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Original Research Article

A study of clinical, etiological demographic profile of patients with concomitant esotropia between ages 0-10 years

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ABSTRACT

Purpose: A study of clinical, etiological demographic profile of patients with concomitant esotropia between ages 0-10 years in a tertiary care hospital to assess various clinical patterns and refractive errors.
Design: It is a prospective observation study of patients with concomitant esotropia conducted at Sarojini Devi Eye Hospital, Hyderabad from September 2016 to March 2018. The study included 100 patients who attended the squint department, with chief complaints of inward deviation of eyes.
Results: A total of 100 patients were examined, 37 (37%) were of the 0-5 age group, and 63 (63%) were of the 6-10 age group. 41(41%) were male 59 (59%) were of female. 50 (50%) were from urban areas and 50 (50%) rural areas.
The majority of the cases were of infantile esotropia 39 (39%) followed by Basic esotropia 34 (34%) sensory esotropia 12 (12%), accommodative esotropia 6 (6%), partially accommodative esotropia 5 (5%) and esotropia in myopia 4 (4%).
Amblyopia was seen in 69 (69%) of cases which majority improved with amblyopia therapy. The most common refractive error was hypermetropia 76 (76%) and Myopia was seen in 24 (24%) of cases. AHP in 5.12% of cases, DVD in 15.38%, of cases, IOOA in (64.10%), DVD and IOOA in 10.25% of cases, manifest nystagmus in 10.25% of cases, manifest latent nystagmus in 5.12% of cases were seen.
Conclusion: This study provides data on the most prevalent forms and associations of concomitant esotropia. Knowledge of various clinical types and timely intervention will help in the development of binocular single vision.

1. Introduction

Concomitant esotropia is a form of strabismus in which one or both eyes turn inwards & amount of deviation doesn't vary with the direction of gaze. Esotropia constitutes 40% of strabismus and can occur constantly or intermittently giving the individual a crossed-eye appearance.

Amblyopia can occur as a result of esotropia occurring in childhood. To avoid blurred images from the deviated eye, the brain will suppress the image of the esotropic eye which when allowed to continue untreated, will lead to the development of amblyopia. Early identification of type and associations and advocation of appropriate treatment is mandatory to prevent the development or else reduce the density of amblyopia which is common in Esotropia. Otherwise, it will affect the mental and social development of the individual including scholastic performance.

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This study was envisaged to find out the incidence of various clinical types, and associations of comittant esotropias such as DVD and IOOA in patients with Esotropia attending squint department in a tertiary care hospital.

2. Aim

To study the clinical, etiological demographic profile of patients with concomitant esotropia between ages 0-10 years in a tertiary care hospital and to assess various clinical patterns and refractive errors.

3. Materials and Methods

It is a prospective observational study of concomitant Esotropias conducted at Sarojini Devi Eye Hospital, Hyderabad from September 2016 to March 2018. The study included 100 patients who attended the squint department, with the chief complaint of inward deviation of the eyes.

3.1. Inclusion criteria

Cases of concomitant Esotropia between ages 0-10 years.

3.2. Exclusion criteria

Cases with incomitant esotropia and concomitant esotropia above age 10 years, cases operated on once, and traumatic strabismus.

3.3. Screening of the case

As soon as the patient comes to the General outpatient department, the main complaints are enquired and after examination, he is routinely tested for vision. In on general examination if a squint is revealed he is immediately referred to the Orthoptic department, a routine orthoptic examination is performed as per the following scheme.

3.4. Method of examination

The following was the examination protocol.

Detailed history included the relevant symptoms, duration of complaints, antenatal, natal, and post-natal history, any systemic illness, family history, and details of previous treatment history. The clinical examination included a general and systemic examination, examination of visual acuity with Snellen's visual acuity chart in verbal, and Lea symbol chart in preverbal children. The ability to fix and follow lights and any resistance to occlusion was recorded in the case of infants. Refraction was carried out under full cycloplegia,

3.5. The anterior segment was evaluated

A detailed orthoptic examination was done for all cases which included the following Facial symmetry and compensatory head posture were noted. Hirschberg corneal reflex test was done.

