %
Urban	12 60 %	8 40 %	0	0
Rural	9 37.5 %	11 45.83 %	3 12.50 %	1 4.16 %

Table No.10 Post-Op Complication

COMPLICATIONS	Patient Count	Percentage
Astigmatism	30	68.18 %
Corneal Oedema	4	9.09 %
Iris Prolapsed	2	4.54 %
Nuclear Drop	1	2.27 %
Retinal Detachment	1	2.27 %

Table No.11:Post-op Complication: Astigmatism

Astigmatism				
Procedure	Total	Socio-economic status	Gender	count
PHACO	11 (25.0%)	Urban 5 (45.45 %)	Male	3
			Female	2
		Rural 6 (54.54 %)	Male	2
			Female	4
SICS	15 (34.09%)	Urban 9 (60.00 %)	Male	4
			Female	5
		Rural 6 (40.00 %)	Male	3
			Female	3
ECCE	3 (6.81%)	Urban 1 (33.33 %)	Male	1
			Female	0
		Rural 2 (66.66 %)	Male	0
			Female	2
ICCE	1 (2.27%)	Urban 0	Male	0
			Female	0
		Rural 1 (100 %)	Male	0
			Female	1

Table No.12:Post-op Complication: Corneal oedema

Corneal Oedema				
Procedure	Total	Socio-economic status	Gender	count
PHACO	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
SICS	2 (4.54%)	Urban 1 (50.0 %)	Male	1
			Female	0
		Rural 1 (50.0 %)	Male	0
			Female	1
ECCE	1 (2.27%)	Urban 0	Male	0
			Female	0
		Rural 1 (100 %)	Male	0
			Female	1
ICCE	1 (2.27%)	Urban 0	Male	0
			Female	0
		Rural 1 (100 %)	Male	0
			Female	1

Table No.13: Post-op Complication: Iris Prolapsed

Iris Prolapsed				
Procedure	Total	Socio-economic status	Gender	count
PHACO	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
SICS	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
ECCE	2 (4.54%)	Urban 0	Male	0
			Female	0
		Rural 2 (100 %)	Male	0
			Female	2
ICCE	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0

Table No.14: Post-op Complication: Nuclear Drop

Nuclear Drop				
Procedure	Total	Socio-economic status	Gender	count
PHACO	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
SICS	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
ECCE	1 (2.27%)	Urban 0	Male	0
			Female	0
		Rural 1 (100 %)	Male	0
			Female	1
ICCE	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0

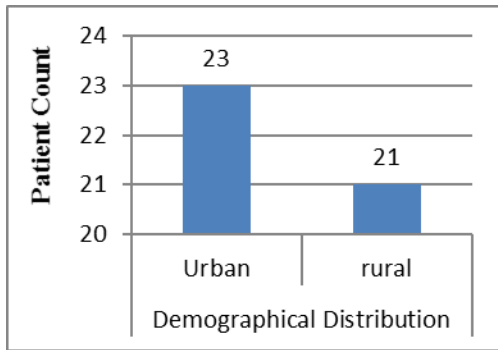
Table No. 15: Post-op Complication: Retinal Detachment

Retinal Detachment				
Procedure	Total	Socio-economic status	Gender	count
PHACO	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
SICS	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0
ECCE	1 (2.27%)	Urban 0	Male	0
			Female	0
		Rural 1 (100 %)	Male	0
			Female	1
ICCE	0	Urban 0	Male	0
			Female	0
		Rural 0	Male	0
			Female	0

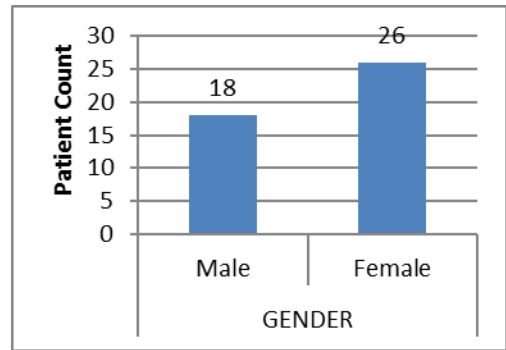
Table No.16: summary of Post-op Complication

Refractive Complication 30 (68.18%)				Surgical Complications 8 (18.18 %)															
Astigmatism				Corneal Oedema				Iris Prolapsed				Nuclear Drop				Retinal Detachment			
30 68.18%				4 9.09%				2 4.54%				1 2.27%				1 2.27%			
Urban		Rural		Urban		Rural		Urban		Rural		Urban		Rural		Urban		Rural	
15 (50.0%)		15 (50.0%)		1 (25.0%)		3 (75.0%)		0		2 (100%)		0		1 (100%)		0		1 (100%)	
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
8	7	5	10	1	0	0	3	0	0	0	2	0	0	0	1	0	0	0	1

