IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

COMPARISON OF VISUAL FUNCTIONS IN DIABETIC AND NON-DIABETIC PATIENTS AFTER CATARACT SURGERY

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Abstract:-This study has been undertaken to compare visual functions in diabetic and non-diabetic patients after cataract surgery. To find out the difference in visual outcomes of cataract surgery in diabetic and non-diabetic patients.To find out the difference in intraocular pressure of cataract surgery in diabetic and non-diabetic patients.To find out any change in colour vision in diabetic and non-diabetic patients after cataract surgery.To compare the visual acuity after cataract surgery in diabetic non-diabetic patients. The data for diabetic and non-diabetic patients who underwent phacoemulsification with IOL implantation in Integral University, Lucknow from March to May were collected. Pre and post-operative data were analysed for every patient.

Keywords: NCT, DM, Non-DM, VA

INTRODUCTION:-

CATARACT development of opacity in the lens or capsule is referred to as a cataract. The formation of opaque lens fibres or a degenerative process that opacifies normally generated transparent lens fibres are two possible causes of cataracts. One of the main reasons for blindness in the globe is cataracts.[1]

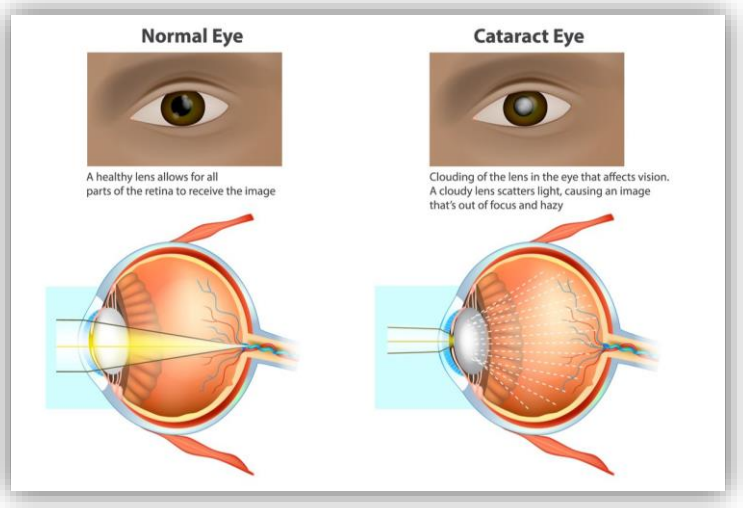
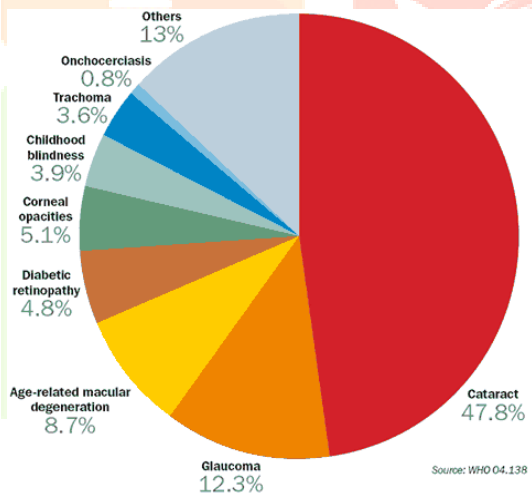


Fig. Cataract

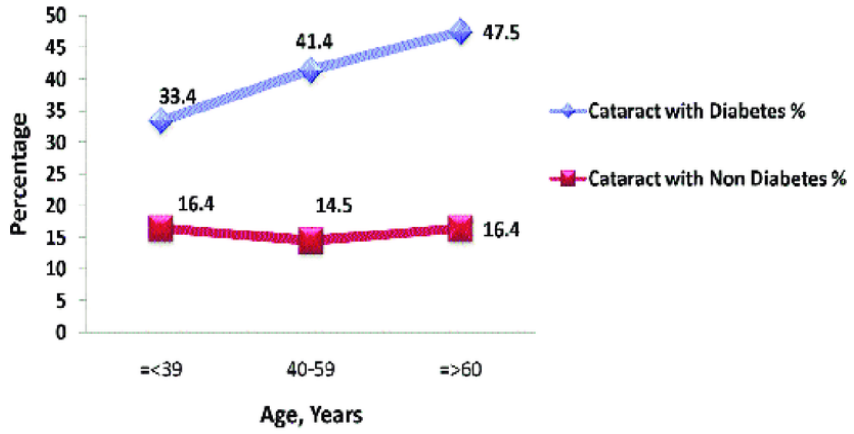
Age-related increases in cataract prevalence range from 3.9% in the 55–64 age group to 92.6% in the 80+ age group. The most common preventable cause of blindness and vision impairment in the world is cataracts. Its prevalence is rising as people's life expectancies, particularly in poorer nations, are rising internationally. Consequently, the healthcare system will be under more stress. The three biggest causes of blindness are cataracts (47.8%), glaucoma (12.3%), age-related macular degeneration (8.7%), Trachoma (3.6%), childhood blindness(3.9%), corneal opacities(5.1%), diabetic retinopathy(4.8%) and onchocerciasis(0.8%). according to data from the World Health Organisation (WHO) from 2010. There are 39 million people blind globally. Around the world, cataracts affect 53.8 million people (2004), of which 52.2 million live in low- and middle-income nations.[2]



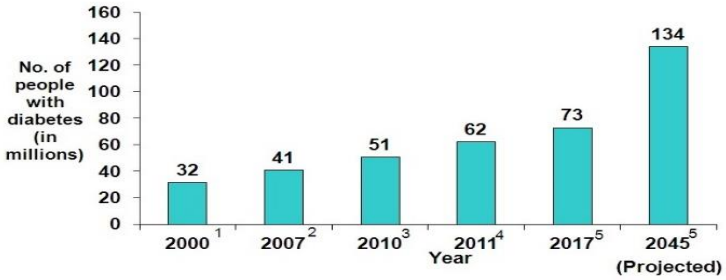
DIABETES:- Diabetes is a metabolic disorder characterised by hyperglycaemia over a prolonged period.[3] DM has several categories, including type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and secondary causes due to endocrinopathies, steroid use, etc. The main subtypes of DM are Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM), which classically result from defective insulin secretion (T1DM) and/or action (T2DM). T1DM presents in children or adolescents, while T2DM is thought to affect middle-aged and older adults who have prolonged hyperglycemia due to poor lifestyle and dietary choices. The pathogenesis for T1DM and T2DM is drastically different, and therefore each type has various etiologies, presentations, and treatments.[4]

The diagnosis of T1DM is usually through a characteristic history supported by elevated serum glucose levels (fasting glucose greater than 126 mg/dL, random glucose over 200 mg/dL, or haemoglobin A1C (HbA1c exceeding 6.5%) with or without antibodies to glutamic acid decarboxylase (GAD) and insulin.[5]

