



RESEARCH ARTICLE

"CLINICAL PROFILE OF COMITANT HORIZONTAL STRABISMUS IN 0-20 YEARS OF AGE: A STUDY FROM RURAL MAHARASHTRA"

Anisha Wagh¹ and Shobhana A. Jorvekar²

1. Junior Resident, Department of Ophthalmology, Pravara Institute of Medical Sciences Loni.
2. Professor, Department of Ophthalmology, Pravara Institute of Medical Sciences Loni.

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Abstract

Introduction: Strabismus, a misalignment of the eyes, is a significant ocular disorder affecting children and young adults. Comitant horizontal strabismus is characterized by a consistent angle of deviation regardless of direction of gaze. It can impact visual development and psychosocial well-being. Understanding its clinical profile is essential for improving diagnosis, treatment, and management strategies, especially in rural healthcare settings.

Objectives: This study aims to analyse the clinical characteristics, distribution patterns, and associated factors of comitant horizontal strabismus in individuals aged 0-20 years in a rural tertiary care hospital in Maharashtra.

Materials and Methods: A cross-sectional, observational study was conducted over two years in the ophthalmology department of a tertiary care hospital. A total of 40 patients aged 0-20 years diagnosed with comitant horizontal strabismus were enrolled. Clinical assessments included visual acuity testing, cycloplegic refraction, ocular movement evaluation, cover tests, prism and alternate cover tests and amblyopia assessment. Data was entered into excel and analysed as percentages and proportions.

Results: Among the 40 patients, 42.5% had esotropia, while 57.5% had exotropia. Esotropia was more prevalent in younger children (0-5 years), whereas exotropia increased with age. Esotropia was strongly associated with hypermetropia (76.47%), while exotropia was linked with myopia (60.87%). Amblyopia was more common in esotropic cases (23.53%) than in exotropic cases (17.39%). Exotropia was predominantly intermittent (73.91%), whereas esotropia was constantly present in all cases.

Conclusion: This study highlights the predominance of exotropia over esotropia, the strong refractive error associations, and the significant presence of amblyopia in strabismic patients. Early detection and appropriate intervention are crucial in preventing visual impairment and addressing the psychosocial challenges associated with strabismus. Further large-scale studies can enhance our understanding of the epidemiology and management of comitant horizontal strabismus in underserved populations.

Corresponding Author:-Anisha Wagh

Address:-Junior Resident, Department of Ophthalmology, Pravara Institute of Medical Sciences Loni.

Introduction:-

Strabismus, characterized by the misalignment of the eyes, is a prevalent ocular condition that can significantly impact visual development, particularly in children and young adults. The clinical profile of comitant horizontal strabismus, defined by a consistent angle of deviation regardless of gaze direction, is critical for understanding its implications on visual function and treatment outcomes. Research indicates that the prevalence of strabismus in children ranges from 0.29% to 6%, with a notable incidence of comitant forms in the pediatric population.^(1,2) This condition often manifests in early childhood, with a majority of cases diagnosed by the age of six, highlighting the importance of early detection and intervention.⁽³⁾

The etiology of comitant horizontal strabismus can be multifactorial, encompassing genetic predispositions, environmental factors, and neurodevelopmental influences. Studies have shown that a significant proportion of children with strabismus also exhibit associated conditions such as amblyopia, which can further complicate treatment and visual outcomes.⁽³⁾ The management of comitant horizontal strabismus typically involves a combination of surgical and non-surgical approaches, with surgical interventions being particularly effective in aligning the visual axes and improving binocular function.⁽⁴⁾

Moreover, the psychosocial implications of strabismus are profound, as children with this condition often face challenges related to self-esteem and social interactions due to their visual appearance.⁽⁵⁾

Understanding the clinical profile of horizontal strabismus in a rural tertiary care setting is critical for several reasons. First, it aids in identifying common types and associated conditions that may require specific management strategies.⁽⁶⁾ Second, it aids in the development of patient-centred healthcare strategies. To initiate population health management strategies effectively, healthcare providers must understand the characteristics of the patient population they serve. This understanding helps in providing integrated care that minimizes the need for costly interventions, thereby enhancing the overall efficiency of healthcare systems.⁽⁷⁾ Additionally, such studies contribute to the growing body of literature on the epidemiology of ocular disorders, particularly in low-resource settings, and help inform public health initiatives aimed at improving access to eye care services.

In conclusion, strabismus represents a significant public health concern, particularly in paediatric populations. The prevalence and burden of this condition necessitate a concerted effort to promote early diagnosis and treatment to prevent amblyopia and its associated psychosocial consequences. Understanding the clinical profile of strabismus is essential for effective management and intervention, particularly in underserved rural areas.