3.5.1. Cover test and uncover test

The patient was asked to fixate on a point light where the normal-looking eye was covered while observing the movement of the uncovered eye. This test was performed for near fixation (i.e. at 33 cm) and distance fixation (i.e. at 6 meters) In the uncover test the covered normal looking eye was uncovered and movement was observed. Cover test confirms the presence of a manifest squint and Uncover test establishes the presence type of Heterophoria (latent deviation) if present. During the cover and uncover test look for any nystagmus which may be unmasked by the test.

3.5.2. Alternate cover test for near and distance

In this test, the patient was asked to fixate an object alternately with each eye while the occluder was placed alternately in front of each eye. Establishes whether the squint is unilateral or alternate and also differentiates content from paralytic squint(where secondary deviation is greater than primary deviation)

A prism bar cover test was done for near and distance with corrected refractive error if any, with prisms of increasing strength with apex towards the deviation in front of one eye and the patient was asked to fixate the target with the other eye. The deviation was measured in all the directions of gaze especially in up and down gazes to know the alphabetical pattern of deviation.

3.5.3. Assessment of ductions and versions

Ductions are assessed by covering one eye and the fellow eye fixates a spotlight which is moved to bring the fixating eye to the farthest possible position in all the cardinal directions of gaze. It is observed whether movement lags or is excessive in any direction. If no lags are noticed the ductions are recorded as full. If lags are noticed, a subjective assessment is made on a scale of 9 points (+4 to -4). Versions are assessed by asking the patient to hold his head straight and still and to make eye movements on command or to follow a fixation light in all the cardinal gazes. observations such as excessive or defective movements in any direction and to note any retraction of the globe and narrowing of palpebral fissure in certain gaze(as seen in Duanes retraction syndrome) are made.

3.6. Sensory examination

3.6.1. Worth four dot test

This is to know the presence of suppression and if present, of which eye, the presence of diplopia. The patient is asked to see at an illuminated screen after wearing red and green goggles, where four colored circles are seen, one red two green, and the colorless fourth. If he sees all four binoculars single vision is present and whether crossed or uncrossed

can also be noted

Appreciation of three greens denote the suppression of the eye wearing red glass and appreciation of two reds discloses suppression of the eye behind the green glass. Two red or green lights may appear alternately, but never simultaneously indicating alternate suppression. It is carried out at a distance of 6 meters and also at a reading distance.

3.6.2. Binocular stereoacuity vision

This is assessed with a Random dot stereogram and Titmus fly test.

3.6.3. Refraction and fundus examination

As a routine, all the cases of concomitant esotropia below age 7 years are advised to atropinise both eyes with 1% ointment thrice daily for three days and asked to come on the fourth day for refraction and fundus examination. In children, more than 7 years cyclopentolate 1% eye drops are instilled every 10 minutes three times and retinoscopy is performed one and half hours later.

Post mydriatic test is done after 15 days in atropinised children and after 2 days in children dilated with cyclopentolate to see the acceptance of glasses to give the optical correction.

A clinical diagnosis of the type of esotropia is made based on the above examination results.

4. Results and Discussion

Strabismus is a state of abnormal alignment of the two eyes. This condition has a multi-dimensional impact on the patient's life and is fairly common. Various epidemiological studies place the prevalence at around 0.5 to 5%, varying substantially with the region.

Strabismus might be associated with amblyopia, adding another spectrum to the functional disability. Visual loss coupled with poor self-image and esteem, places the person at a social and emotional disadvantage and contributes to low quality of life in these patients. Society is prejudiced against strabismic individuals, often underestimating their intelligence quotient and stereotyping them.

The etiology of concomitant esotropia can be from simple refractive error to life-threatening intracranial lesions presenting as acute onset nonaccommodative esotropia.

The present study includes 100 patients of concomitant esotropia who attended the strabismus department at Sarojini Devi Eye Hospital, Hyderabad. All patients underwent complete orthoptic examination and characteristics of different concomitant esotropia are derived and compared with other studies.

4.1. Age distribution

The age range of patients is from 0 months to 10 years in the present study.

