



Frequency of Exophoria among the Convergence Insufficiency Patients

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Abstract

The purpose of my study was to find the frequency of exophoria among the patients of convergence insufficiency in out-patient ophthalmology department at Benazir Bhutto Hospital RWP during the period of 3 months and to prescribe them orthoptic exercises or prisms. It was a cross sectional, descriptive study and consecutive sampling was used to collect sample of 100 patients. Data was entered and analysed using SPSS v-22. The continuous variable was analysed as Mean SD and Median, and categorical variable as Frequency. Simple Bar charts and Histograms were used to display the data. Patients were evaluated for convergence insufficiency along with exophoria at near. After examination, clinical signs of convergence insufficiency were noted with RAF ruler, exophoria was evaluated with routine orthoptic assessment & orthoptic exercises were prescribed to patients. Results of my study showed that exophoria is present in 64% of convergence insufficiency patients predominantly affecting the females than males. The Mean age and SD of the patients was 17.3 ± 7.44 . The Median age was found to be 15.3 years. Among the 100 convergence insufficiency patients 64 patients were having near exophoria greater than distance exophoria while 36 patients had no near exophoria or less than distance exophoria. Occurrence of strabismus was greater in females (57.8%) than in males (42.2%). Exophoria is present in 54.7 % among the children while percentage is 45.3 % in adults, this shows that there is not much difference between the percentages among children and adults. This study showed that exophoria is the most common sign among convergence insufficiency patients. Orthoptic exercises are the cheapest and easiest solution of this problem.

Key Words: Strabismus; Convergence insufficiency Exophoria; Orthoptic assessment.

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1. Introduction

Strabismus or deviation is one of the common eye conditions with visual, functional and cosmetic consequences. It is basically misalignment of the eyes and may affect the binocular vision and depth perception of the eyes [1]. The condition is more commonly known as "crossed eyes." It is most commonly called as "Crossed eyes" in which two eyes do not align in the same direction, therefore do not look at the object at the same time [2]. This turning of eyes can be congenital. Or acquired, latent or manifest and comitant or incommitant [3]. If the deviation can be seen with both eyes open then it is called manifest strabismus or heterotropia. It can be horizontal or vertical tropia. Hypertropia and hypotropia are the upward and downward deviation of the eyes respectively. Similarly, exotropia and esotropia (also known as divergent and convergent deviations) are the outward and inward turning of the eyes respectively. condition. Alternatively. The deviation which is only present on blocking the binocular vision by occlusion of one eye is called latent strabismus or heterophoria. It is further classified as hyperphoria, hypophoria, exophoria and esophoria [4].

The heterophoria is a latent deviation in which eyes are not focused to same direction. In most of the cases, these deviations are compensated by fusional reserve with appearance of any clinical signs. However, in severe cases, these may be decompensated by fusional reserve and appear as manifest deviations [5].

Exophoria is a type of heterophoria in which one or both eyes are turned outwards on dissociating the eyes via cover or prism during the routine eye examination [6]. The visual axis is diverted from the orbital axis [7]. Prevalence of exophoria is more among the children as compared to adults and it increases with the advancement of age [8].

It can be classified depending upon the causative factors:

- Refractive errors
- Divergence excess
- Convergence insufficiency [9]

In addition to these, it may be caused by neural, muscular and mechanical anomalies. In contrast to exotropia, diplopia is compensated because fusion between both eyes is still present [10]. It can also be caused by wide IPD (inter-pupillary distance) and age [11]. Patients with CI usually presents as teenagers or early adulthood with gradually worsening symptoms of headache, asthenopia, blurred vision and infrequent diplopia during the near work. These symptoms get worse by prolonged near work at the end of the day, illness, anxiety and insomnia. If this condition is left untreated then it may lead to exotropia therefore it is necessary to diagnose it at earliest to prevent it developing the tropia from phoria [12]. Treatment may include eye exercises, prism (combination of treatment is most effective) or surgery in rare cases. Surgery is the last option in case of large exophoria [13]. Pencil push-up exercises are the most effective method for treatment of convergence insufficiency with exophoria [14,15]. This study aims to find the magnitude of exophoria in patients of convergence insufficiency and highlight its importance to practitioners.

