Relation Between Ocular Pressure and Cup to Disc ratio In Glaucoma

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Abstract

Glaucoma is an irreversible optic neuropathy associated with characteristic cupping of the optic nerve head with corresponding nerve fiber loss and peripheral and ultimately center visual field defect. To assess this disease the relationship of ocular tension and cup/disc ratio in glaucoma patients need to be determined. The retrospective study was done with 132 eyes of 66 patients visiting glaucoma clinic at Ibn-Al-HaethamTeaching Eye Hospital, beginning in November 2016toApril 30 2017 for the above subjects, ocular tension ,by measuring the cup/disc ratio and visual acuity . The present study was showed that, an important relation of ocular tension and cup/disc ratio which revealed that increasing ocular tension a accompanied with increasing cup/disc ratio irreversibly. So, when the intraocular pressure is treated with medicine for reducing its levels, the value of the cup/disc ratio is not affected (remain in its high level). It has been noticed that there is reversely relation between cup/disc ratio and visual acuity, and glaucoma incidence was increased with increasing the age of patients i.e. as the population grows older , the prevalence of glaucoma raises.

Key words: Glaucoma, Intraocular Pressure, Cup/Disc ratio,Visual Acuity

Introduction

Glaucoma can be defined as a significant clinical elevated ocular pressure, sufficient enough to damage optic nerve(1) .Glaucoma causes irreversible defects in the visual field and can lead to total blindness when left untreated(2). Over 3million Americans and over 60million-people world wide,have glaucoma.The WHO estimates that 4.5million people worldwide are blind due to glaucoma(3). Traditionally, glaucoma was classified broadly in to primary and secondary with angle closure (ACG) and open angle (OAG). (OAG)being the most common types(2,4).(ACG) is known to be highly prevalent among East Asian(5).Whilst Africans and people of African descent record higher prevalence of(OAG)(6).Secondary glaucoma refers to any case in which another disease causes or contributes to elevated eye pressure, resulting in optic nerve damage and vision loss(7).The prevalence of the disease is however projected to further increase as the global population increases in both age and number(8).The large discs of healthy eyes may have large cups that can be misdiagnosed as glaucomatous cupping, this can be demonstrated in the diagnosis of glaucoma(9).When optic nerve damage has happened despite a normal ocular pressure, this is called(Normal tension glaucoma),but when the ocular pressure is elevated higher than (21mmHg) and never develop damage to optic nerve and visual field loss, this is called(Ocular Hypertension) or glaucoma suspect. Ocular tension acts as a risk predisposing factor for glaucoma. However, in abnormal case the eye pressure can build up inside the eye,causing optic nerve damage and eventually vision loss, a condition known as glaucoma ,but in normal cases eye pressure play an important role for maintain the clinical function of the eye(10). The nerve damage involves loss of retinal nerve fiber layer(RNFL) in a characteristic manner(11). Worldwide, glaucoma is the second–leading cause of blindness after cataract according to WHO (12,13).Others high risk factors for glaucoma include: people over 60 years age,family members of those already diagnosed diabetes and sever myopia besides ocular pressure elevation (14).

Materials and Methods

This retrospective study was conducted at Ibn-Al-HaethamTeachingEye Hospital(I-AHTEH), Baghdad, Iraq.which is the central teaching eye hospital in country with specialized ophthalmologests working there. Subjects from different parts of Iraq can directly attend this hospital, also it acts as secondary and tertiary referral center to assessed subjects each day. In this study 66 cases with eyes disorder were selected that have visited glaucoma clinic during a period of six months ,beginning November 1 2016to the April 30 2017. Age ranged (35–80) years. Gander of these cases are:(37)male and(29)females,so by taking case history as; past medical history regarding medical illness,drugs used, family history, eye surgery. Ophthalmologists and who were on call at the outpatient clinics were the patients presenting.

Visual Acuity (V.A) was measured with optometrists using standard eye chart at 6 meters.Subjects unable to read the top line of the chart were tested at 3 meters and these with poor vision were tested sequentially with counting finger, hand movement and light perception.Also eye examination using slit–lamp(Topocon) to check the anterior segment. The fundus was examined by ophthalmoscope instrument with+20D lens after pupillary dilation .IOP was measured with optometrists

using tonometer (Koeniz,).Cup/Disc ratio checked with Heidelbergy Retinal Tomography (HRT).Subjects were examined with specialized ophthalmologists and then presented to determine of final diagnosis and consideration treatment alternative.