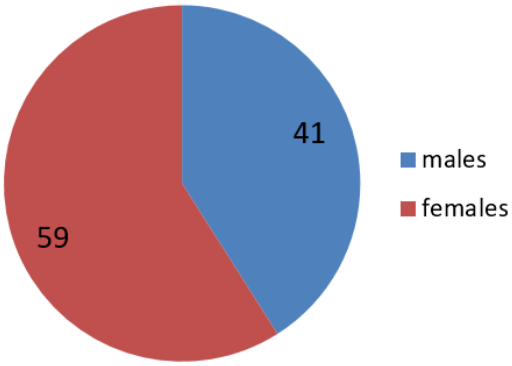

Figure 1: Sex distribution in concomitant esotropia

Table 1: Age distribution in different types of concomitant esotropia

	0-5 years	6-10 years
Infantile esotropia	26%	13%
Accommodative esotropia	5%	1%
PAET	1%	4%
Basic esotropia	2%	32%
Sensory esotropia	2%	10%
Esotropia in myopia	1%	3%
Total	37%	63%

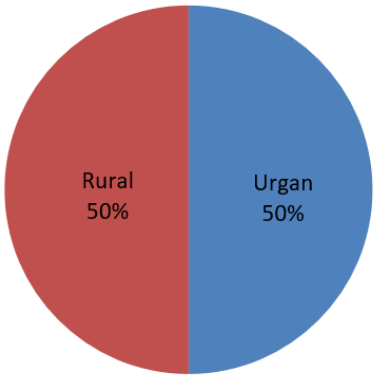

Figure 2: Demographic distribution in concomitant esotropia

Table 2: Incidence types of concomitant esotropia '

	Percentage	Number
Basic esotropia	34	34
Infantile esotropia	39	39
Accommodative esotropia Refractive -4 Non refractive -2	6	6
Paet	5	5
Esotropia in myopia	4	4
Sensory esotropia	12	12
Total	100	100

Table 3: Age of onset of different types of concomitant esotropia

	<6 months	6 months-2 years	2 to 5 years	More than 5 years
Infantile esotropia	39	0	0	0
Accommodative esotropia	0	2	3	1
Partially accommodative esotropia		3	1	1
Basic esotropia	0	4	16	14
Sensory esotropia	0	0	2	10
Esotropia in myopia	0	1	0	3
	39	10	22	29

Table 4: Incidence of amblyopia in concomitant esotropia

	Mild (6/9 to 6/12)	Moderate (6/12 to 6/36)	Severe(>6/36)	Total
Infantile esotropia	11	3	8	22
Accommodative esotropia	2	1	1	4
PAET	2	1	1	4
Basic esotropia	24	4	0	28
Sensory esotropia	2	2	4	8
Esotropia in myopia	0	0	3	3

Table 5: Distribution of size of deviation in concomitant esotropia

	5-24	25-49	>50
Infantile esotropia	0	18	21
Accommodative esotropia	1	4	1
PAET	1	2	2
Basic esotropia	2	16	16
Sensory esotropia	0	6	6
Esotropia in myopia	0	3	1
Total	4	49	47

Table 6: Distribution of hypermetropia in concomitant esotropia

	Mild Hypermetropia (0 to +2D)	Moderate Hypermetropia (+2.25D to +5D)	Severe Hypermetropia (>+5D)
Infantile esotropia	22	9	1
Accommodative esotropia	1	2	3
PAET	1	1	3
Basic esotropia	16	8	0
Sensory esotropia	0	3	6
Total	40	23	13

Table 7: Distribution of myopia in concomitant esotropia

	Low Myopia (0 to -2D)	Moderate Myopia (-2.25D to -5D)	High Myopia (>-5D)
Sensory esotropia	0	3	0
Basic esotropia	8	2	0
Eso in high myopia	1	0	3
Infantile esotropia	7	0	0
Total	16	5	3

Table 8: Associations of infantile esotropia:

Association	Percentage
Anomalous head posture	5.12%
Dissociated vertical deviation (DVD)	15.38%
Overaction of inferior obliques (OAIO)	64.10%
DVD and OAIO (combined)	10.25%
Manifest nystagmus	10.25%
Manifest-latent nystagmus	5.12%

