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Original Research Article

A clinical study to analyse the effect of treatment on visual outcomes in bilateral refractive myopic amblyopia in pediatric population

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ABSTRACT

Purpose: To determine the efficacy of treatment on visual outcomes in bilateral refractive myopic amblyopia according to the degree of amblyopia and myopia in children of 4-18 years of age-group.
Materials and Methods: This prospective interventional study enrolled 25 cases with bilateral myopia in the age group of 4-18yrs excluding those with organic cause. Thorough ocular examination carried out including subjective test, torch-light and slit-lamp examination, fundoscopy, cycloplegic refraction, wet retinoscopy,. Myopia not improving with best-corrected visual acuity[BCVA] selected and classified according to the degree of amblyopia. The Initial and final BCVA compared converted to log MAR scale for statistical analysis. Treatment planned according to degree of amblyopia and myopia were macular stimulation, occlusion, and combination of occlusion with macular stimulation and spectacle correction. Follow-up period was 1 year with initial weekly visits followed by monthly visits. Percentage improvement of visual acuity assessed in each patient.
Result: Among 25 cases, with respect to difference in amblyopia grade in BE, maximum mild amblyopia in 10 eyes improved with macular stimulation and 8 eyes of moderate-severe amblyopia improved with combination of macular stimulation and occlusion. P-value[0.01] is statistically significant with macular stimulation in LE.
Conclusion: Untreated refractive errors in myopic are more prone to develop bilateral amblyopia. Timely proper treatment and compliance are necessary for visual improvement.

1. Introduction

Amblyopia by definition, refers to a partial loss of vision in one or both eyes, in the absence of any organic disease of ocular media, retina, and visual pathway. Amblyopia is produced by certain amblyogenic factors operating during the critical period of visual development from birth to 6 years of age. Amblyogenic factors includes visual deprivation as occurs in anisometropia, light deprivation due to congenital cataract, and Abnormal binocular interaction as in strabismus.[1,2]

Depending upon the etiology, different types of amblyopia are seen such as Strabismic amblyopia, Stimulus deprivation amblyopia in congenital or traumatic cataract, complete ptosis, and dense central corneal opacity.[3] Anisometropic amblyopia, isoametropic amblyopia in bilateral uncorrected high refractive error. Meridional amblyopia in uncorrected astigmatic refractive error selective for specific visual meridian.[4]

Unilateral and bilateral refractive amblyopia defined as -

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1. Unilateral cases- BCVA of <6/9 in amblyopic eye and intarocular difference of at least two log MAR lines.
2. Bilateral cases- BCVA of <6/9 in each eye with at least three log MAR line difference between eyes.

Bilateral amblyopia is less common than unilateral amblyopia causing bilateral blurring of image in each eye whereas unilateral causes blur image only in one eye. There is significant blurred retinal image in each eye disrupting normal physiological binocular single visual development during the critical period of life. (8-10 years of age) Whereas unilateral amblyopia, retinal image blur in one eye inhibits cortical activity from one eye, preventing normal visual development misalignment of eyes prevent normal process of fusion due to suppression of the deviating eye resulting in loss of binocularity.

We selected bilateral refractive amblyopia over unilateral as despite treatment, we could not achieve 6/6 BCVA with full correction in both eyes. Refractive error plays an important role in the development of amblyopia which can cause isometropic and anisometropic amblyopia. And this can be due to the result of hypermetropia as well as myopia.[5] Also/bilateral refractive myopic amblyopia is less common than hypermetropic amblyopia. Very little studies are known about bilateral refractive myopic amblyopia. Hence, we selected bilateral refractive myopic amblyopia to face the difficulties and challenges with treatment in pediatric population andto understand /efficacy of treatment on visual outcomes with different treatment plans and strategy that can be achieved to enhance BCVA in this type of refractive amblyopia.

1.1. Aims and Objectives

1. To study demographic profile of patients with amblyopia attending eye OPD in a tertiary care centre.
2. To determine the efficacyof treatment on visual outcomes in bilateral myopic amblyopia according todegree of amblyopia.
3. To evaluate visual improvement with efficacy of treatment and its correlation with respect to duration of treatment.