The subjects who were examined above in this study were diagnosed with glaucoma(66 patients) have been submitted to medical treatment for reducing IOP. After that checking (IOP, C/D ratio andVA)and recording any alterations that were happened.

Results

In this study the total number of cases included were66, the age of patients ranged between(35 – 80) years. The mean average of age is 55.5, with ratio of male to female 1.2:1. Table(1)was showed study findings;the study revealed a number of 126 eyes (95.45%) with high increasing IOP ranged (23 – 43) mm Hg, which were recorded in both eyes, glaucomatous patients eyes also have C/D ratio ranged (0.4 – 0.9) and have V.A lower than normal (poor vision). Remaining number 6 eyes of (132) eyes randomly (4.55%) showed normal IOP level ranged (10- 21) mmHg.

Table (2) illustrate Age and Gender distribution in 66 patients included in this study. It has been noticed that, the over all incidence of glaucoma increased between (40 to 70) years old and it affects males more than females. Also it has been noticed that, high percentage at age ranged between (61 to 70) years number 19(28.8%) and lowest percentage at age ranged between (71 - 80) years, number5 (7.6%).

The above illustration for this study was done before medical treatment, but total numbers of patients (66 glaucomatous) were submitted to medical treatment for reducing IOP level under21mmHg.

The results for this management were significant in most cases (69.70%)that was showed IOP returned normal (12-21mmHg),but the other cases (30.30%) remain have high level IOP (22-31 mmHg),and it has been noticed that, C/D ratio do not affected by medical treatment and remains has high ratio(irreversible) as illustrated in (Fig.5).

Discussion Glaucoma is an irreversible defects in the visual field and can lead to total blindness when left untreated(3,12,14).Although glaucoma is a public health and social problem but it lost simple diagnostic techniques and therapeutic interventions are barriers to an effective step (15).Iraqi study by Fiaz.1.AL.Shakarchi.2011, indicated that glaucoma was the third leading cause of blindness after cataract and diabetic retinopathy, and its incidence was recorded(5%)(16). The present study indicates that glaucoma was prevalent among 66 patients (132 eyes) that were visited glaucoma clinic at (IAHTEH) in Baghdad city. This study was concentrated for describing glaucoma disease and its parameters (IOP, C/D ratio and V.A). These are illustrated in(Table.1).The results have been showed that, with increasing IOP, C/D ratio was increased (Fig. 1), resulting in a larger cupping of optic disc(1,17).Also the result showed that V.A was decreased with raised IOP level, this is due to optic nerve damage or optic atrophy (18).From observing (Table.1),it has been noticed that six eyes with ratio (4.55%) were showed normal IOP (18-21) mmHg, this means there is (Normal tension glaucoma) (1,19).Table .2 was showed the risk for developing glaucoma increased in age ranged (40-70) years as illustrated in (Fig.2).