Materials and Methods:-

This cross-sectional, observational study was conducted over two years, from March 2023 to January 2025, in the Ophthalmology department of a tertiary care teaching hospital in Maharashtra. Following approval from the institutional ethics committee, patients meeting the specified criteria were included in the study. Written informed consent was obtained from all participants after explaining the study's purpose.

Inclusion Criteria:

Patients aged 0 to 20 years, regardless of gender

Exclusion Criteria:

1. Consecutive strabismus
2. Paralytic strabismus
3. Previous strabismus surgery with residual deviations
4. Palpebral fissure abnormalities

A total of 40 patients were enrolled and underwent a thorough medical history review and ocular examination. Distance visual acuity was assessed using the Snellen chart, illiterate E test, Landolt test depending on the patient's age. Patients also underwent age appropriate cycloplegic refraction. Ocular movements were recorded for both individual and binocular vision.

The diagnosis of concomitant squint was established through the cover test, uncover test, and alternate cover test. The angle of deviation was measured using the Hirschberg test, Krimsky test, prismalternate cover test, and synaptophore. Additional evaluations included the Worth four-dot test, fixation assessment, and fundus examination.

All collected data were entered into Microsoft Excel and analysed as percentages and proportions.

Results:-

Gender distribution

Table 1:-Distribution of patients according to gender.

Gender	Esotropia		Exotropia	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)
Male	8	47.06	12	52.17
Female	9	52.94	11	47.83

Among patients with esotropia, females (52.94%) were slightly more affected than males (47.06%). In cases of exotropia, males (52.17%) had a marginally higher prevalence than females (47.83%).

Overall, the gender distribution was fairly balanced between both conditions.

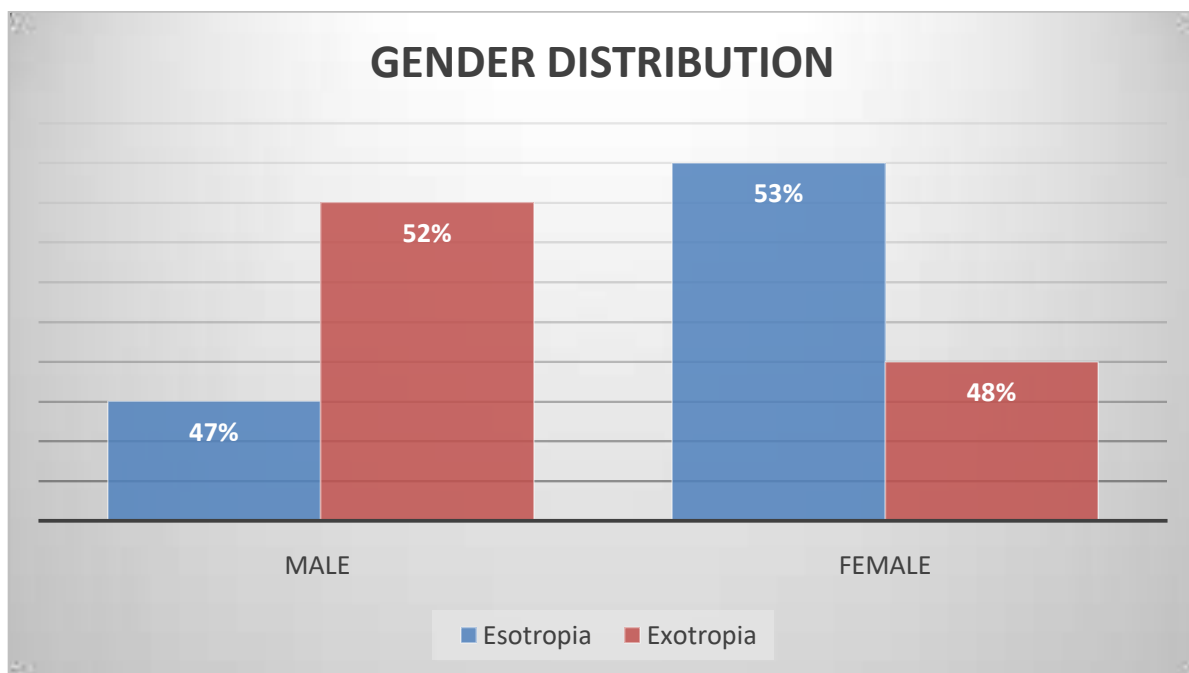


Fig 1:- Distribution of patients according to gender.

Age distribution

Table 2:- Distribution of patients according to age.