2. Materials and Methods

2.1. Study design

Prospective Interventional study

2.2. Inclusion criteria

4-18yrs age bilateral myopic (anisometric, isometropic and meridional) amblyopia

2.3. Exclusion criteria

1. Strabismic amblyopia.
2. Sensory deprivation amblyopia**.**

This study enrolled in 25 cases with bilateral myopic amblyopia in the age group of 4-18yrs excluding those with organic causes. This study followed with the informed consent of parents. All subjects underwent thorough ophthalmic examinationincluding visual acuity, subjective test, cover-uncover test for strabismus assessment, torch-light and slit-lamp examination, fundoscopy for posterior segment evaluation, cycloplegic refraction, wet retinoscopy. Using Snellen's chart at 6 meters distance, BCVA assessed followed by cycloplegic refraction. According to age of patient, atropine 1% ointment was given to child under 5 years of age under observation of its undue side-effects and contraindication. Parents instructed to apply a minute rice flake like ointment in the lower lid of their child for 3 days, thrice per day i.e.8 hourly.5-8years of age were dilated using homatropine 2%, one drop repeated twice after 10 mins and more than 8 years above were dilated using cyclopentolate 1%, one drop repeated thrice after 15 mins. The gold standard method of wet retinoscopy performed, to advice spectacle correction with assessment of best-corrected visual acuity.

Bilateral amblyopic cases selected as 6/9-≤6/60 BCVA in both eyes on the Snellen chart. With standard distance as 6 meters, best-corrected visual acuity accepted as the line out of 5 letters which a patient can read 4 letters. We selected those patients not improving to 6/6 BCVA without any organic cause in both eyes. Then we classified them according to degree of amblyopia on the basis of difference of best-corrected visual acuity in both eyes respectively as:

Amblyopia-6/9- ≤ 6/18

Moderate Amblyopia -6/18- ≤6/36

Severe Amblyopia -6/36 - ≤6/60

According to severity of myopia, under full cycloplegic refraction followed by evaluation of the spherical equivalent, patients were graded as-

Mild Myopia- 1-≤3D

Moderate myopia-3-≤6 D

Severe myopia-6-≤9 D.

The Initial and final binocular BCVA of the patients were compared. Visual acuity data for patients converted to common logarithm of minimum angle of resolution (log MAR) scale for statistical analysis. Then treatment planned according to degree of amblyopia, age, severity of myopia and patient compliance as-

Mild Bilateral myopic Amblyopia - Spectacle correction with 2 hours of occlusion both in alternate eyes

Moderate bilateral myopic Amblyopia –Spectacle correction with 6 hours of occlusion both in alternate eyes.

Severe Bilateral myopic Amblyopia –Spectacle correction with 6 hours of occlusion and macular stimulation both in alternate eyes.

The duration of occlusion for both eyes prescribed on alternate day's i.e.6 hours of day 1 for one eye and another

6 hours of day 2 for the other eye respectively. Macular stimulation done by patching a better eye and stimulating more amblyopic eye than other with use of entopic phenomenon of Haidinger's brushes of synoptophore daily for a week with a minimum span duration of 15 minutes and after 10-15 days we assessed improvement. In cases of improvement, we continued it for a month whereas in cases of no improvement therapy was stopped. The duration of occlusion and macular stimulation advised separately based upon degree of myopia, severity of amblyopia, compliance, and age of patient respectively. Compliance changes has occurred with the therapy of macular stimulation due to irregular follow-up. Compliance with wearing spectacles and treatment strategies estimated in each follow-up visit based upon response of parents from questioning and almost all cases with good compliance during follow-up periods were included.

2.4. Follow –Ups

Period of 12 months with initial 1 weekly visits followed by monthly visits.

2.5. Statistical analysis

The Initial and final best corrected visual acuities (BCVA) converted to Mean± Standard Deviation[SD] in log MAR scale and the cumulative mean percentage of visual improvement is assessed with each treatment strategy.

3. Results and Observations

In Table 1: Less than 10 years of age group [19 cases] were more affected. Also, there were no sex dominance among males and females .Less than 10 yrs age group had more number of severe myopia [9 cases].Whereas age more than 10 yrs had more moderate cases.[4 cases].