According to the International Diabetes Federation, there will be 439 million people with diabetes mellitus (DM) by 2045. This means that the prevalence of DM is rising every day. The prevalence of DM will rise above 33% by 2050 as a result of an ageing population and increased patient life expectancy.[6]



According to reports, people with DM have a five times higher risk of developing cataracts, especially when they are young. The frequency of diabetic cataracts has increased along with the prevalence of DM. One of the most frequent surgical treatments among the general public is cataract extraction, and there are more and more cataract operations performed each year. Surgery results have improved as a result of recent technical developments in cataract surgery.[7]



This study aims to compare the visual functions of diabetic and non-diabetic patients after cataract surgery after 1-2 months. This study is only about the comparison of visual acuity, colour vision and IOP between diabetic and non-diabetic patients after surgery. The result would contribute only to the visual outcomes after cataract surgery in different subgroups for ex-in diabetic and non-diabetic, patients having mature cataracts and immature cataracts. Data from this study will be useful for healthcare planners and further studies on such groups of patients.[8]

Comparing the visual abilities of people with and without diabetes after cataract surgery is a subject for which there is a dearth of information.

The comparison of diabetes and non-diabetic patients' visual abilities following cataract surgery will be shown in this study's complete data.

TOOLS REQUIRED

- INSTRUMENT- Snellen's chart, near vision Snellen's chart, trial box, non-contact tonometer and Ishihara chart.
- PERFORMA-case sheet
- TYPE OF STUDY- analytical
- PLACE OF STUDY- Integral University, Lucknow
- APPROX SAMPLE SIZE- 15 diabetic patients and 15 non-diabetic patients

INCLUSION CRITERIA-

- Adults aged between 40-60 years diagnosed with diabetes mellitus
- Adults aged between 40-60 years with normal patients(non-diabetic)
- Adults diagnosed with cataracts (immature and mature senile cataracts)
- Adults who have undergone cataract surgery (phacoemulsification)
- Adults diagnosed with senile cataracts only

EXCLUSION CRITERIA**:** -

- Adults with another type of cataracts
- Adults with a history of trauma
- Adults with combined surgeries simultaneously
- Unwilling adults
- Adult with mental issues

METHODOLOGY

The data for diabetic and non-diabetic patients who underwent phacoemulsification with IOL implantation in Integral University, Lucknow from March to May were collected. Pre and post-operative data were analysed for every patient.

We gathered 30 patients (max sample size) of which 15 patients were diabetic and 15 were non-diabetic and received cataract surgery(phacoemulsification) at Integral Hospital(University) who were 40-60 years old. Patients were examined in the outpatient department and diagnosed as having Cataracts in one eye or both eyes but underwent operation of one eye only. This study includes the gender distribution of diabetic and non-patients 40% of males and 60% of females. The type of cataracts include in this study were immature and mature only. All patients were called after one month of their surgery.

The Fundus of each patient was examined by the ophthalmologist itself. This study includes non-diabetic patients with normal fundus. The fundus status of diabetic patients ranged from normal to slightly abnormal. Dilated fundus examination was done and results were recorded in the given performance.

- Snellen charts were used in this study for recording the visual acuity of patients as these charts were used in our OPD. None of the patients used any glasses neither for distance nor for near. The value of the Snellen chart was converted into LOGMAR value. Most of the patients with visual acuity less than 1(>6/60 in Snellen chart) came with cataracts for surgery. The visual acuity of pre and post was recorded. The post-op visual acuity of patients was taken after one month of surgery. This study shows the comparison of visual acuity before and after the surgery.

FIG: Performing Visual Acuity test

- In this study, patients from both groups had their near vision measured using Jager's near vision chart. None of the patients were using reading glasses. The values on Jagers' chart were written the same (N6, N9, N12, etc.). Because there was a cataract in the other eye, near-vision measurements were conducted and recorded separately before the procedure. However, following phacoemulsification for a month, both eyes' simultaneous near-vision measurements.

- Non-contact tonometers were used in this study for recording the intraocular pressure of patients. The normal range of IOP is 10-20mmhg. The patients with normal IOP had gone under surgery. In this study diabetic and non-diabetic had normal IOP.IOP was recorded before the surgery and also recorded after the surgery. This study will show the comparison of IOP among diabetic and non-diabetic patients before and after cataract surgery.

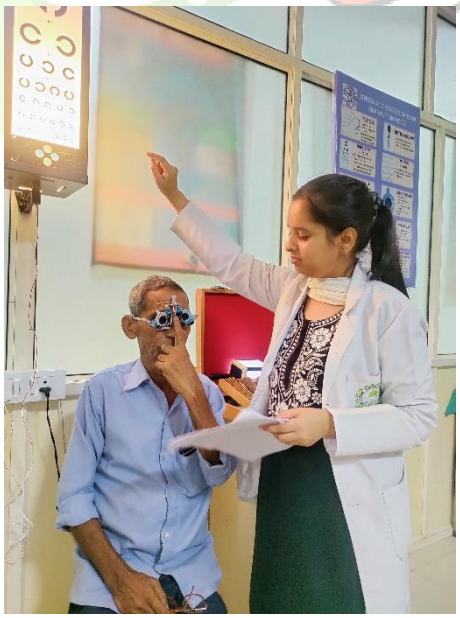


FIG: Performing NCT

- 15 diabetic patients and 15 non-diabetic patients of comparable age, pre and post-operative patients had their following colour vision test using the Ishihara chart. None of the patients had any previous experience with the test. Both eyes were examined for each patient. Colour vision tests were done twice, firstly before the cataract surgery and secondly after the cataract surgery. This was done so that comparison could be done easily. Patients with visual acuity FC.1mt, Hand Movement and PL(+) were examined after cataract surgery.
- Pre-op and post-op patients, as well as 15 diabetic and 15 non-diabetic individuals between the ages of 40 and 60, had a handheld Snellen chart near vision test. In both groups of patients' pre-op cases, near-vision readings of both eyes were obtained separately, and in both groups of patients' post-op cases, near-vision readings of both eyes were taken jointly.
- After all the tests were done patients were given prescriptions for their near and distance work.
- All the data collected were entered into MS Excel for preparing a chart of every detail of patients of both groups.