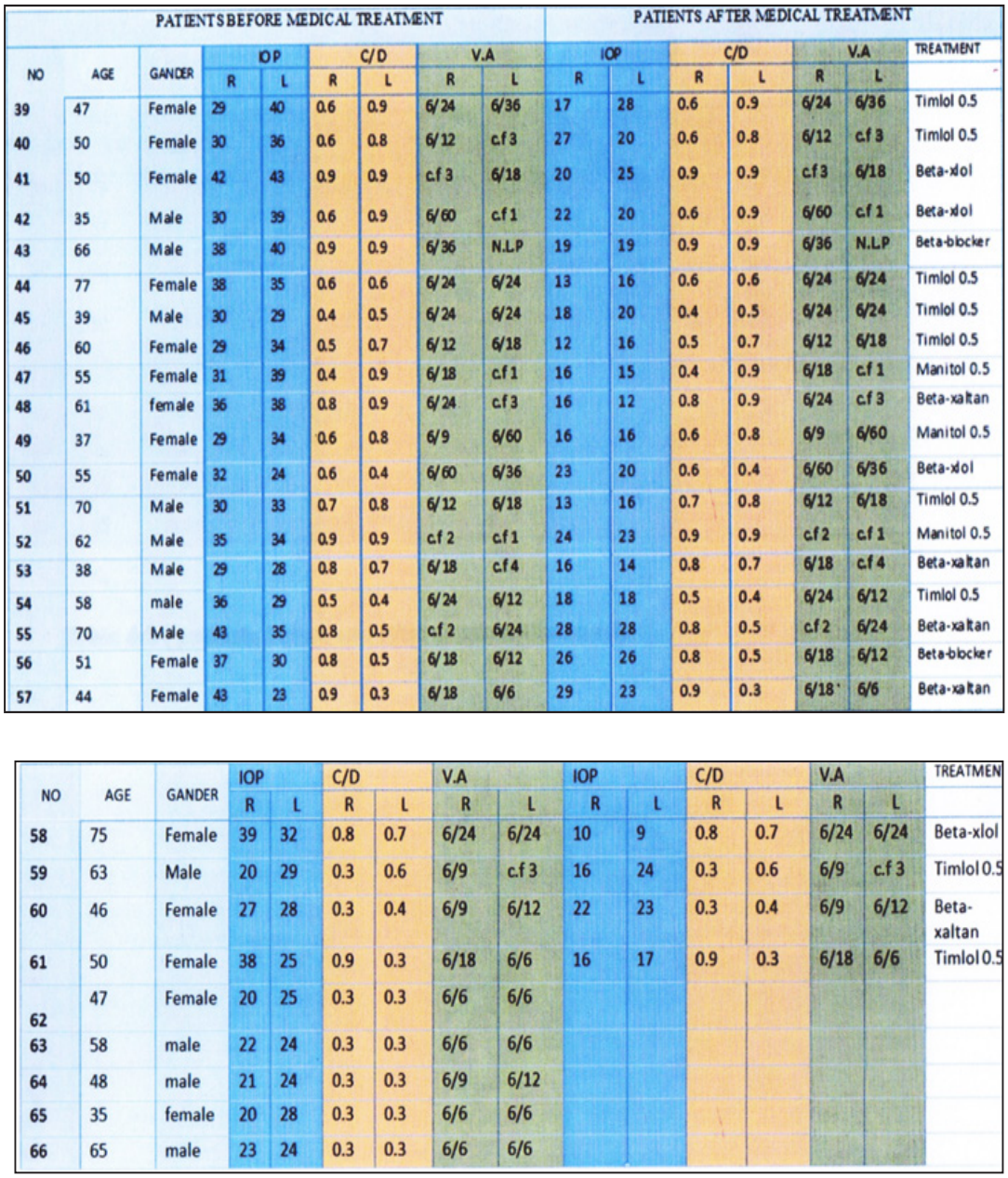
This results agree with the report for submitted by Resnikoffetal.2002.Sothe prevalence of glaucoma increases when population become older(13).The higher occurrence of glaucoma in male patients at age (60-70) years may be attributed to senile changes in the eye.But the lowest number of glaucomatous patients was founded between age (71-80) years this may be due to less medical seeking and senile sclerotic. Thus higher number of females are affected between age (41 - 50) years and this may be due to hormonal disturbances(Fig.3). Treatment for patients in current study by medical drugs give us significant result in reducing IOP level to normal (12-21)mmHg.It has been noticed that C/D ratio do not return to normal and this may be due to the irreversible damage that occurs to the optic disc, as shown in (Fig.5)(20). Some of eyes for patients have not reducing the IOP by medication and remain have high level IOP, this represent (Hyper tension glaucoma)(Fig.4)(21).

Burgoyne,et al demonstrate that, the area of optic disc did not change after IOP changes while the optic disc cupping showed significant differences(22).The study results may be identical to the study for J.Gloster, 1978 that explains findings for (C/D ratio) with their chances for developing glaucoma according to the range (0.4 –0.9)(23).The study has been showed reversely relation between C/D ratio and V.A (Fig.6).