In above Table 2, Bilateral cases of moderate myopes were majority affected [44%] whereas cases of bilateral mild and moderate were almost equal.

≤10 years[n=19] improved to minimum 5.3% in 2 case[RE and LE] showed 3 and 5 line improvement respectively. Maximum 12 case[63.2%] showed 1 line improvement. While agegroup >10 years[n=6] improved to minimum 16.7% in RE and LE showed 3 line and 2 line improvement respectively. Maximum 3 case[50%] showed 1 line improvement in LE. Age≤10 years showed better improvement.[5.3%-63.2%]Table 3

In mild [n=6] myopia minimum 16.7% [1 case] of RE showed 2 line improvement. Maximum 50% [3 case] of RE showed 1 line improvement. In moderate myopia [n=9], minimum 11.1% in 2 case of RE showed 2 and 3 line improvement respectively. Maximum 77.8% in 7 case of LE showed 1 line improvement. In severe case[n=10],minimum 10% in 2 case of RE and LE showed 3 and 5 line improvement respectively. Maximum 60%, 6 case in RE showed 1 line improvement.Table 4

Maximum 5 lineimprovement in [LE] with occlusion with macular stimulation observed in 1 patient and 3 line improvement in [RE] with macular stimulation and combination of both in 1 patient. All cases[6] showed increase in BCVA with combination of treatment in Table 5 .

In Table 6, treatment as per difference of amblyopia in both eyes given .Maximum, mild amblyopia in 10 eyes improved with macular stimulation and 8 eyes of moderate-severe amblyopia improved with combination. P-value[0.019] is statistically significant with macular stimulation [RE].

In above Table 7: Mild cases showed better improvement followed by moderate. Whereas severe cases showed least improvement.

In above Table 8: On each follow up visits, there was improvement in BCVA from baselineand statistically significant with respect to p-value.

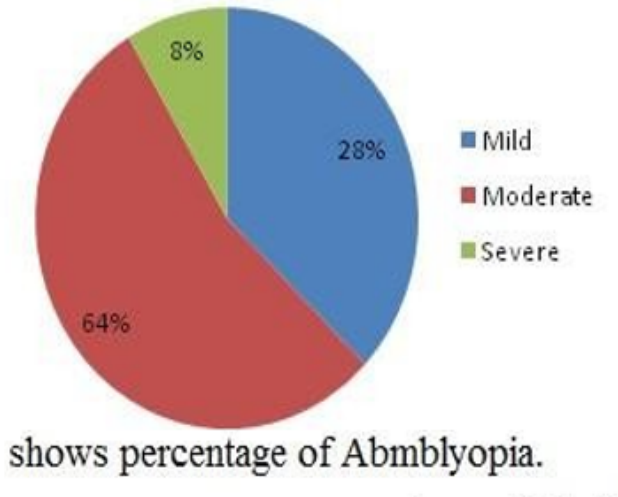
Table 9 Maximum improvement of 10-30% observed in both eyes.

Table 10 Moderate amblyopic were majority found [64%] followed by mild [28%] and severe [8%].

In Table 12, Macular stimulation given in majority of 44% followed by Occlusion with macular stimulation [36%]

Among 25 cases, visual improvement range of 10-30% observed in 9 cases (36%) with occlusion in both eyes.30-60% in 7 cases(28%) with macular stimulation, 60-90% in 3 cases (12%)with combination of occlusion with macular stimulation and 0-10% in 6 cases(24%) who do not come for regular follow-up and low compliance in Table 10.

In above Table 13, Macular stimulation and occlusion showed significant results in improvement of vision in both eyes, p-value=0.001. Also macular stimulation with pvalue=0.017.