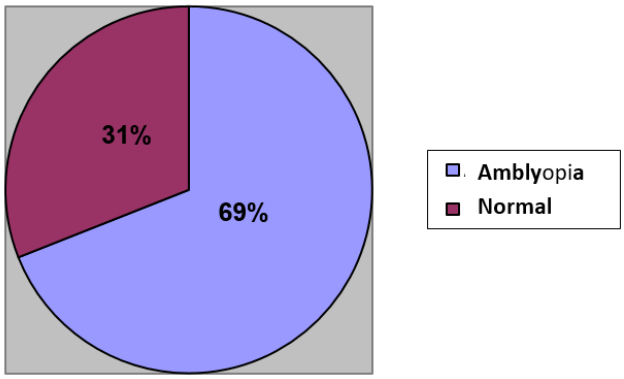

Figure 3: Size of deviation in different types of concomitant esotropia

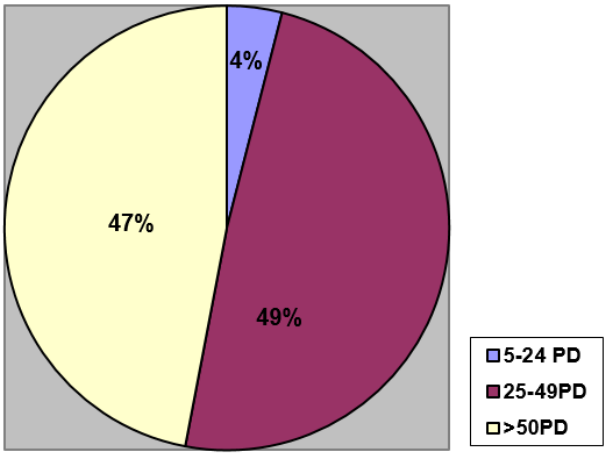

Figure 4: Distribution of refractive errors in concomitant esotropia

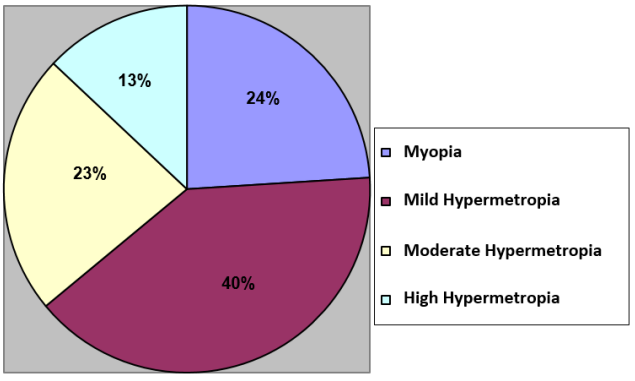

Figure 5: Distribution of myopia

37% of patients are between 0-5 years.(Table 1)

63% of patients are between 6-10 years.

In a study conducted by Dalia S et al[1] on 100 patients with concomitant esotropia, 55% were between the age group 0-5 years and 45% were above age 6 years.

4.2. Sex distribution

Out of a total of 100 patients, 41 were males and 59 were females.(Figure 1)

Male: Female ratio was 1:1.44. Several authors have commented on the preponderance of females in the population of patients with Eso deviation. In the study published by Krzystkowa and Pajakowa67% were females and in the study published by Dahlia S et al. 56% were females.

4.3. Incidence of types of concomitant esotropia

Of the 100 cases in our study, infantile esotropia contributed to the majority forming 39% of cases. A case of infantile esotropia of 60 PD is shown in Figures 6, 8 and 9. Followed by Basic esotropia 34%, a case of basic esotropia is shown in Figure 7. Followed by sensory esotropia 12%. Accommodative esotropia constituted 6% of which Refractive accommodative is 4% as shown in the Figure 11 and non-refractive accommodative is 2%. Partially accommodative esotropia constituted 5% s shown in the Figure 10 and Esotropia in high myopia constituted 4%.