2. Materials and methods

It was a cross sectional, descriptive study and consecutive sampling was used to collect sample of 100 patients. The study was conducted in three months from 1st October 2013 to 30th December 2013 and sample was selected from ophthalmology department of Benazir Bhutto hospital, Rawalpindi Pakistan. For ethical concerns, study was approved from the ethical review board of The University of health sciences Lahore in accordance with the principles of Declaration of Helsinki. All the patients between the ages of 5 to 35 years referred to refraction room no. I selected the sample size of 100 patients depending upon the time available and evaluated them under the supervision of ophthalmologist. Data of patients was collected on a Performa designed. A detailed adnexal and anterior segment examination was done with the help of slit lamp. The posterior segment was examined with the direct ophthalmoscope. The patients having any ocular pathology other than refractive errors were excluded from my study. Visual acuity of all patients was taken by Snellen's acuity chart. Pinhole acuity was taken to check any improvement in visual acuity. Streak Retinoscopy was done for the children up to the age of 16 with 0.5% Cyclopentolate to find the total refractive error objectively and was then subjectively verified by post mydriatic test. Subjective refraction was done in the patients of age greater than 16 years and was confirmed by +1.00DS blur test and cross cylinder. For the preliminary orthoptic evaluation, Hirschberg test, cover/uncover test, alternate cover test, and prism cover test were performed both for distance & near. Extra-ocular motility was noted & near point of convergence was measured with RAF ruler. SPSS version 22 was used for data analysis and descriptive statistics (mean, median, mode and standard deviation) were evaluated for the study variables.

3. Results

3.1. Mean age and SD

The Mean age and SD of the patients was 17.3 ± 7.44 . The Median age was found to be 15.3 years.

Table 1: Mean age of the patients and SD.

	No of exophoric patients	Minimum	Maximum	Mean	Std. Deviation
Patient's age	64	8	35	17.3	7.44

3.2. Exophoric & NON exophoric

Among the 100 convergence insufficiency patients 64 patients were having near exophoria greater than distance exophoria 64 % while 36 patients had no near exophoria or less than distance exophoria 36 %.

Table 2: Frequency of exophoric & non exophoric

	Frequency	Percentage	Valid percentage	Cumulative Percentage
Exophoric	64	64	64	64
Non Exophoric	36	36	36	100
	100	100	100	

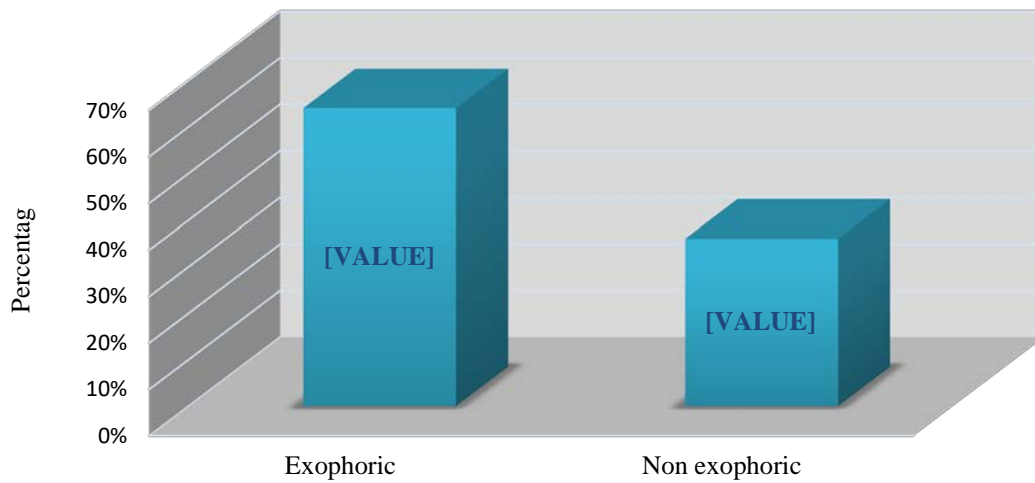


Figure 1: Percentage of exophoric & non exophoric patients among convergence insufficiency patients showing greater percentage of exophoric patients.