Graph 1: Amblyopia %

Table 1: Age and sex wise distribution in Myopia (N=25)

S. No.	Grading of Myopia	Degrees [Diopters]	Sex		Age <10 yrs (n=19) (%)	Age>10 yrs (n=6) (%)
			Male (n=13) (%)	Female(n=12) (%)		
1	Mild	1-≤3	01 (7.69%)	05 (41.67%)	05 (26.32%)	01(16.67%)
2	Moderate	3-≤6	05 (38.46%)	04 (33.33%)	05 (26.32%)	04(66.66%)
3	Severe	6-≤9	07 (53.85%)	03 (25%)	09 (47.36%)	01(16.67%)

Table 2: Severity of myopia in either eye

Myopia	Right Eye (%)	Left Eye (%)	P-value*
Mild	7 (28%)	8 (32%)	
Moderate	11 (44%)	11 (44%)	0.931
Severe	7 (28%)	6 (24%)	

*Chi-square test

Table 3: Relationship of line of improvement [change in BCVA] and age group in left and right eyes

Eye	Line of Improvement	Age		P-value
		≤ 10 years (n=19) (%)	>10 years (n=6) (%)	
RE	0	6 (31.6%)	1 (16.7%)	0.043
	1	12 (63.2%)	2 (33.3%)	
	2	0 (0%)	2 (33.3%)	
	3	1 (5.3%)	1 (16.7%)	
LE	0	6 (31.6%)	2 (33.3%)	0.954
	1	9 (47.4%)	3 (50%)	
	2	3 (15.8%)	1 (16.7%)	
	5	1 (5.3%)	0 (0%)	

Table 4: Relationship of line of improvement [Change in BCVA] and Grading of myopia in left and right eyes

Eye	Line of Improvement	Grading of Myopia RE &LE			P-value
		Mild (n=6)(%)	Moderate(n=9) (%)	Severe (n=10) (%)	
RE	0	2(33.3%)	2(22.2%)	3(30%)	0.884
	1	3(50%)	5(55.6%)	6(60%)	
	2	1 (16.7%)	1(11.1%)	0 (0%)	
	3	0 (0%)	1(11.1%)	1 (10%)	
LE	0	2 (33.3%)	2(22.2%)	4 (40%)	0.299
	1	2 (33.3%)	7 (77.8%)	3 (30%)	
	2	2 (33.3%)	0 (0%)	2 (20%)	
	5	0 (0%)	0 (0%)	1 (10%)	

Table 5: Line of improvement with treatment in either eye.

Eyes	Line of Improvement	Treatment Prescribed			P-Value
		Macular stimulation (n=11) (%)	Occlusion (n=5) (%)	Occlusion with macular stimulation (n=9)(%)	
RE	0	4 (36.4%)	1 (20%)	2 (22.2%)	0.505
	1 line	6 (54.5%)	4 (80%)	4 (44.4%)	
	2 line	0 (0%)	0 (0%)	2 (22.2%)	
	3 line	1 (9.1%)	0 (0%)	1 (11.1%)	
LE	0	4 (36.4%)	0 (0%)	4 (44.4%)	0.045
	1 line	7 (63.6%)	2 (40%)	3 (33.3%)	
	2 line	0 (0%)	3 (60%)	1 (11.1%)	
	5 line	0 (0%)	0 (0%)	1 (11.1%)	

Table 6: Difference of amblyopia in BE and line of improvement with treatment.

Eye	Line of Improvement	Macular stimulation			Occlusion			Occlusion with macular stimulation			
		Difference of amblopia Grade in BE									
		Mild (n=9) (%)	Mildmoderate (n=1)(%)	Moderate (n=1)(%)	Mild (n=1)(%)	Mildmoderate (n=2)(%)	Moderate-severe (n=2)(%)	Mild (n=1)(%)	Mildmoderate (n=3)(%)	Moderate (n=4)(%)	Moderate-severe (n=1)(%)
RE	0	4(44.4%)	0(0%)	0(0%)	0(0%)	0(0%)	1(50%)	0(0%)	1(33.3%)	1(25%)	0(0%)
	1 line	5(55.6%)	0 (0%)	1(100%)	1(100%)	2(100%)	1(50%)	0(0%)	2(66.7%)	2(50%)	0(0%)
	2line	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(100%)	0(0%)	1(25%)	0(0%)
	3line	0(0%)	1(100%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(100%)
	P-value		0.019			0.392				0.141	
LE	0	4(44.4%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	2(66.7%)	2(50%)	0(0%)
	1 line	5(55.6%)	1(100%)	1(100%)	1(100%)	1(50%)	0(0%)	1(100%)	1(33.3%)	1(25%)	0(0%)
	2line	0(0%)	0(0%)	0(0%)	0(0%)	1(50%)	2(10%)	0(0%)	0 (0%)	1(25%)	0(0%)
	5line	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(100%)
	P-value	0.497			0.233			0.2			