Figure 6: 60 PD of right eye infantileesotropia

Figure 7: A case of basic estropia

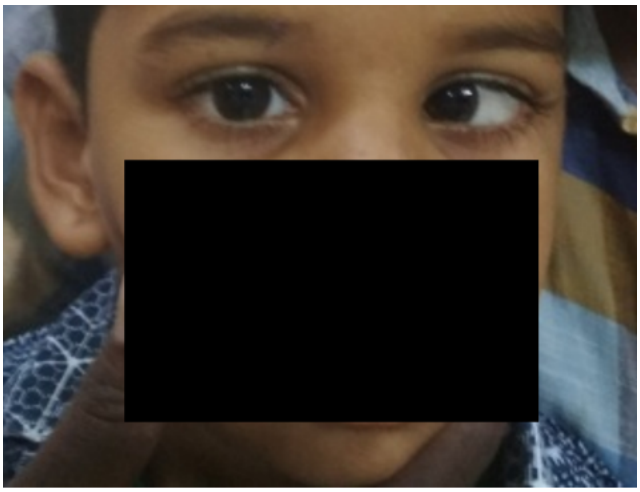

Figure 8: A case of alternate infantile esotropia

Figure 9: Old photograph of the same child at age 4 months showing esotropia

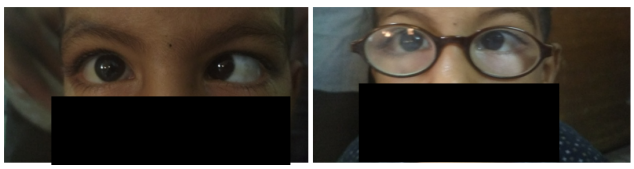

Figure 10: A case of partially accommodative esotropia; Without glasses with glasses residual esodeviation can be noted

Figure 11: A case of refractive accommodative esotropia

In the study done by Dalia et al. in Kerala, south India Infantile esotropia contributed the majority forming 38% of cases followed by basic esotropias 23% and partially accommodative 22%. Among the accommodative esotropias which constituted 12% of the study, half of the cases were of the mixed variety. Sensory esotropia constituted 3% and convergence excess was 2%. So the present study and study by Dalia S et al were done in south India in which the most common type is infantile type. This is different from other studies done.

In a study done in Kashmir, North India by Sarosh et al[2] most common type was partially accommodative 37.17% followed by Accommodative Esotropia 26.7% Infantile esotropia 19% Basic esotropia 10.2% followed Sensory esotropia 6.9%.

In a study done by Chia et al[3] in Asian population most common type was accommodative esotropia 30% followed by infantile esotropia and Partially accommodative esotropia 23% followed by basic esotropia 17%.

In the study done by Greenberg et al.[4] in Olmsted County, Minnesota Accommodative esotropia 36.5% was the most common type followed by Basic esotropia 16.6% followed by Infantile esotropia 8.1% followed by Ssensory 6.5%.

According to the report of study conducted at College of Medicine, Johnson city, U.S.A[5] more than half of the cases (52.9%) had some form of Accommodative element. This was followed by the accommodative type (10.5%). Infantile Esotropia constituted only 5.4% in their study.

Whilst in studies done in south India Infantile esotropia is the most common, in studies done in north India and western population Accommodative component is most common. There appears to be a Geographical variation in the incidence of types of concomitant esotropia.

In the present study 46.15% of patients presented with a deviation between 25-49 PD While 53.84% of patients presented with deviation >50PD. In contrast to this in the study done by Costenbader et al.[6] 24.65% of patients presented a deviation between 0-24 PD, 30.94% of patients presented with a range of 25-49 PD, and 44.41% of patients presented with a deviation greater than 50 PD.

In both the studies majority of cases presented with large angle deviation.

4.4. Refractive errors

In the present study, myopia is seen in 17.95% of Infantile esotropias, Mild hypermetropia in 56.41% which constituted the majority of infantile esotropias, moderate hypermetropia in 23.08% and high hypermetropia in 2.56% which constituted least.

In the study done by costenbader et al[7] Myopia constituted only 6.04%, Mild hypermetropia was 47.44% which constituted majority. Moderate Hypermetropia was seen in 41.86% and high Hypermetropia was seen in 4.65%

only.

Amblyopia is a commonly associated factor in essential infantile esotropia. It was found in 56.41% in the present study. It was seen in 35% of 408 patients with essential infantile esotropia in a study done by von noorden et al[8] Costenbader reported a prevalence of 41% in his series of 500 cases and Shauly and coworkers[9] diagnosed amblyopia in 48% of their 103 patients.