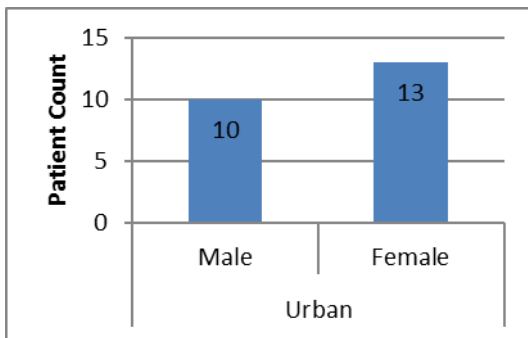
Histogram 1: Demographic details



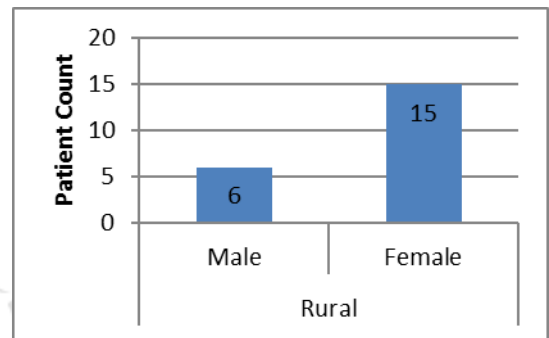
Histogram 2: Gender Details



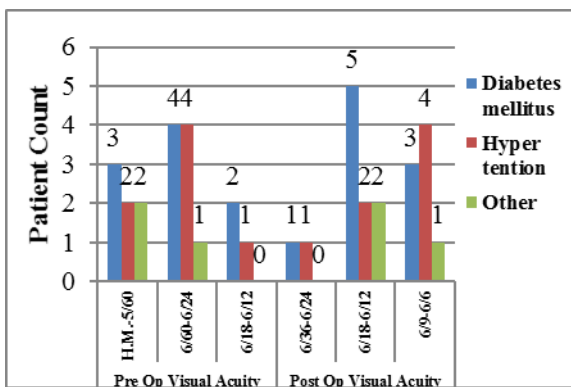
Histogram.3: Urban Areas Details



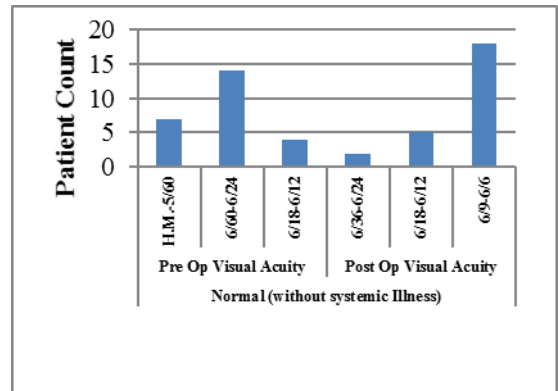
Histogram.4: Rural Area Details



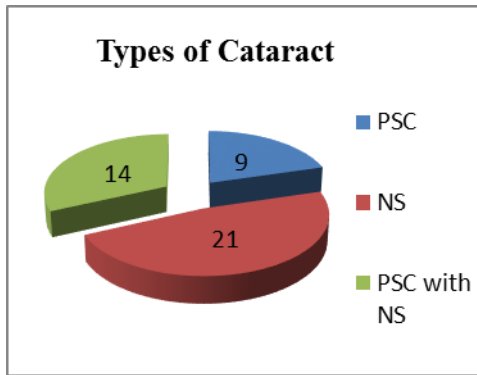
Histogram.5: Systemic state with Pre and Pro VA



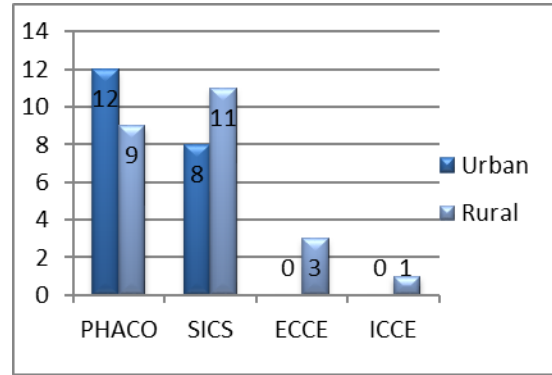
Histogram.6: Normal Systemic State with Pre and Pro VA



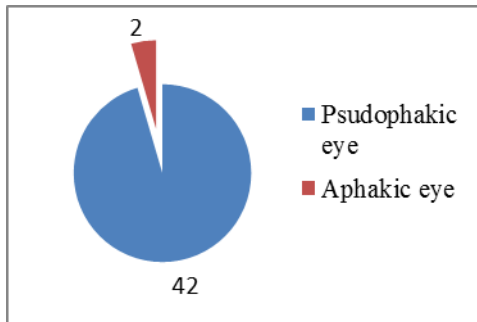
Histogram 7: Different Types of Cataract



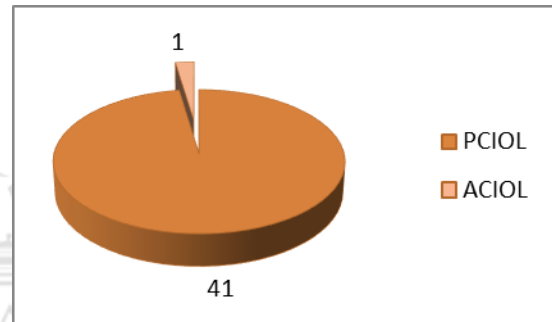
Histogram 8: Different Types of Cataract



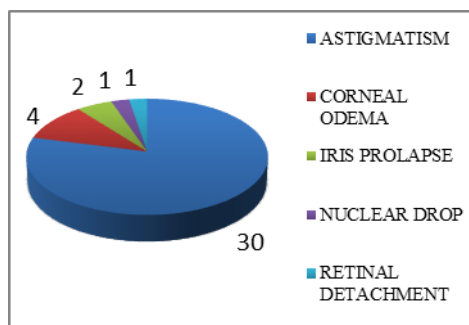
Histogram.9: Postoperative Status of the eye Implant



Histogram.10: Postoperative IOL



Histogram.11: Post-op Complication



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