Table 7: Visual improvement with severity of amblyopia in BE

Variable Name	Pre-treatment Vision			Post-treatment Vision		
Amblyopia (BCVA)	Right Eye (%)	Left Eye (%)	Pvalue*	Right Eye (%)	Left Eye (%)	Pvalue*
Mild	15 (60%)	13 (52%)		20 (80%)	19 (76%)	
Moderate	10 (40%)	9 (36%)	0.202	5 (20%)	6 (24%)	0.943
Severe	0 (0%)	3 (12%)		0 (0%)	0 (0%)	

*Chi-square test

Table 8: Visual improvement on duration of each follow up visits from Baseline [Time-Frame 8 weeks]

Study visit	BCVA (Mean ± SD)	
	Right Eye	Left Eye
Baseline	0.524 ± 0.226	0.536 ± 0.271
1^{st} follow up BCVA	0.404 ± 0.197	0.420 ± 0.219
2^{nd} follow up BCVA	0.404 ± 0.197	0.420 ± 0.219
3^{rd} follow up BCVA	0.404 ± 0.197	0.420 ± 0.219
P-value*	0.001	0.001

*Friedman test for follow-up

Table 9: Percentage of visual improvement in both eye and their significance

Amblyopia Improvement Range	Right Eye (%)	Left Eye (%)	P-value*
0%	8 (32%)	8 (32%)	
10% - 30%	9 (36%)	9 (36%)	p>0.05
30% - 60%	6 (24%)	6 (24%)	
60% - 90%	2 (8%)	2 (8%)	

*Chi-square test

Table 10: Degree of Amblyopia according to BCVA n=25

S.No.	Grade of Amblyopia	BCVA	No. of patients	Percentage
1	Mild	6/9-≤6/18	07	28
2	Moderate	6/18-≤6/36	16	64
3	Severe	6/36-≤6/60	02	08

Table 11: Moderate amblyopic were majority found [64%] followed by mild [28%] and severe [8%].

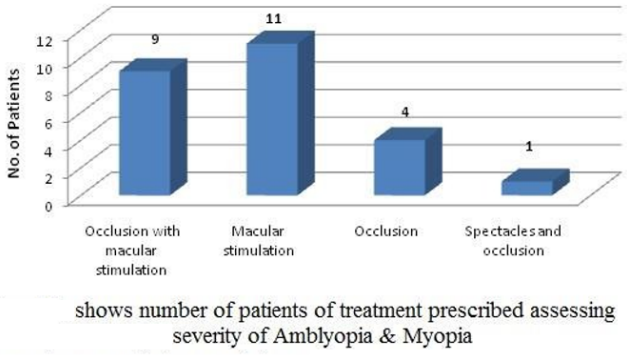
S No.	Treatment	No. of patients	Percentage
1	Occlusion with macular stimulation	09	36
2	Macular stimulation	11	44
3	Occlusion	05	20

Table 12: Visual improvement range according to line of treatment in BE

Treatment	Visual improvement Range %	Frequency	Percentage
Low compliance	0-10	6	24
Occlusion	10 – 30	9	36
Macular stimulation	30 – 60	7	28
Occlusion with macular stimulation	60 – 90	3	12

Table 13: Effect of treatment on vision and their significance with duration respectively

Variable Name	Pre-test RE Vision	Post-test RE Vision	P value	Pre-test LE Vision	Post-test LE Vision	P value
Low compliance	0.40 ± 0.23	0.32 ± 0.18	0.363	0.37 ± 0.19	0.32 ± 0.18	0.363
Macular Stimulation and Occlusion	0.51 ± 0.21	0.43 ± 0.24	0.001	0.58 ± 0.25	0.48 ± 0.24	0.001
Macular stimulation	0.60 ± 0.26	0.44 ± 0.19	0.042	0.57 ± 0.33	0.41 ± 0.23	0.017
Occlusion	0.52 ± 0.23	0.33 ± 0.12	0.127	0.67 ± 0.29	0.30 ± 0.10	0.235



Graph 2: Treatment prescirbed to the number of patients

Fig. 1: Shows amblyopia treatment by the methods of occlusion with use of occlusion adhesive patch and spectacle correction in 10 years old girl.