4.5. Associations of infantile esotropia

In the present study Anomalous head posture is present in 5.12% of cases. DVDs are associated with 15.38% of cases, IOOA is associated with 64.10% of cases, DVD and IOOA combined are present in 10.26% of cases, manifest nystagmus is present in 10.25% of cases and manifest latent nystagmus is present in 5.12% cases.

In a study conducted by Von Noorden et al[10] study anomalous posture was present in 6% of cases.DVDs are associated with 51% cases, OAIO was associated with 68% cases, DVD and OAIO combined was present in 42% cases, manifest nystagmus was present in 15% cases and manifest latent nystagmus was present in 10% cases.

According to literature the onset of age for refractive accommodative esotropia is between 2 to 3 years.

In the present study the mean age is of onset is 2.36 years. No case with delayed onset until adolescence is found in the present study.

In the present study one case of refractive accommodative esotropia had onset at 11 months. Pollard[11] reported two infants with hypermetropia in whom esotropia developed at 41 /2 and 5 months of age.

Coats and coworkers[12] studied the natural history of pure refractive accommodative esotropia after spectacle correction in patients with onset before 1 year old in 17 cases to determine whether their outcomes and characteristics were different from those of patients with more typical age at onset of refractive accommodative esotropia.

Havertape[13] and coworkers studied to determine the frequency of accommodative esotropia with onset by 6 months of age and concluded fifteen percent of infantile esotropia patients and 8% of accommodative Esotropia patients have infantile accommodative esotropia.

According to the literature refractive accommodative esotropia occurs in patients with emmetropia, hypermetropia, or myopia; however, moderate degrees of hypermetropia are encountered most frequently.

In the present study of the 2 cases of non-refractive accommodative esotropia 1 cases had moderate hyperopia and one case had mild hyperopia. Other refractive errors are not reported in the present study as sample size of nonrefractive accommodative esotropia is less that only 2 cases.

Most patients with non refractive accommodative esotropia present between the ages of 6 months and 3 years.

In the present study one case presented at 2 years 5 months of age and one case at 5 years.

In a study by i Geun Kim et al[14] on factors associated with the direction of ocular deviation in sensory horizontal strabismus and unilateral organic ocular problems.

It is found that the most common cause for sensory esotropia is congenital cataract out of 53 patients 33 had congenital cataract. In the present study only 12 cases of Sensory esotropia are studied and in 11 cases the cause is congenital esotropia and one case is cornea opacity with vascularization due to stevens Johnson's syndrome.

In a study by Kutluk S et al[15] a prevalence of Dissociated vertical deviations in 12.5% of patients with sensory heterotropias was the repoted. In the present study case with DVD is reported in 16.66% (2 cases).

In a study Sidikaro Y, Noorden GK Von et al[6] strikingly high prevalence of overacting inferior and superior oblique muscles in patients with Sensory esodeviations or exodeviations was reported. In the present study 4 cases had IOOA and other 8 cases were associated with nystagmus.

In study done by Bagolini B et al,[16] Hugonnier R et al[17] have described cases of Esotropia in Myopia.

In the present study 4 cases of Esotropia in Myopia are reported. All cases had high myopia. One case is associated with nystagmus and one case is associated with IOOA with abduction limitation and V pattern Esotropia. 3 cases had Amblyopia.

4.6. Importance of cycloplegic refraction

Cycloplegic refraction is the key test to diagnosis, classify and treat the type of concomitant esotropia. So cycloplegic refraction is an essential part of paediatric ophthalmic assessment especially in cases of concomitant esotropia. Cycloplegic refraction should be carried in every patient with atropine sulphate 1% ointment upto 7 years and cyclopentolate 1% eyedrops above 7 years.

5. Conclusion

Infantile esotropia was the commonest variety of concomitant esotropia followed basic esotropia. Majority of cases presented in 6-10 years. Male: Female ratio in the study is 1:1.44. Urban and rural population have equal representation. Inferior Oblique over action, DVD history were the common associations of infantile esotropia. The commonest refractive error was Hypermetropia. Concomitant esotropia is an important cause of amblyopia, 69% cases presented with amblyopia. Cycloplegic refraction is essential part of paediatric ophthalmic assessment. Hence, the knowledge of various clinical types and timely intervention will help in development of binocular single vision.

6. Source of Funding

None.

7. Conflict of Interest

None.

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