3.3. Gender distribution

Occurrence of strabismus was greater in females (57.8%) than in males (42.2%).

Table 3: Gender-wise distribution.

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	37	57.8	57.8	57.8
Male	27	42.2	42.2	100.0
Total	64	100.0	100.0	

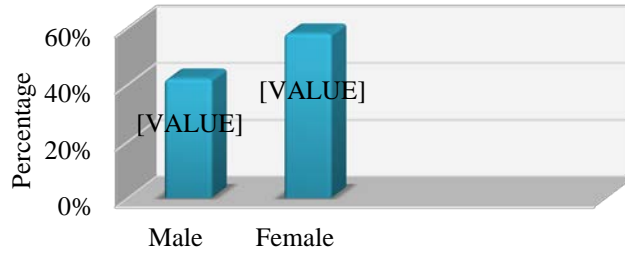


Figure 2: Gender-wise distribution of exophoric patients showing the great percentage among the female.

3.4. Age frequency distribution

The highest frequency of the patients was in the age group of 10-15 years i.e. 29%, followed by 20-25 years age group i.e. 15%. 54.7% of the patients were children (1-16 years). Remaining 45.3% were adults.

Table 4: Age Frequency distribution

Age in Years	Frequency	Percent	Valid Percent	Cumulative Percent
5-10	3	4.7	4.7	4.7
10-15	29	45.3	45.3	50
15-20	9	14.1	14.1	64.1
20-25	15	23.4	23.4	87.5
25-30	1	1.5	1.5	89
30-35	7	11	11	100.0
Total	64	100.0	100.0	

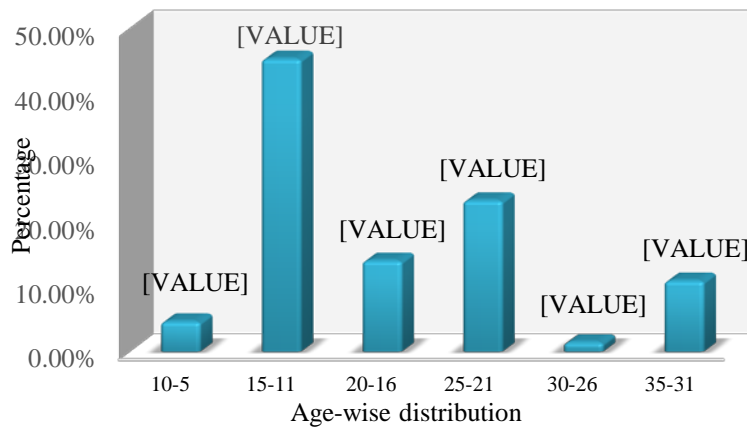


Figure 3: Age-wise distribution showing highest percentage among the age group of 11-15.

3.5. Frequency distribution among children & adults:

Esophoria is present in 54.7 % among the children while percentage is 45.3 % in adults. This shows that there is not much difference between the percentages among children and adults

Table 5: Frequency among children & adults

	Frequency	Percent	Valid Percent	Cumulative Percent
Children (5-16)	35	54.7	54.7	54.7
Adults (17-35)	29	45.3	45.3	100.0
Total	64	100.0	100.0	