Age (in years)	Esotropia		Exotropia	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)
0-5	13	76.47	7	30.43
6-10	4	23.53	7	30.43
11-20	0	0	9	39.14

Esotropia was most prevalent in younger children (0-5 years: 76.47%) and decreased with age. No cases were observed in the 11-20 age group.

Exotropia showed an increasing trend with age, with 30.43% in the 0-5 and 6-10 age groups, and the highest prevalence (39.13%) in the 11-20 age group.

This suggests that esotropia tends to manifest earlier, whereas exotropia becomes more apparent in older children and adolescents.

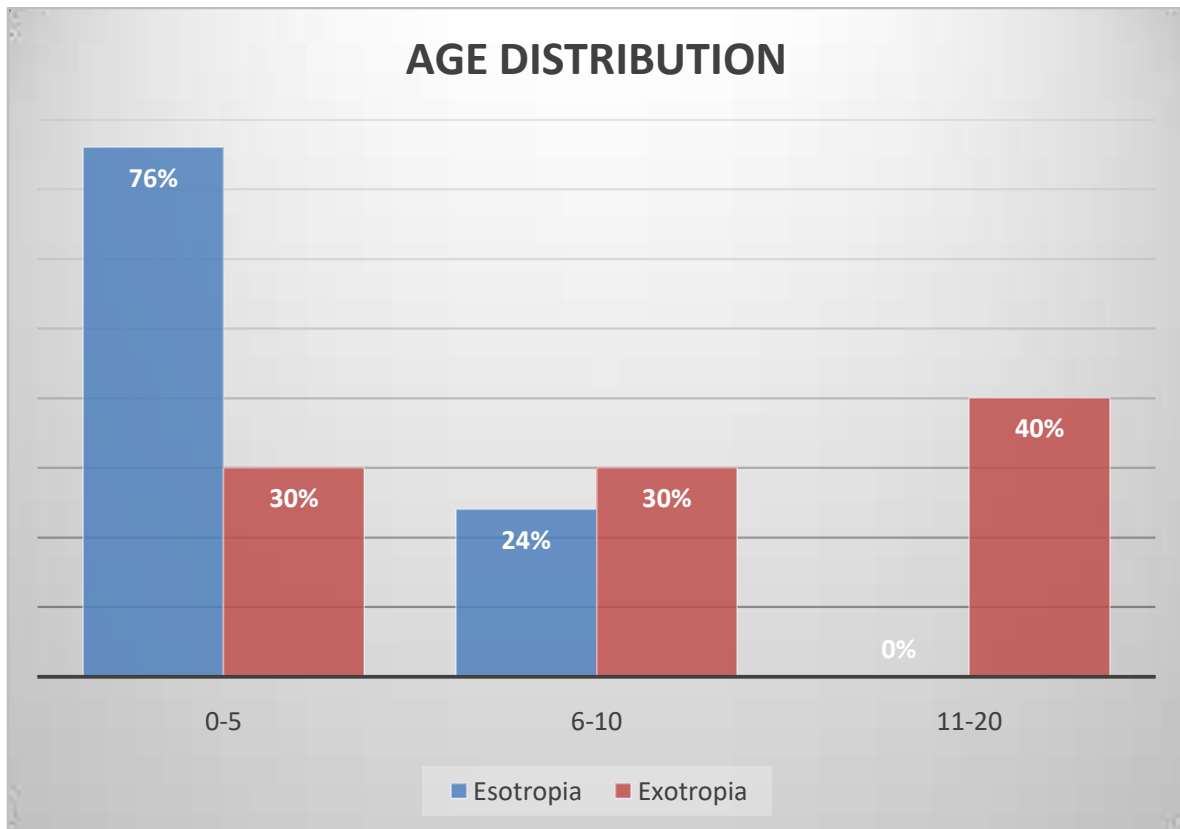


Fig 2:- Distribution of patients according to age.

Direction of deviation

Table 3:- Distribution of patients according to direction of deviation.

Direction of deviation	No. of patients	Percentage (%)
Esotropia	17	42.5
Exotropia	23	57.5

Exotropia was more common (57.5%) than esotropia (42.5%) among the study participants.