Table 1: The patients distribution in glaucoma

PATIENTS BEFORE TREATMENT									PATIENTS AFTER TREATMENT						
NO	AGE	GANDER	IOP		C/D		V.A		IOP		C/D		V.A		TREATMENT
			R	L	R	L	R	L	R	L	R	L	R	L	
20	50	male	37	38	0.8	0.8	C.F 4	6/60	18	18	0.8	0.8	C.F 4	6/60	Beta-xaltan
21	70	female	40	36	0.8	0.7	6/36	6/36	18	15	0.8	0.7	6/36	6/36	Timlol 0.5
22	40	female	29	20	0.4	0.3	6/9	6/6	22	18	0.4	0.3	6/9	6/6	xaltan
23	54	male	29	29	0.6	0.4	6/24	6/9	18	16	0.6	0.4	6/24	6/9	Manitol 0.5
24	65	Male	26	29	0.4	0.6	6/60	c.f 2	20	23	0.4	0.6	6/60	c.f 2	Beta-xlol
25	67	Female	26	26	0.5	0.7	6/24	6/18	22	24	0.5	0.7	6/24	6/18	Beta-xlol
26	70	Male	30	39	0.8	0.9	6/24	6/24	14	15	0.8	0.9	6/24	6/24	Beta-xlol
27	70	Male	29	36	0.6	0.8	6/36	c.f 4	14	23	0.6	0.8	6/36	c.f 4	Timlol 0.5
28	55	Female	38	32	0.9	0.8	6/60	6/60	20	18	0.9	0.8	6/60	6/60	Beta-xaltan
29	57	Female	29	28	0.7	0.7	6/9	6/18	18	18	0.7	0.7	6/9	6/18	Timlol 0.5
30	60	Male	40	38	0.9	0.9	c.f 3	c.f 1	18	18	0.9	0.9	c.f 3	c.f 1	Timlol 0.5
31	60	Male	37	31	0.8	0.6	6/18	6/36	12	10	0.8	0.6	6/18	6/36	Beta-xlol
32	64	Female	38	30	0.8	0.5	6/18	6/9	20	18	0.8	0.5	6/18	6/9	Beta-xaltan
33	46	Female	40	30	0.8	0.6	6/18	6/12	26	22	0.8	0.6	6/18	6/12	Beta-xaltan
34	52	Male	35	29	0.8	0.5	6/12	6/12	28	19	0.8	0.5	6/12	6/12	Beta-blocker
35	67	male	33	30	0.8	0.7	6/24	6/18	18	20	0.8	0.7	6/24	6/18	Beta-xaltan
36	50	Female	28	43	0.3	0.9	6/18	6/36	26	10	0.3	0.9	6/18	6/36	Beta-blocker
37	74	Male	39	31	0.9	0.7	6/36	6/36	14	26	0.9	0.7	6/36	6/36	Timlol 0.5
38	60	Male	32	37	0.7	0.8	6/18	c.f 1	18	29	0.7	0.8	6/18	c.f 1	Timlol 0.5

PATIENTS BEFORE TREATMENT									PATIENTS AFTER TREATMENT						
NO	AGE	GANDER	IOP		C/D		V.A		IOP		C/D		V.A		TREATMENT
			R	L	R	L	R	L	R	L	R	L	R	L	
20	50	male	37	38	0.8	0.8	C.F 4	6/60	18	18	0.8	0.8	C.F 4	6/60	Beta-xaltan
21	70	female	40	36	0.8	0.7	6/36	6/36	18	15	0.8	0.7	6/36	6/36	Timlol 0.5
22	40	female	29	20	0.4	0.3	6/9	6/6	22	18	0.4	0.3	6/9	6/6	xaltan
23	54	male	29	29	0.6	0.4	6/24	6/9	18	16	0.6	0.4	6/24	6/9	Manitol 0.5
24	65	Male	26	29	0.4	0.6	6/60	c.f 2	20	23	0.4	0.6	6/60	c.f 2	Beta-xlol
25	67	Female	26	26	0.5	0.7	6/24	6/18	22	24	0.5	0.7	6/24	6/18	Beta-xlol
26	70	Male	30	39	0.8	0.9	6/24	6/24	14	15	0.8	0.9	6/24	6/24	Beta-xlol
27	70	Male	29	36	0.6	0.8	6/36	c.f 4	14	23	0.6	0.8	6/36	c.f 4	Timlol 0.5
28	55	Female	38	32	0.9	0.8	6/60	6/60	20	18	0.9	0.8	6/60	6/60	Beta-xaltan
29	57	Female	29	28	0.7	0.7	6/9	6/18	18	18	0.7	0.7	6/9	6/18	Timlol 0.5
30	60	Male	40	38	0.9	0.9	c.f 3	c.f 1	18	18	0.9	0.9	c.f 3	c.f 1	Timlol 0.5
31	60	Male	37	31	0.8	0.6	6/18	6/36	12	10	0.8	0.6	6/18	6/36	Beta-xlol
32	64	Female	38	30	0.8	0.5	6/18	6/9	20	18	0.8	0.5	6/18	6/9	Beta-xaltan
33	46	Female	40	30	0.8	0.6	6/18	6/12	26	22	0.8	0.6	6/18	6/12	Beta-xaltan
34	52	Male	35	29	0.8	0.5	6/12	6/12	28	19	0.8	0.5	6/12	6/12	Beta-blocker
35	67	male	33	30	0.8	0.7	6/24	6/18	18	20	0.8	0.7	6/24	6/18	Beta-xaltan
36	50	Female	28	43	0.3	0.9	6/18	6/36	26	10	0.3	0.9	6/18	6/36	Beta-blocker
37	74	Male	39	31	0.9	0.7	6/36	6/36	14	26	0.9	0.7	6/36	6/36	Timlol 0.5
38	60	Male	32	37	0.7	0.8	6/18	c.f 1	18	29	0.7	0.8	6/18	c.f 1	Timlol 0.5