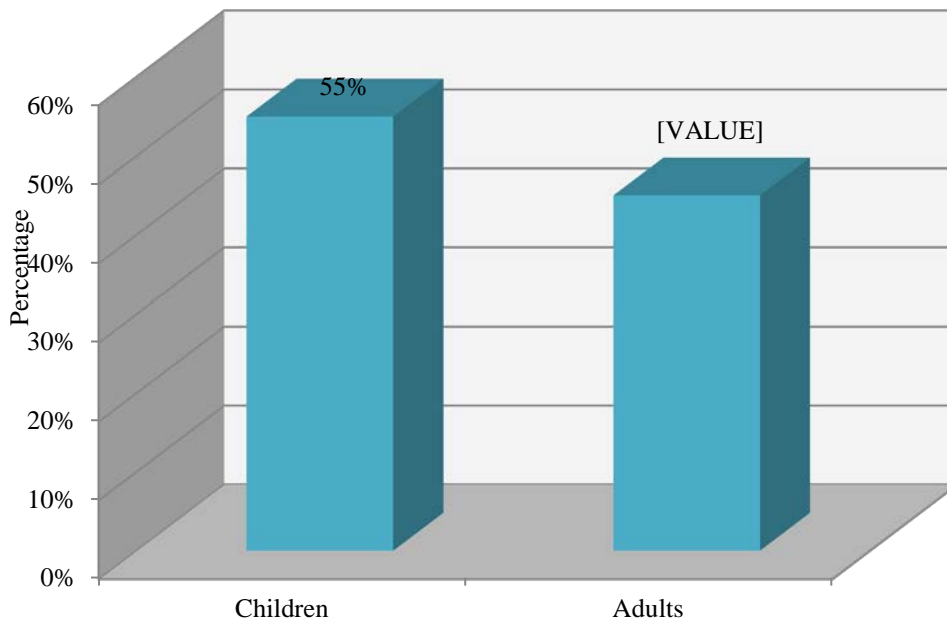


Table 4: Percentage of exophoria among children & adults. It depicts greater percentage among the children as compared to adults.

3.6. PCT at near_{sc}

Prism Cover Test performed at near without correction in most of the measureable patients (75 %) had the range of prism dioptres within 2.0-3.0PD followed by 23 % within 0.0-1.0PD. Remaining 4% were having above 4 PD.

Table 6: Prism Cover Test at near without correction.

Angle of deviation	Frequency	Percent	Valid Percent	Cumulative Percent
0-1.0 PD	23	36	36	36
2.0-3.0 PD	37	58.9	58.9	94.9
4.0-5.0 PD	3	4.6	4.6	99.5
Above 5.0 PD	1	1.5	1.5	100.0
Total	64	100.0	100.0	

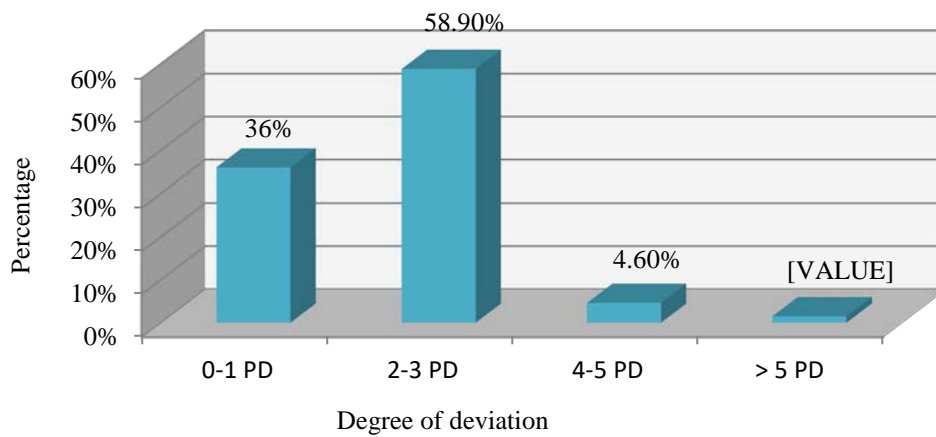


Figure 5: Prism Cover Test at near without correction. This table is showing the highest deviation of at near is in the range of 2-3 PD.

3.7. Prism Cover Test at distance _{sc}

In PCT performed at distance without correction, 93.7% patients had deviations between 0.0-1.0 PD while 4.7% between 2.0-3.0 PD & 1.6% above 3.0 PD.

Table 7: Prism Cover Test at distance without correction.