RESULT AND ANALYSIS

The total number of cataract surgeries from March to May was many in Integral Hospital. After all exclusion cases, the total number of cases for analysis was 30 patients. Among these 15 patients were diabetic and 15 patients were non-diabetic. As shown in figure no.1

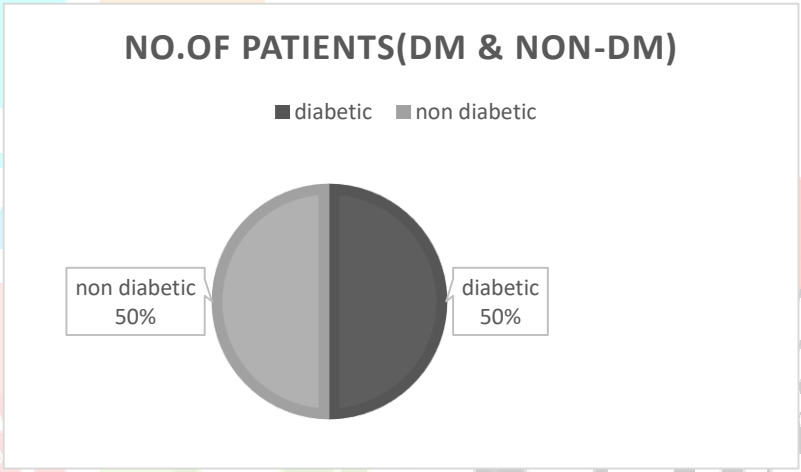


FIG 1: Pie chart showing No.of patients in DM and NON-DM

GROUP	N	%
DM-GROUP	15	50
CONTROL GROUP	15	50
TOTAL	30	100

Table 1: Showing the distribution of subjects in a different group

Patients in the DM and NON-DM groups were between the age group 40-60 years(fig.2 a and b) and more female than male(the percentage was also greater). As shown in figure.3.(a and b) In the DM group only cataract was considered and other systemic diseases were excluded.

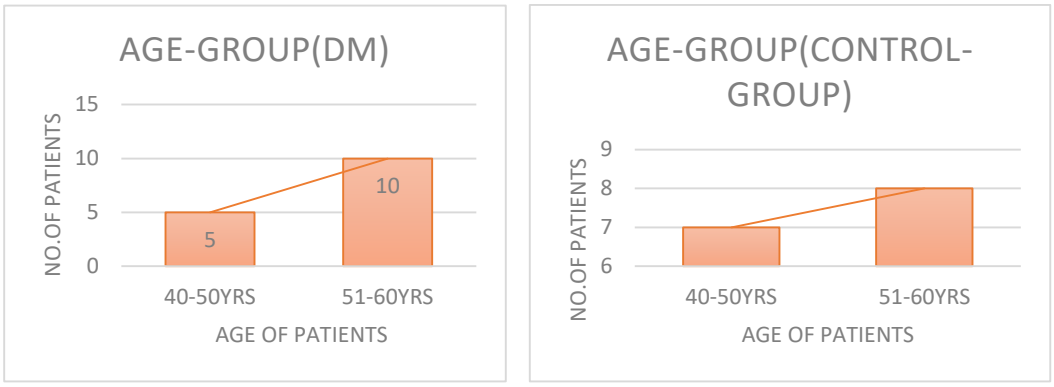


FIG 2(a and b): clustered column showing the distribution of age group between both groups.

GROUP	40-50YRS	51-60-YRS	MEAN	S.DEVIATION	P-VALUE
Control	7	8	7.5	0.70	
Test Group	5	10	7.5	0.70	

Table 2: Age distribution between control and test group.

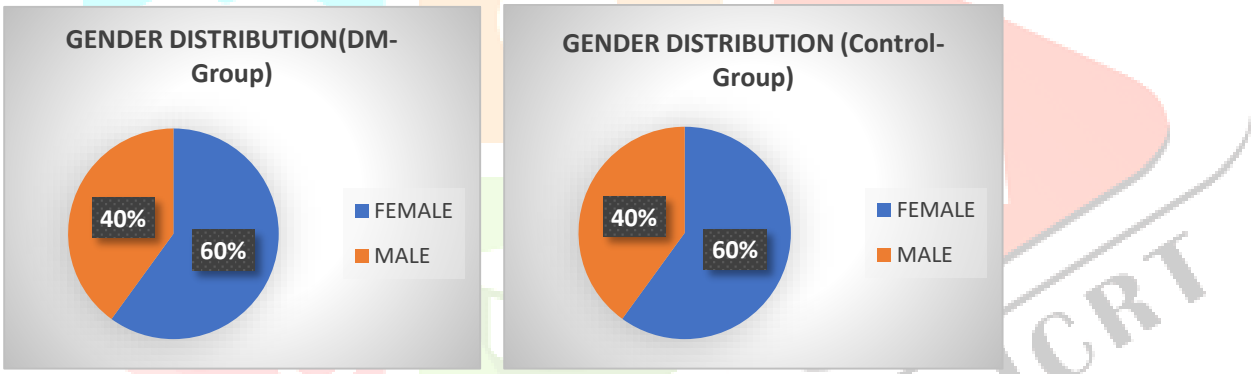


FIG 3(a and b): Pie chart showing gender distribution in % of DM-group and Control group

		Gender		Total
		Female	Male	
Group	Control	9	9	15
	DM Group	6	6	15
Total		15	15	30

Table 3: Gender count distribution in control and DM-group

Only two types of cataracts were taken in this study i.e.Immature senile cataracts and Mature cataracts. IMSC(BE)LE>RE, IMSC(LE), IMSC(RE), MSC(BE), MSC(LE) With IMSC(LE) and MSC(RE) With IMSC(LE) were seen in patients' diabetic group and IMSC(BE), IMSC(BE)LE>RE, IMSC(BE)RE>LE, IMSC(LE), IMSC(RE), MSC(LE) With IMSC(RE) and MSC(RE) With IMSC(LE) were seen in the patient of non-diabetic. As shown in Fig. 4(a and b)