NO	AGE	GANDER	PATIENTS BEFORE MEDICAL TREATMENT						PATIENTS AFTER MEDICAL TREATMENT						TREATMENT
			IOP		C/D		V.A		IOP		C/D		V.A		
			R	L	R	L	R	L	R	L	R	L	R	L	
39	47	Female	29	40	0.6	0.9	6/24	6/36	17	28	0.6	0.9	6/24	6/36	Timlol 0.5
40	50	Female	30	36	0.6	0.8	6/12	c.f 3	27	20	0.6	0.8	6/12	c.f 3	Timlol 0.5
41	50	Female	42	43	0.9	0.9	c.f 3	6/18	20	25	0.9	0.9	c.f 3	6/18	Beta-xlol
42	35	Male	30	39	0.6	0.9	6/60	c.f 1	22	20	0.6	0.9	6/60	c.f 1	Beta-xlol
43	66	Male	38	40	0.9	0.9	6/36	N.L.P	19	19	0.9	0.9	6/36	N.L.P	Beta-blocker
44	77	Female	38	35	0.6	0.6	6/24	6/24	13	16	0.6	0.6	6/24	6/24	Timlol 0.5
45	39	Male	30	29	0.4	0.5	6/24	6/24	18	20	0.4	0.5	6/24	6/24	Timlol 0.5
46	60	Female	29	34	0.5	0.7	6/12	6/18	12	16	0.5	0.7	6/12	6/18	Timlol 0.5
47	55	Female	31	39	0.4	0.9	6/18	c.f 1	16	15	0.4	0.9	6/18	c.f 1	Manitol 0.5
48	61	female	36	38	0.8	0.9	6/24	c.f 3	16	12	0.8	0.9	6/24	c.f 3	Beta-xaltan
49	37	Female	29	34	0.6	0.8	6/9	6/60	16	16	0.6	0.8	6/9	6/60	Manitol 0.5
50	55	Female	32	24	0.6	0.4	6/60	6/36	23	20	0.6	0.4	6/60	6/36	Beta-xlol
51	70	Male	30	33	0.7	0.8	6/12	6/18	13	16	0.7	0.8	6/12	6/18	Timlol 0.5
52	62	Male	35	34	0.9	0.9	c.f 2	c.f 1	24	23	0.9	0.9	c.f 2	c.f 1	Manitol 0.5
53	38	Male	29	28	0.8	0.7	6/18	c.f 4	16	14	0.8	0.7	6/18	c.f 4	Beta-xaltan
54	58	male	36	29	0.5	0.4	6/24	6/12	18	18	0.5	0.4	6/24	6/12	Timlol 0.5
55	70	Male	43	35	0.8	0.5	c.f 2	6/24	28	28	0.8	0.5	c.f 2	6/24	Beta-xaltan
56	51	Female	37	30	0.8	0.5	6/18	6/12	26	26	0.8	0.5	6/18	6/12	Beta-blocker
57	44	Female	43	23	0.9	0.3	6/18	6/6	29	23	0.9	0.3	6/18	6/6	Beta-xaltan

NO	AGE	GANDER	IOP		C/D		V.A		IOP		C/D		V.A		TREATMEN
			R	L	R	L	R	L	R	L	R	L	R	L	
58	75	Female	39	32	0.8	0.7	6/24	6/24	10	9	0.8	0.7	6/24	6/24	Beta-xlol
59	63	Male	20	29	0.3	0.6	6/9	c.f 3	16	24	0.3	0.6	6/9	c.f 3	Timlol 0.5
60	46	Female	27	28	0.3	0.4	6/9	6/12	22	23	0.3	0.4	6/9	6/12	Beta-xaltan
61	50	Female	38	25	0.9	0.3	6/18	6/6	16	17	0.9	0.3	6/18	6/6	Timlol 0.5
62	47	Female	20	25	0.3	0.3	6/6	6/6							
63	58	male	22	24	0.3	0.3	6/6	6/6							
64	48	male	21	24	0.3	0.3	6/9	6/12							
65	35	female	20	28	0.3	0.3	6/6	6/6							
66	65	male	23	24	0.3	0.3	6/6	6/6							