	Frequency	Percent	Valid percent	Cumulative percent
0.0-1.0PD	60	93.7	93.7	93.7
2.0-3.0PD	3	4.7	4.7	98.4
>3.0PD	1	1.6	1.6	100.0
Total	64	100.0	100.0	

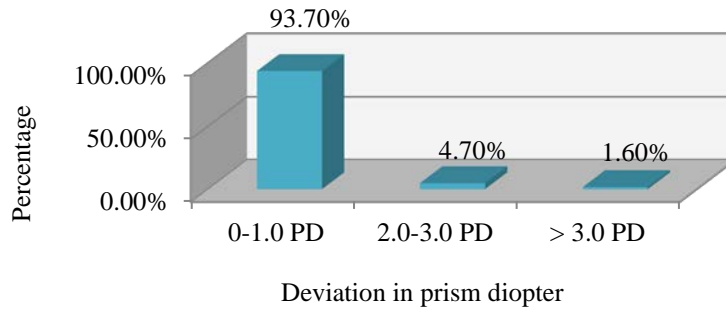


Figure 6: Prism Cover Test at distance without correction.

3.8. Refractive errors

Most of the patients were emmetrope (90.6%), followed by simple hypermetropia in only two patients (6.3%) and simple myopia in four patients (3.1%).

Table 8: Frequency of refractive errors

Refractive error	Frequency	Percent	Valid Percent	Cumulative Percent
Emmetropia	58	90.6	90.6	90.6
Hypermetropia	2	6.3	6.3	96.9
Myopia	4	3.1	3.1	100.0
Total	64	100.0	100.0	

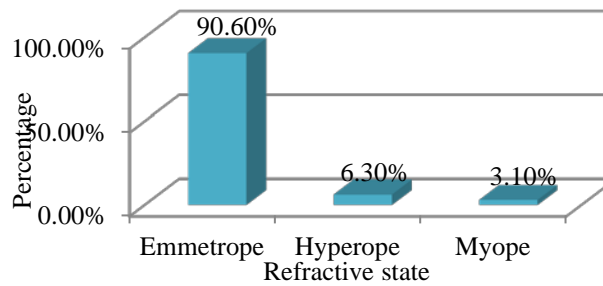


Figure 7: Frequency of refractive errors

4. Discussion

Prevalence of exophoria among convergence insufficiency has been estimated through numerous studies [16,17]. In this study, the overall occurrence of exophoria among convergence insufficiency patients was found to be 64%. The overall estimated prevalence of exophoria among convergence insufficiency patients is 36% in African American, 29% Caucasian, 19% Hispanic and 1% Asian [18] The difference in this study can probably be attributed to the different age group considered, sampling technique used, specified inclusion & exclusion

criteria & the racial differences between Asian & American population. In North America, during a study on convergence insufficiency it was noted that 79% of the CI patients had exophoria at near [16] and other study showed that 63% of CI patients exhibited exophoria on cover testing at near [17]. My study shows that's 64% of the CI patients have exophoria at near. Another study showed the patients ranged in age from 5 to 73 years (mean 11.9). Females out-numbered males (46:32). The diagnoses were: decompensating heterophoria or convergence insufficiency. Exophoria was more common [18]. My study also shows that exophoria is more common in female patients having convergence insufficiency. These results may attribute to more near work to female in Pakistani culture and lack of awareness to get checked regularly.

5. Conclusion

- Exophoria is common both in children with 54.7% patients within the age of 5-16 years & 45.3% patients within the age of 17-35 years, supporting that exophoria is not predominantly associated with childhood or adults.
- Among the convergence insufficiency's patients exophoria is present in 64 % of the patients.
- Occurrence is more common in females.
- Among the children 15-20 age group has maximum percentage of exophoria.
- Amblyopia is not found in any case of exophoria.
- Most of the patients are emmetrope followed by very low occurrences of myopes & hyperopes.

6. Recommendations

- The study should be conducted in other hospitals & with relatively large sample size & longer study duration so that the exact prevalence can be estimated.
- There should be organization of awareness programs for the community about exophoria & its treatment potential at all health care levels.

7. Limitations

Limitations of this study are due to:

- Small sample size.
- Short duration of study.
- Lack of awareness in people about causes of squint, its consequences & its treatment.

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