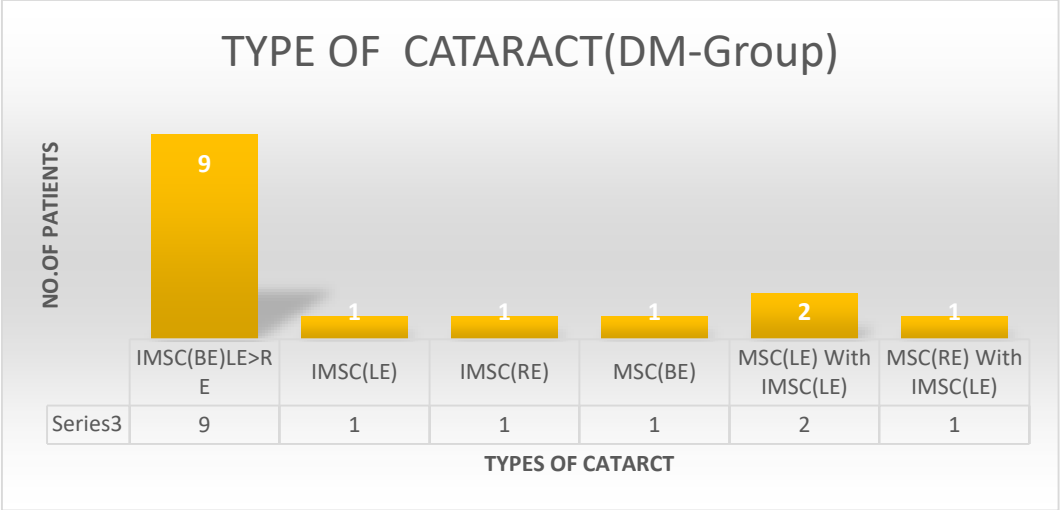


FIG 4. a: clustered column showing the type of cataract in DM-group

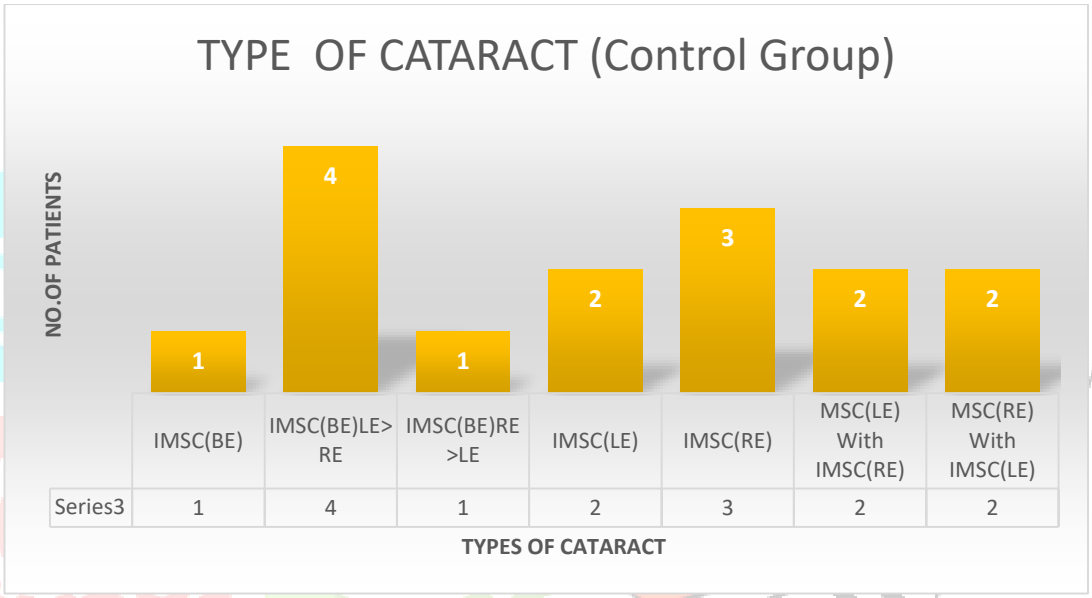


FIG 4. b: Clustered column showing types of cataracts in the Control group.

There was a significant difference between cases in the DM group (50%) and those in the non-DM group (50%) in terms of the proportion of eyes reaching BCVA6/12 postoperatively. DM was identified as one of the main risks of cataracts at a younger age and for BCVA<6/12. In this study, the analysis showed that patients with diabetes mellitus had substantially lower rates of cases reaching BCVA6/12 than patients without diabetes mellitus.

The pre and post-op visual acuity of diabetic patients were taken and then the results were shown as follows, Fig 5(a and b)

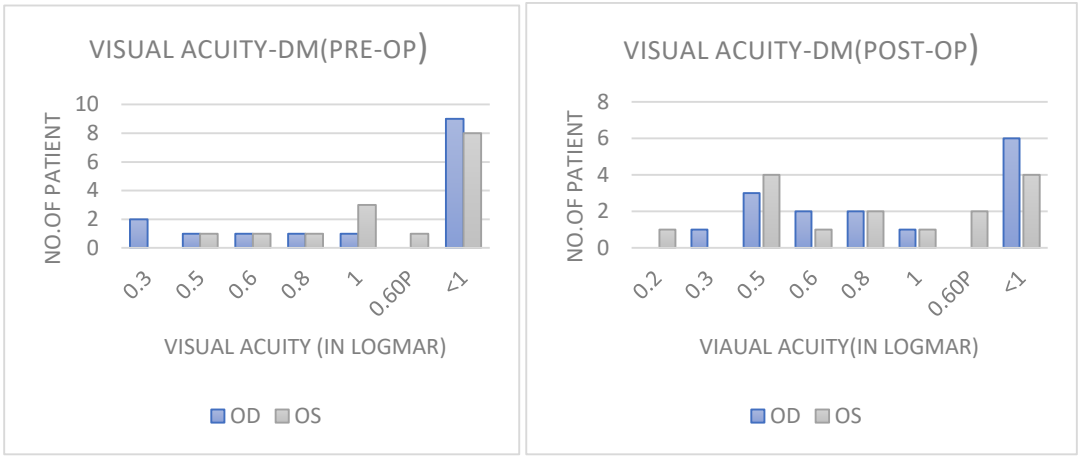


FIG 5(a and b): clustered column showing visual acuity of DM-group of Pre and Post-Op.

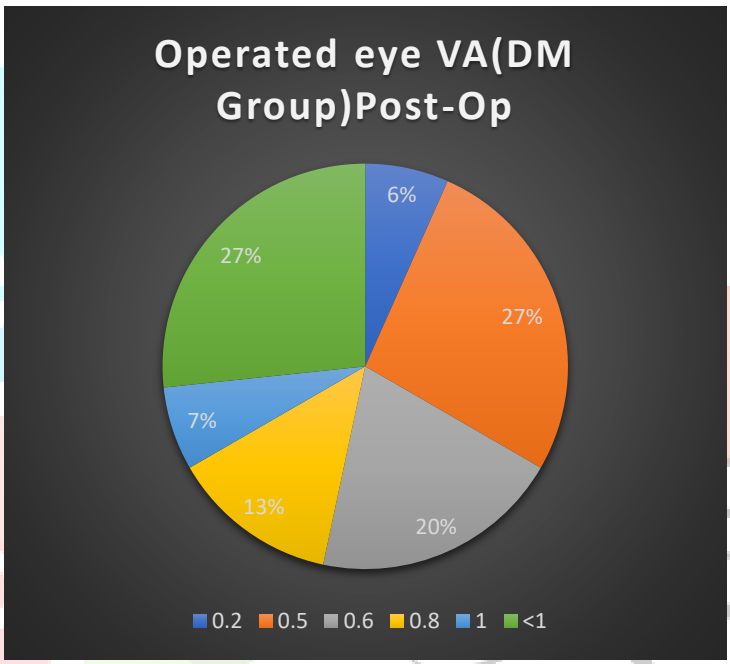


FIG 6: Pie chart showing operated eye Post-Op visual acuity in DM-group

The pre and post-op visual acuity of the control group were taken and recorded in log mar value. In the control group, a high no.of patients were having less than 1 vision (acc to log mar value) before phacoemulsification and after phacoemulsification, a high number shows improvement in their operated eye.