Table 2: The table shows the age and gender distribution in 66 patients with glaucoma

Age (year)	Male	Female	Total	%
31-40	6	5	11	16.7
41-50	5	10	15	22.7
51-60	9	7	16	24.2
61-70	15	4	19	28.8
71-80	2	3	5	7.6
Total	37	29	66	100

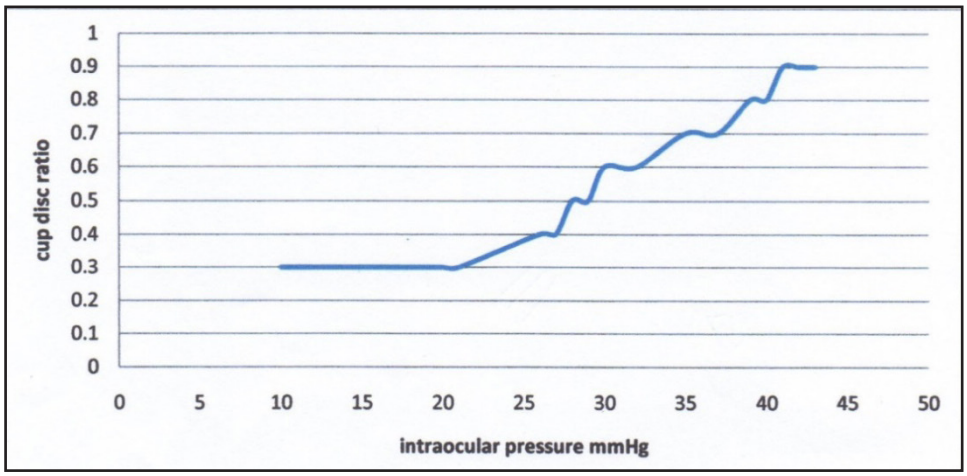


Figure 1: The intraocular pressure with cup/ disc ratio increased.