Fig. 2: Macular stimulation with Haidingers brushes of Synoptophore in a 12 years old boy.

4. Discussion

Amblyopia is amongst common cause of blindness in children and adolescents under 45 years of age, with an incidence of 3.2 percent in the general population.[7] However, anisometropic amblyopia occurs at a rate of 9.64% in patients with myopia, a relatively uncommon disorder, compared to other types of amblyopia.[8] Children with uncorrected myopia, astigmatism, or both, can develop bilateral refractive amblyopia.[7,9] Despite mild levels of myopia, refractive amblyopia can be suspected in children with poor binocular vision. The present study included 25 cases with bilateral myopic amblyopia of age 4-18 years after observing that their vision remained poor even after

receiving optical correction.

Out of 25 patients with amblyopia, no significant gender difference was obtained between male (52%) and female (48%) in present study. In agreement to present study findings, Huang et al., also reported no significant gender difference for amblyopia prevalence (p=0.77).[6] Contrary to that, Bhatiya et al reported male preponderance (76.7%) for anisometropic amblyopia compared to females (23.3%).[10]

In present study, amblyopia was more prevalent in children with age less than 10 years (76%) compared to 24% children who had age more than 10 years. In line with these findings, Shetty et al. (n=42) reported higher prevalence of amblyopia (over 50%) in children having age between 0-15 years which was similar to our study.[11] Another study by West et al in 2016 reported a cumulative incidence of amblyopia between 2% to 4% among the children of age between 8 to 15years,[12] similar to our study. We have taken a larger age-group so we divided them into two age-groups i.e. below 10 years and above 10 years while other studies have taken only one group to find out incidence.

On analysing the incidence of severity of myopia we have observed that majority had severe myopia (40%) followed by moderate (36%) and mild myopia (24%). Those with age more than 10 years, majority had severe myopia (47.36%) followed by 26.32% each who had moderate and mild myopia, whereas those with age less than 10 years, majority had moderate myopia (66.67%) followed by severe (16.67%) and mild myopia (16.67%). In other studies, they have not analyse severity of incidence of myopia.

We observed that there was 44% prevalence of bilateral moderate myopia, whereas 28% cases of bilateral mild and severe myopia were almost equally distributed. In one hospital based study from Mangalore which included 75 patients with high myopia reported that majority of the patients were bilateral (89.33%) compared to 10.66% unilateral cases which is in line with the findings of our study.[13]

Out of 25 patients, we observed 64% were having moderate amblyopia, followed by 28% mild and 8% severe amblyopia. A similar study in Nepal by Sapkota et al. reported that 60% of the eyes had mild to moderate amblyopia, and 40% had severe amblyopia[14]. This may be because one-third of the subjects had bilateral amblyopia due to high ametropia.

44% received macular stimulation, followed by occlusion with macular stimulation in 36% of children. Occlusion was given to only 20% of the patients. To best of our knowledge, this is the first study to compare both methods individually and in combination in improving visual acuity in bilateral refractive myopic amblyopia in the paediatric population.

On analysing the visual improvement with severity of amblyopia in bilateral eyes, 12% patients with severe amblyopia improved and shifted to either moderate or mild category. Also, 11%with moderate amblyopia, improved and shifted to mild cases and total 70% of all the patientspost treatment vision converted to mild amblyopia category. Whereas in a previousretrospective study by Simons et al, the efficacy of penalization (atropine and optical) for mildto moderate amblyopia reported no significant difference in outcome.[15] So the method adopted by our study shows significant improvement contrary to this study.

We separately observed a significant improvement in mean BCVA in right eyes (22.90%) and left eyes (21.64%) at the end of 3^{rd} follow up compared to baseline.

8% patients reported highest improvement in visual range of 60-90% with combination of occlusion with macular stimulation followed by macular stimulation in 24% of patients showedmoderate 30-60% improvement and least visual improvement range of 10-30% with occlusionalone in 9% of patients. Thus, we observed highest visual outcome with combination therapy, followed by macular stimulation and least with occlusion only. Other studies have not improved to this range. In a similar study by Nazemi et al where treatment of anisometropic amblyopia was performed using macular stimulation with telescopic magnification reported significant improvement in mean BCVA ($p<0.001$) at the end of 6 months follow up visit[16]. There were no any previous studies showing the effect of combination therapy on vison.