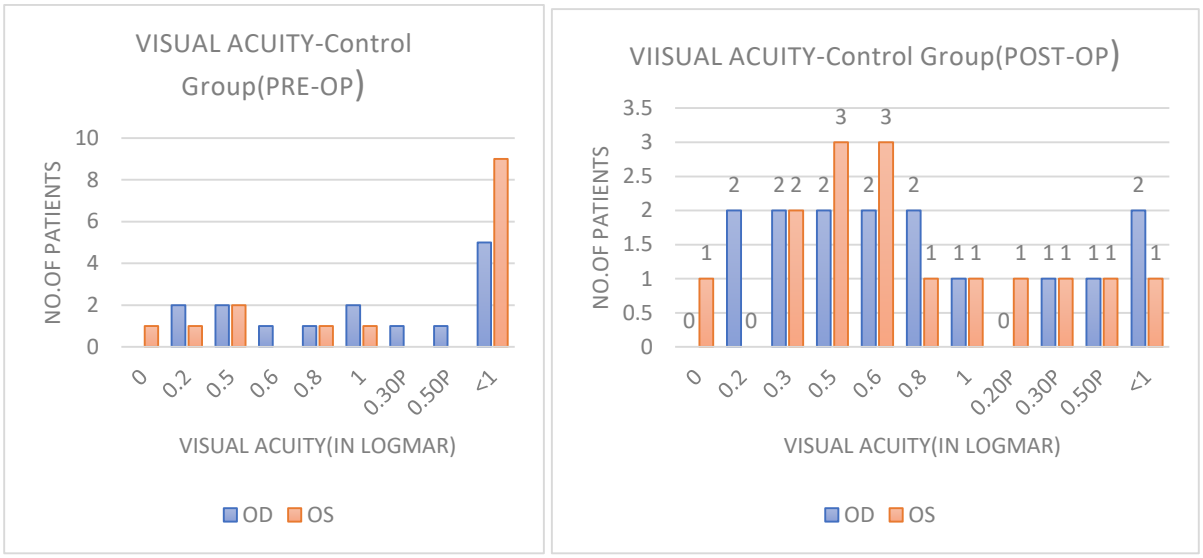


FIG 7 (a and b): Clustered column shows Pre-Op and Post-Op visual acuity in the Control group.

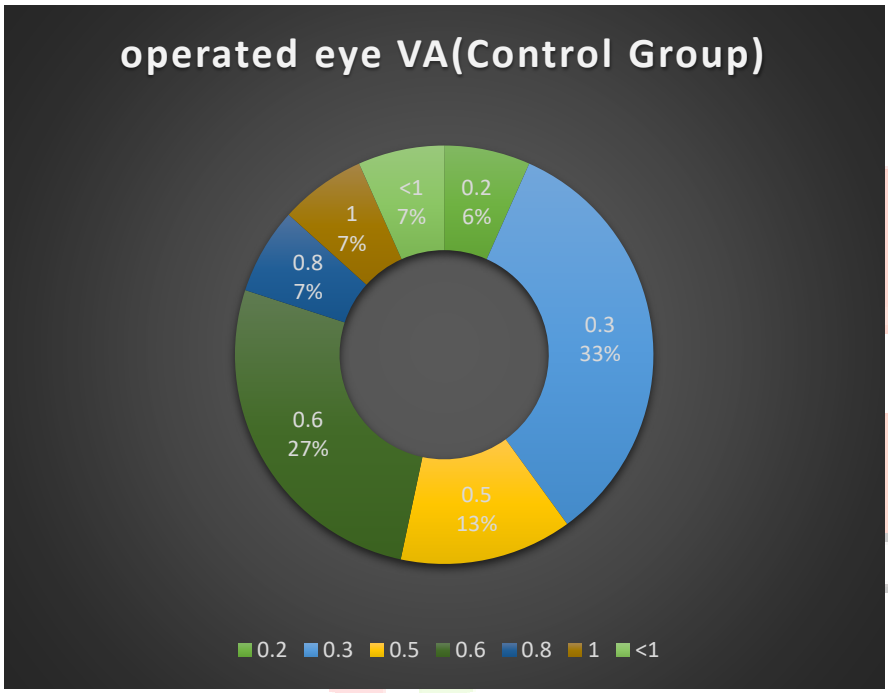


FIG 8: Doughnut chart showing control group visual acuity of the operated eye

	Visual acuity (operated eye)							Total	Mean
	0.2	0.3	0.5	0.6	0.8	1	<1		
Control	1	5	2	4	1	1	1	15	2.14
DM	1	0	4	3	2	1	4	15	2.14
Total	2	5	6	7	3	2	5	30	

Table 4: visual acuity of the operated eye in both groups.

The mean value of visual acuity of the operated eye in both groups was 2.14.

The pre-op and post-op intraocular pressure of both eyes of DM and NON-DM groups were taken and the results are shown below. Fig 9(a and b) and Fig 10(a and b). There were no significant differences between pre and post-IOP in the diabetic and non-diabetic groups. In the diabetic group, there were some cases in which IOP was raised after cataract surgery.

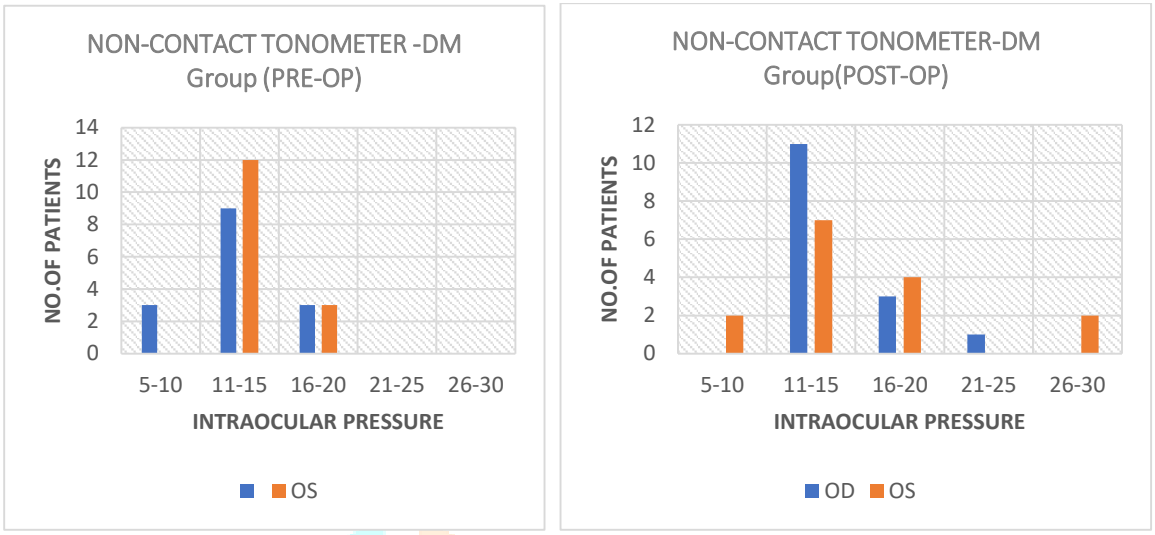


FIG 9(a and b): Clustered column showing pre-op and post-op intraocular pressure of DM group.