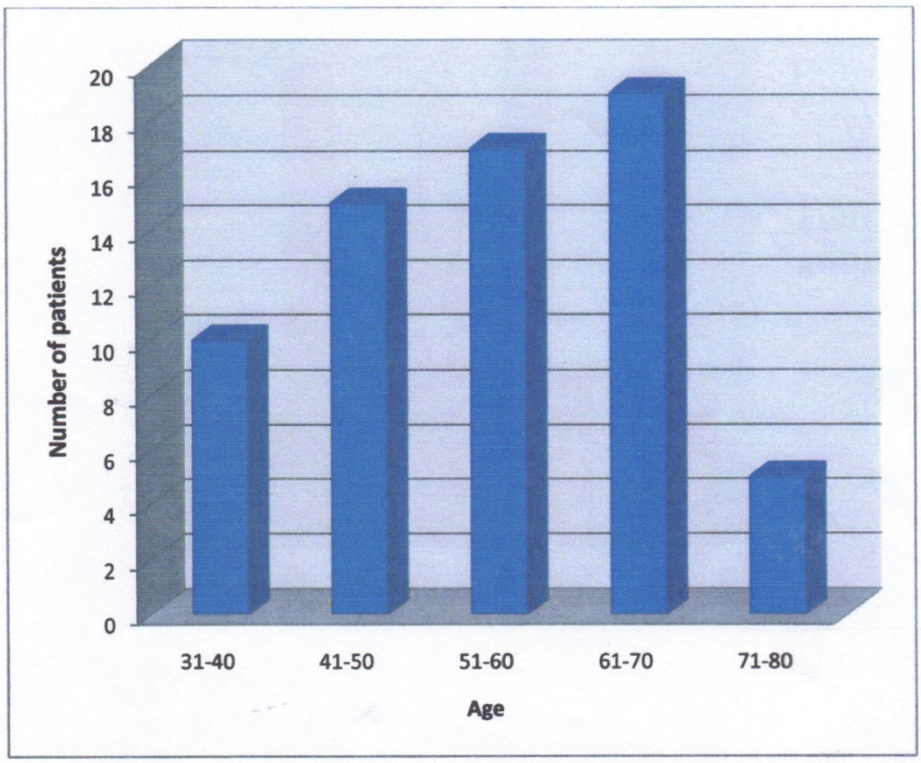


Figure 2: The patients and age relation

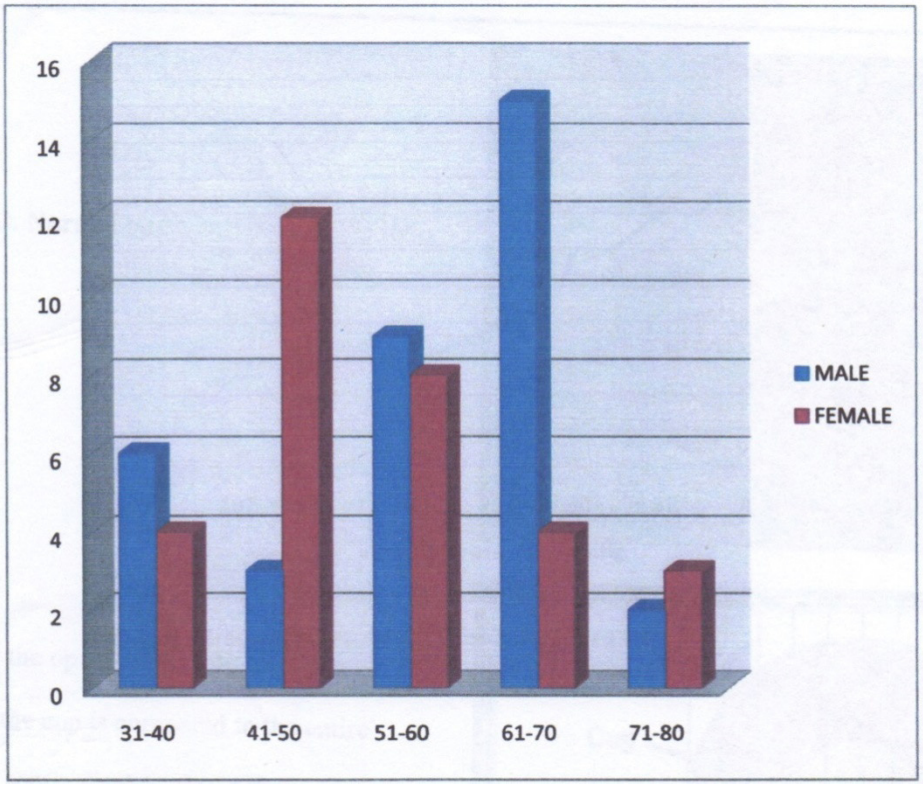


Figure 3: The relation between age and gender

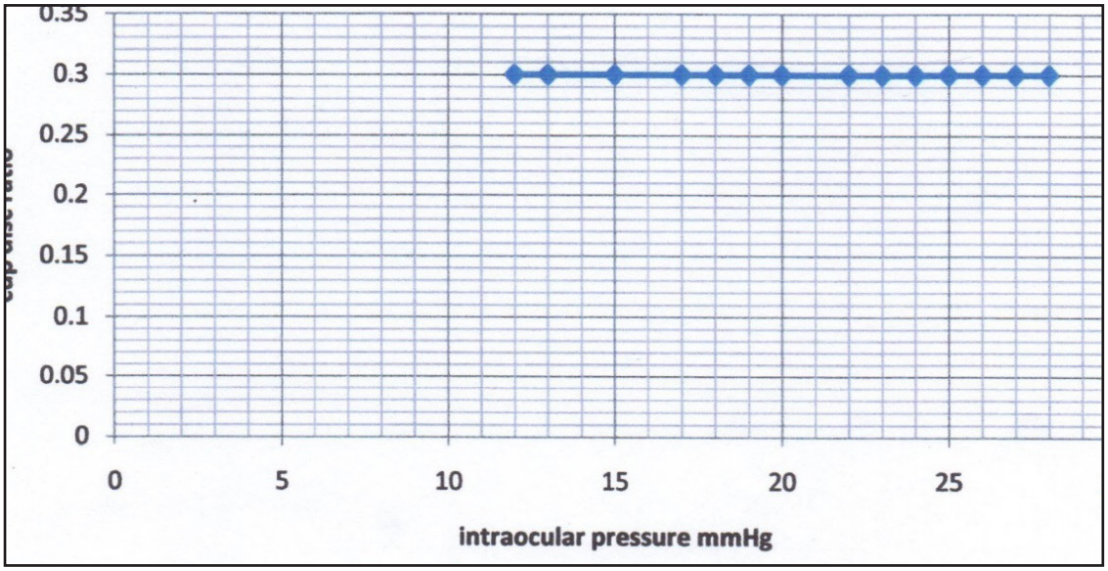


Figure 4: The intraocular pressure, cup / disc ratio unchanged (ocular hypertension)