We observed, patients with ≤10 years (n=19) 5.3% showed 3 and 5 line improvement in RE and LE, respectively. However, 63.2% majority showed 1 line improvement. At the same time, the age group >10 years (n=6), 16.7%, showed an improvement of 3 and 2 line (in both RE and LE, respectively. And 50% showed an improvement of 1 line only. This highlights that patients with age ≤10 years showed better improvement in range of 5.3% to 63.2%. In line with the present study, Holmes et al. reported that older subjects of 7 to <13 years were significantly less responsive to treatment compared with younger age groups (3 to <7 years) for moderate and severe amblyopia which is similar to our study.[17] We reached similar conclusions regarding the effect of age on treatment response in retrospective studies by Fulton and Mayer[18]and Flynn et al.[19] but these studies were limited by lack of a standardized outcome assessment. Also Stewart et al. study of occlusion dose monitors in younger children[20] showed similar response in younger age-groups. Conversely, other authors have reported significant improvement in amblyopic eye visual acuity in children older than 7 years.[21,22]

With respect to Line of improvement with severity of myopia**,** we found that among the mild(n=6) myopia children, majority 50% showed 1 line improvement. In moderate myopia (n=9),11.1% showed 2 and 3 line improvement and majority of 77.8% children showed 1 line improvement. In severe cases (n=10), least 10% showed

maximum 3 and 5 line improvement.And 60% (n=6) showed 1 line improvement. Thus, amblyopia treatment is not affected by severity of myopia in our study. There were no studies which are contradicting this findings with relation to myopia and amblyopia.

In the present study, maximum 5 line improvement was observed in 11.1% patients with combination of occlusion and macular stimulation, and 3 line improvement with macular stimulation in 9.1% and occlusion in 11.1%. All 9 cases who underwent combination treatment showed an increase in BCVA. A significant line of improvement was observed with all treatment plans in the left eye. Chen et al. reported that mean amblyopic eye VA improvement of 3 lines occurred in both moderate and severe cases of amblyopia.[23] We got maximum 5 line improvement compared to this since we used combination of occlusion with macular stimulation which no other studies have done till yet and it showed better response. In agreement with this, a previous study by Kavitha et al. showed VA improvement by ≥1 line in the occlusion group (43.3%) in children with mild to moderate amblyopia and 36.6% with severe amblyopia as compared to 40% and 20%, respectively in nonocclusion group. However, 3 lines of improvement were seen only in the occlusion group which is similar to our study.[24]

Among the amblyopia patients,with respect to difference of amblyopia in both eye, significant difference in vision improvement was observed with macular stimulation only (p=0.019) in right eye. Mostly 55.6% showed 1 line improvement with mild amblyopia receiving macular stimulation ,also 3 line with mild to moderate amblyopia in 1 patient with macular stimulation, and 1 line with mild-moderate amblyopia in 50% patients receiving occlusion. In a prospective, pilot study of the PEDIG reported 2 or more lines of visual improvement from baseline in 27% of the amblyopic children treated with daily patching.[25] An RCT reported half of the patients with amblyopia to show improvement to occlusion or atropine in visual outcome compared to those who were prescribed only glasses.[26] In another study evaluating 16 amblyopic children reported improvement of at least 2 lines (94%) after occlusion therapy.[27,28] So occlusion has given more response in this study which is dissimilar to our study.

5. Limitation

We observed that the study is not devoid of limitations. A few of them are cross-sectional nature, small sample size, and non-randomization. There is a need for a larger randomized clinical trial to provide more strength to this study findings.

6. Conclusion

Bilateral refractive amblyopia is unremarkable, primarily with the absence of visible signs. A good visual outcome was obtained in most of the patients. Mild cases showed better improvement followed by moderate whereas, severe cases showed the least improvement. The majority of patients with mild amblyopia improved with macular stimulation, and an as significant number of patients with moderate-severe amblyopia improved with combination therapy.

7. Conflict of Interest

None.

8. Source of Funding

None.

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