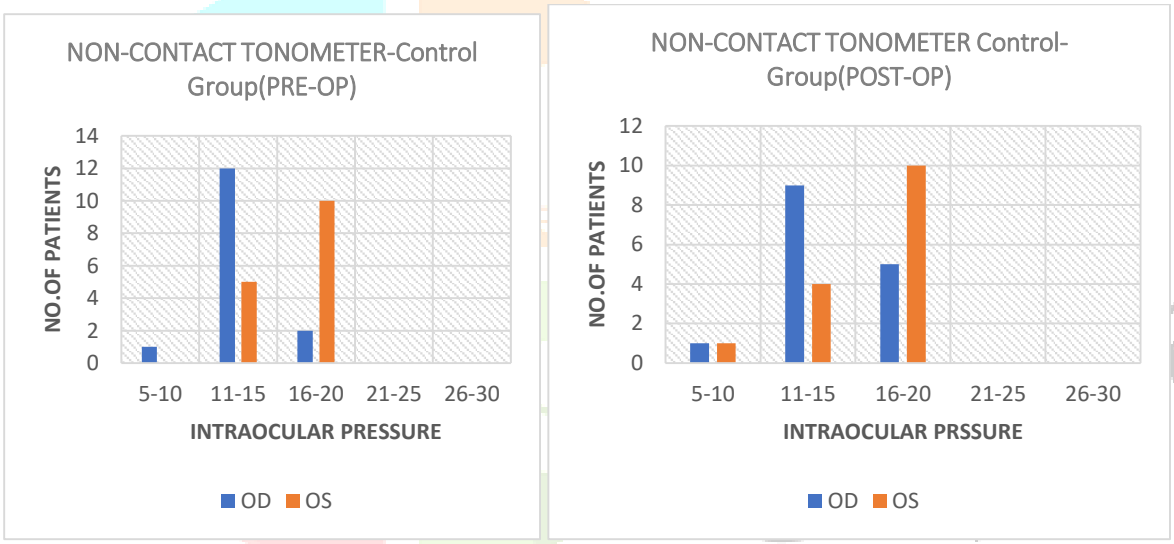


FIG 10(a and b): Clustered column showing pre-op and post-op intraocular pressure in the Control group.

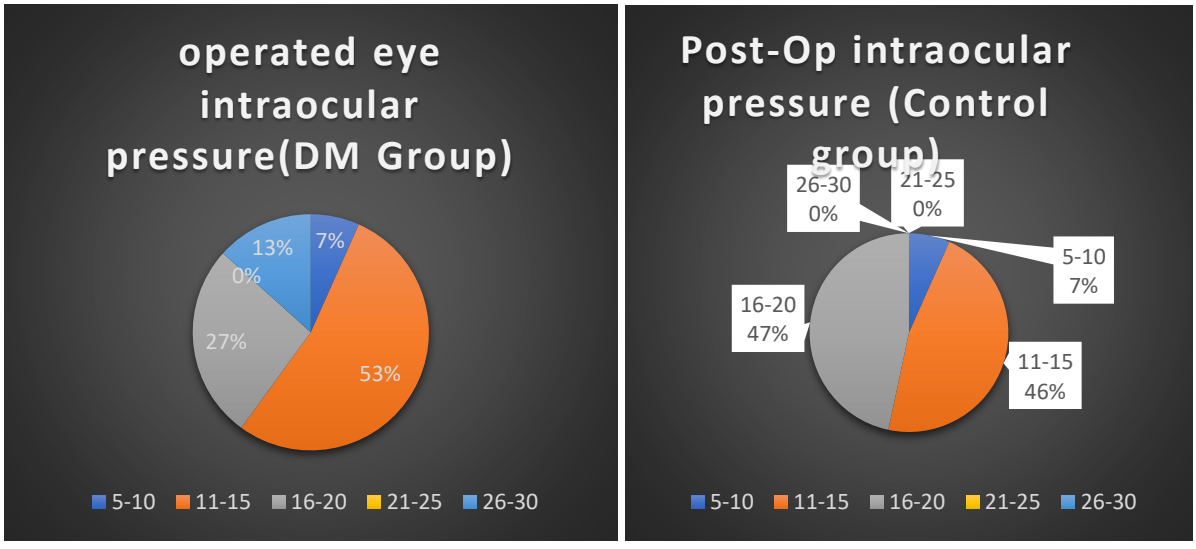


FIG 11(a and b): Pie chart showing operated eye intraocular pressure in both groups.

	Intraocular pressure(Post-Op)						
	5-10	11-15	16-20	21-25	26-30	Total	Mean
Control	1	7	7	0	0	15	3
DM	1	8	4	3	2	15	3
Total	2	15	11	3	2	30	6.6

Table 5: intraocular pressure of operated eye in both groups.

The mean value of intraocular pressure of the operated eye was 3 in both groups.

The pre-op and post-op colour vision of both eyes of both groups were taken and after analysis of data, the results were as follows. As shown in Fig 12(a and b) and Fig 13(a and b). The percentage of cases achieving normal colour vision after cataract surgery is more(100% improvement) in the non-diabetic group as compared to the diabetic.

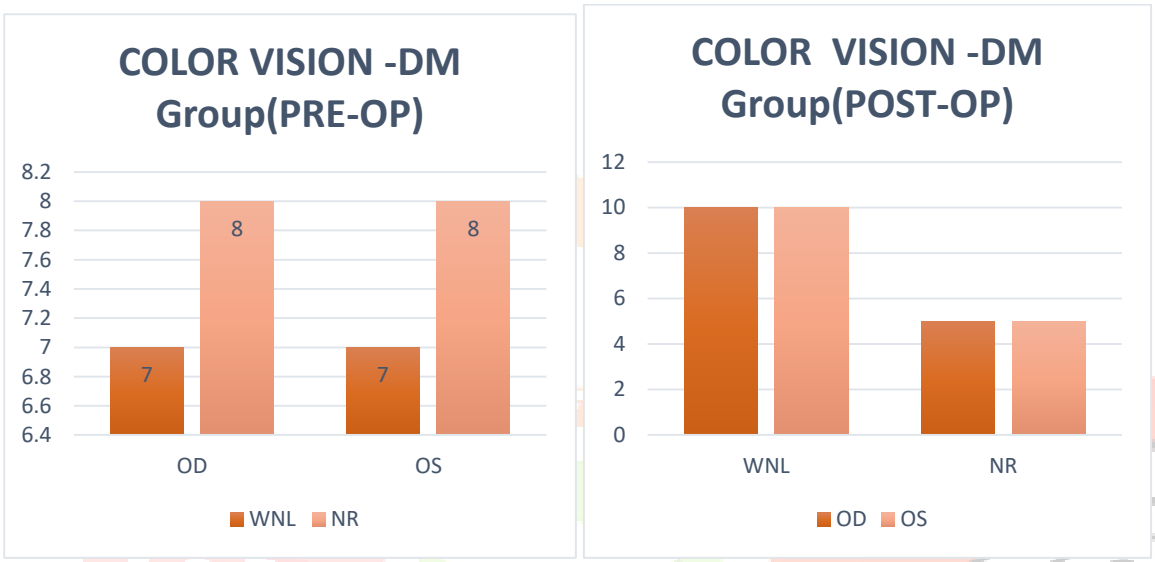


FIG 12(a and b) Clustered column showing Pre-Op and Post-Op colour vision of DM group.