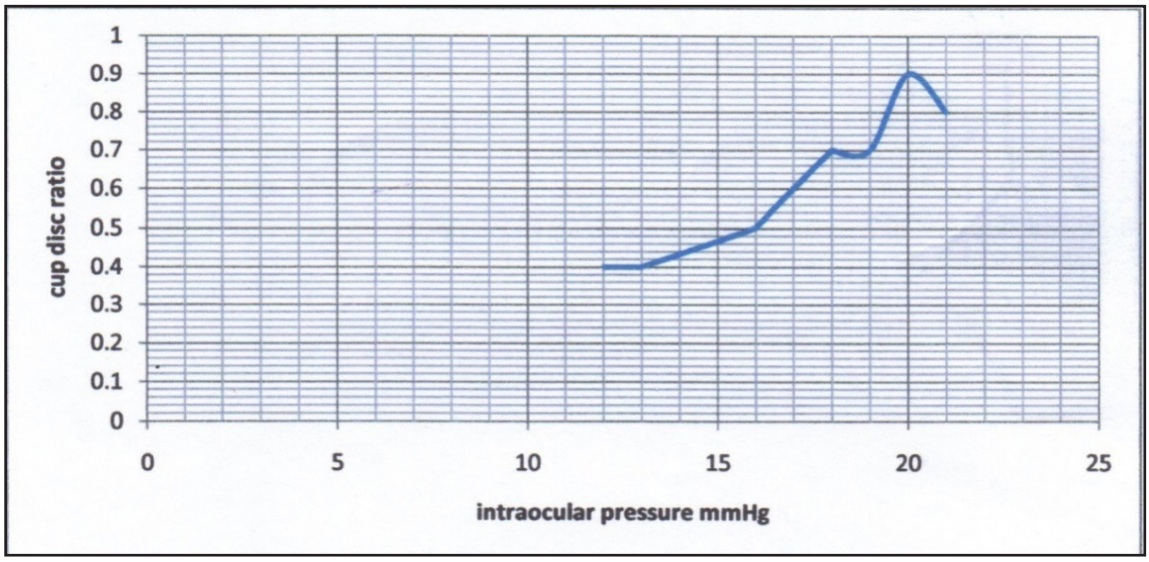


Figure 5: The intraocular Pressure with, the Cup / Disc ratio

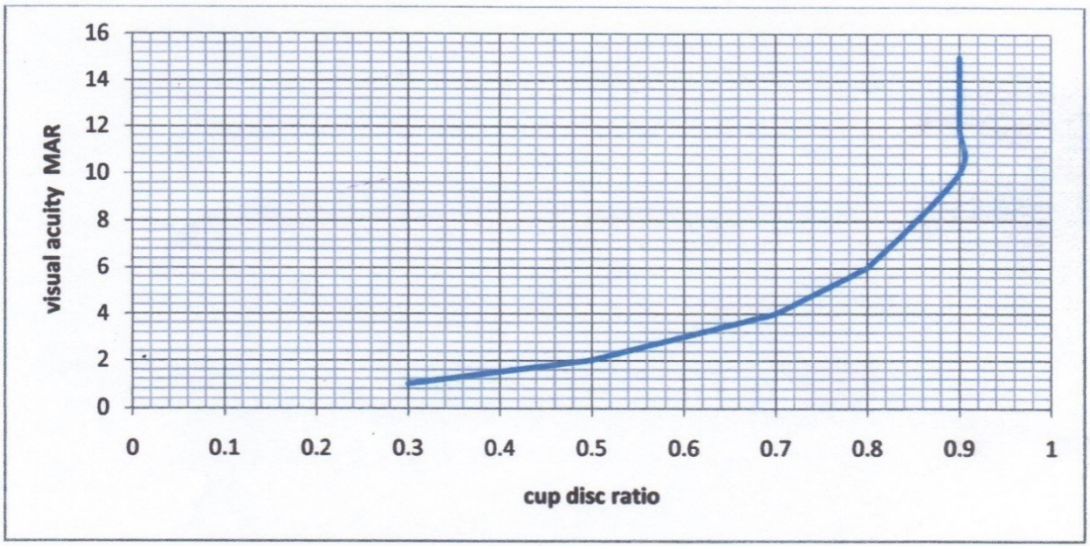


Figure 6: The visual acuity (V.A) with the cup / disc ratio (C/D ratio)

Note:

MAR (Minimum Angle of Resolution) was used for visual acuity.

NLP (No Light Perception) patients are excepted

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