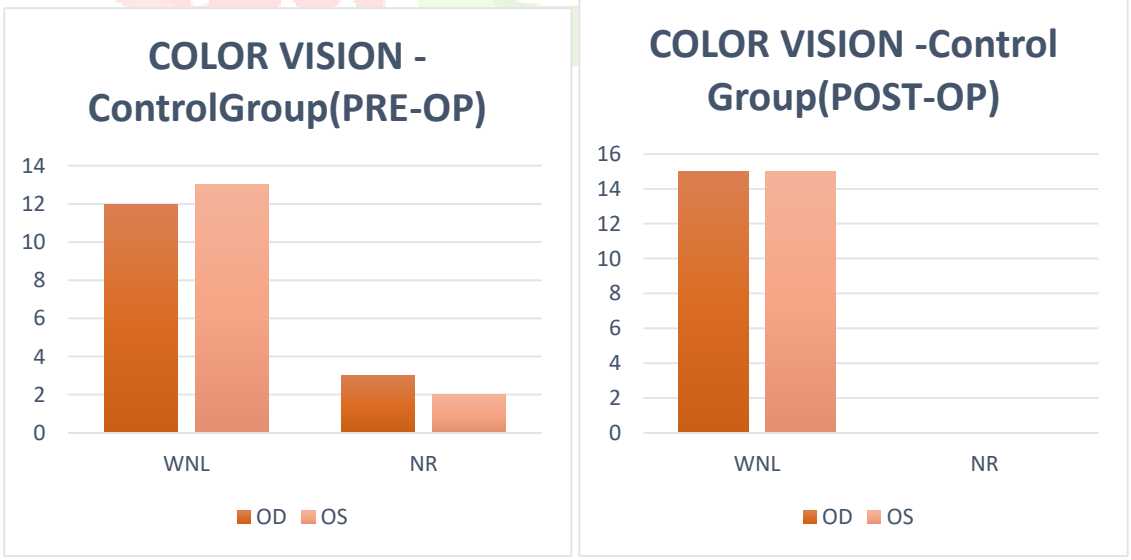


FIG 13 (a and b): Clustered column showing pre-op and post-op colour vision in the control group.

The pre-op and post-op near vision of both groups were taken and after analysing data, the results were that there was significantly more improvement in the non-diabetic group as compared to the diabetic group. The result is shown in Fig.14(a and b) and 15(a and b).

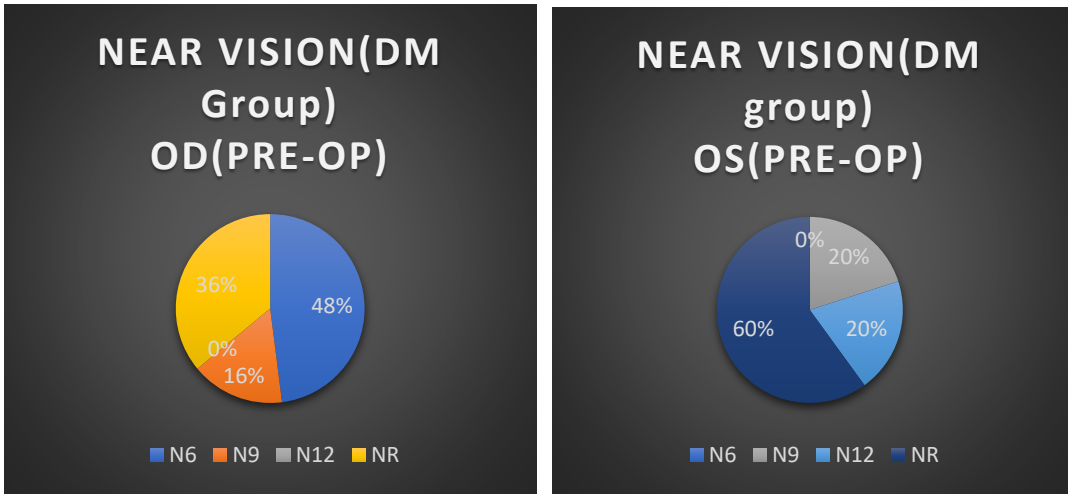


FIG 14(a and b): Pie chart showing pre-op near vision of OD and OS eyes respectively of the DM group.

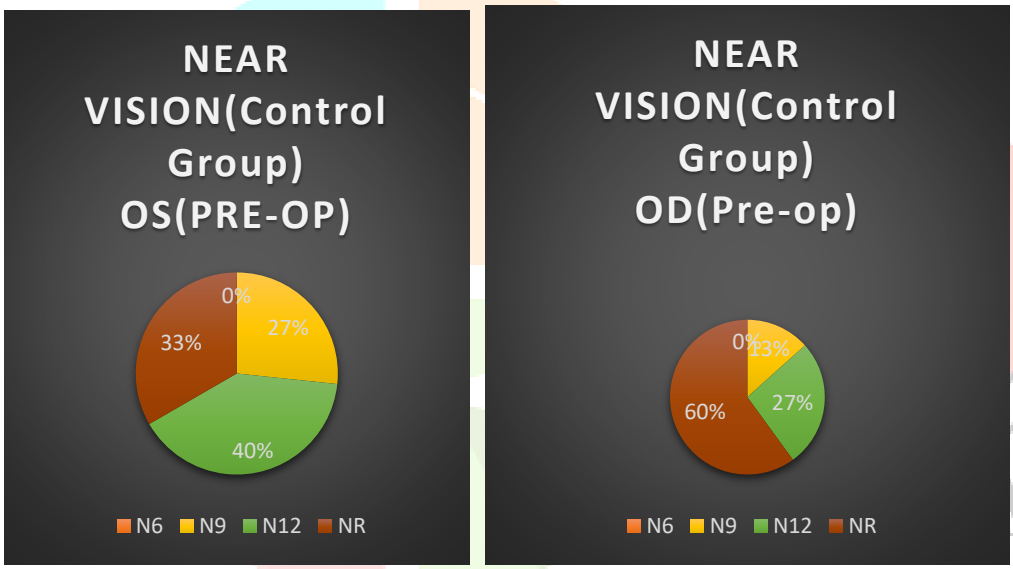


FIG 15(a and b): Pie chart showing pre-op and post-op near vision OD and OS eyes respectively of the Control group.

Following phacoemulsification, near vision in both eyes was recorded concurrently in both patient groups. When compared to diabetic individuals, 100% of non-diabetic patients showed improvement in N6, while 53% of diabetes patients did the same. This is shown in the given Figure 16(a and b).

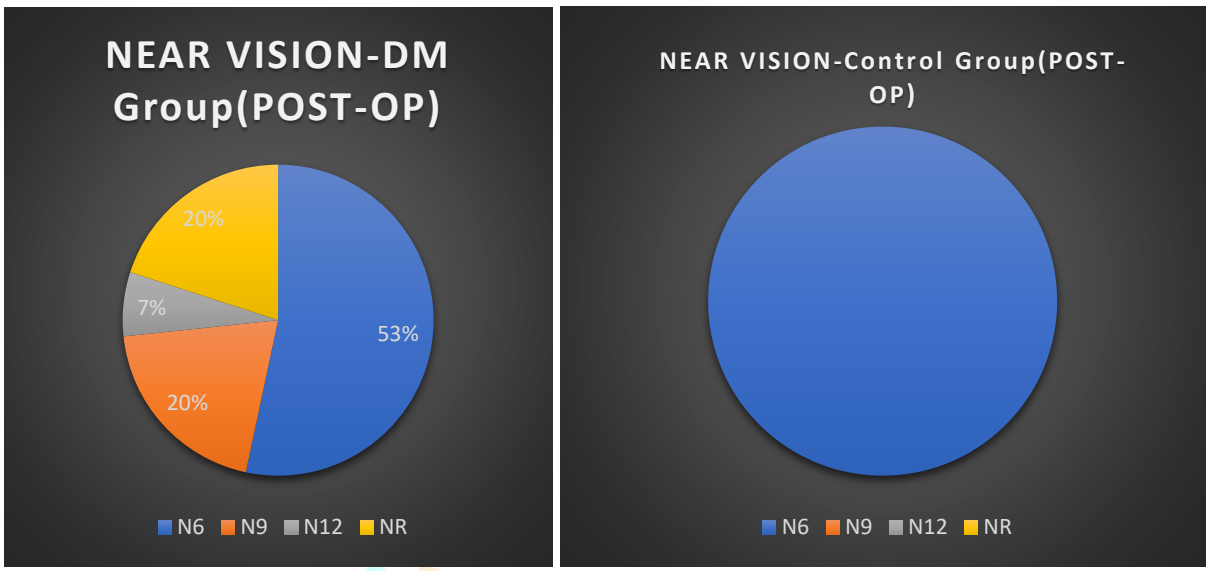


FIG 16(a and b): Pie chart showing a post-op colour vision of both eyes of both groups of patients respectively.

	Near vision (post-op)				Total	Mean
	N6	N9	N12	NR		
Control	15	0	0	0	15	3.75
DM	8	3	1	3	15	3.75
Total	23	3	1	3	30	

Table 6. Near vision of both groups

DISCUSSION

The study had a small sample size obtained from Integral Hospital, Lucknow. The majority of patients in the DM and NON-DM groups were female. Studies were conducted at Integral University, which was situated in the outer area of Lucknow so most of the patients who visited Integral Hospital belonged to low and middle-income families. Women developed more cataracts than males. It was assumed that the differences in albumin/total protein ratio serum triglyceride level and postmenopausal oestrogen deficiency may be contributing factors to this finding.

According to this study, on the 30th post-operative day following surgery, 0% of the operated eye of diabetes patients had normal vision (LOGMAR 0.0 to 0.2 Snellen greater or equal to 6/9), as opposed to 40% of nondiabetic patients 67% of the operated eye of diabetic patients had a moderate vision (6/18 to 6/60) while 53% in case of a non-diabetic group. And 33% of the operated eye had the worst vision after one month of surgery in diabetic patients while non-diabetic had only 7% of the worst vision after surgery.

In this study IOP was also taken before and after the surgery. After one month of cataract surgery, only 13% of the operated patients' IOP was raised slightly in the diabetic group while 100% of the operated patients' IOP was normal in the nondiabetic group.

According to this study, after one month of surgery, a colour vision test was done on both groups of eyes but recorded only the reading of the operated eye. According to the reading, only 67% of the operated eyes of the diabetic group had WNL colour vision and 33% of patients with operated eyes were non-responsive (NR) to this test while in the non-diabetic group, 100% of patients with operated eyes had WNL colour vision.

It is shown in this study that patients of the diabetic group had more % (33%) worse BCVA after surgery while non-diabetic had only 7% worse BCVA after surgery. The possible reasons for the presentation were that the patients were not aware of cataract and their treatment. Most of the patients have not even used glasses for their day-to-day work. Non-diabetic group of patients had a high chance of vision improvement while diabetic patients had a low chance of Improvement in their visual acuity. The reason for not improving visual outcomes in diabetic patients was cataract surgery post-complication and mild NPDR(non-proliferative diabetic retinopathy). The reason for not improving vision in non-diabetic patients was the grading of cataracts and the operation was done under GVP and LA in which chances of improving vision are not sure. Such type of operation was done with the consent of the patient. Another reason for not improving vision was cataract surgery complications.

In the case of colour vision, it is shown in this study that 33% of patients of diabetic were non-responsive after surgery compared to the non-diabetic group. Colour vision defects in diabetic patients are caused by accelerated lens ageing.[12]

In the case of IOP, there were not very many differences in both groups of patients. Only a few patients showed high IOP after cataract surgery in diabetic patients while non-diabetic patients had a normal range of IOP after cataract surgery.

ACKNOWLEDGEMENT

My sincere appreciation goes out to our director **Prof.(dr) Ashfaque Khan**, and supervisors, **Mr Zainul Abedin** & **Mr Khan Faiyaz Ahmed** for letting me write my dissertation on the fascinating topic of "**comparison of visual functions in diabetic and non-diabetic patients after cataract surgery**."While conducting my study for my academic assignment, I discovered many new subjects, and I'm appreciative of all I learned from you. Finally, I simply want to say that there aren't enough words to properly convey how grateful I am to everyone who has supported my academic success. For considerably supporting me with my studies, I would like to thank **Ashutosh Jaiswal** and **Zeya Haqquee.**

In particular, during the last three months of my graduate studies, I want to express my gratitude to my parents for their love and support. This day would not have been possible without them. I also like to thank my older sisters **Zoya Sultana** and **Amreen Sultana** for their assistance with my study. My special thanks to my elder brother **Md Rehan** for his guidance in the technical work done in the thesis.

Finally, I want to thank everyone for their ongoing support of my thesis.

Miss. Samreen Sultana

Place:-Integral University, Lucknow

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