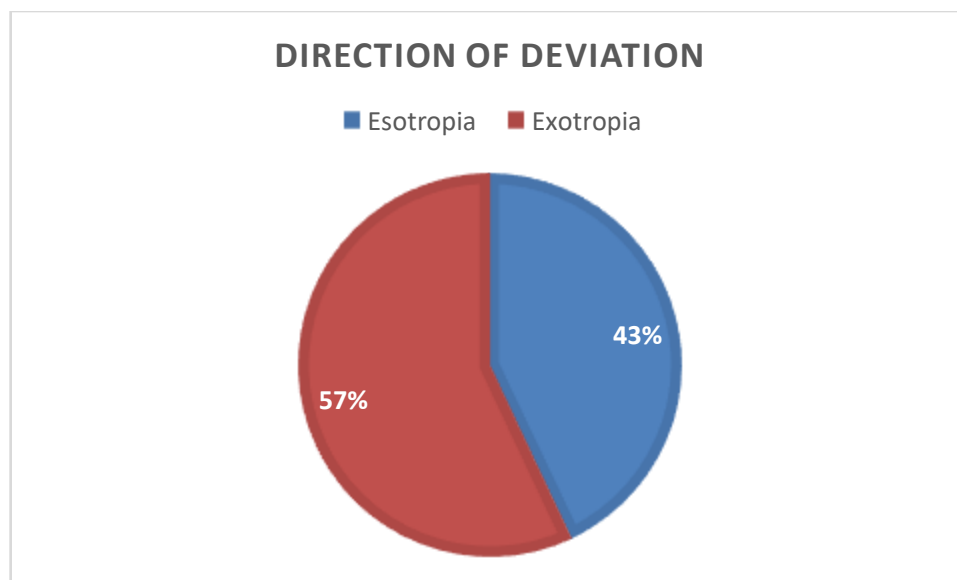


Fig 3:- Distribution of patients according to direction of deviation.

Constancy of deviation

Table 4:- Distribution of patients according to constancy of deviation.

	Constant		Intermittent	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)
Esotropia	17	100	0	0
Exotropia	6	26.09	17	73.91

All esotropia cases (100%) were constant, meaning the deviation was always present. In contrast, exotropia was mostly intermittent (73.91%), with only 26.09% of cases showing constant deviation.

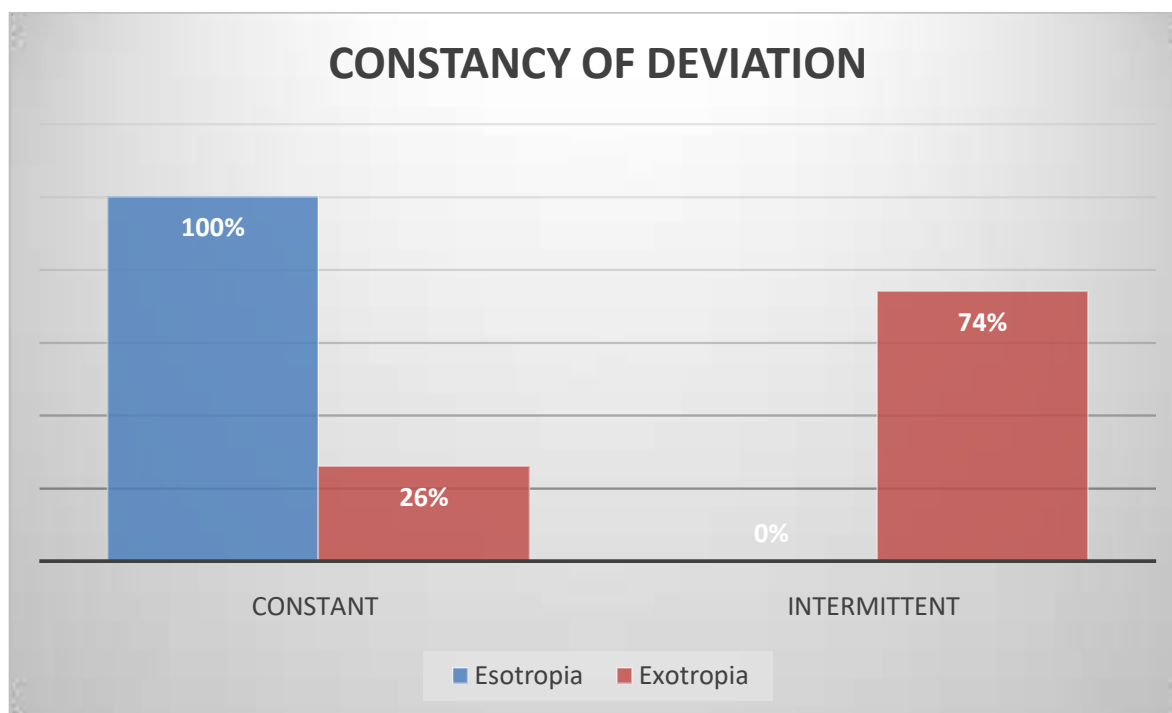


Fig 4:- Distribution of patients according to constancy of deviation.

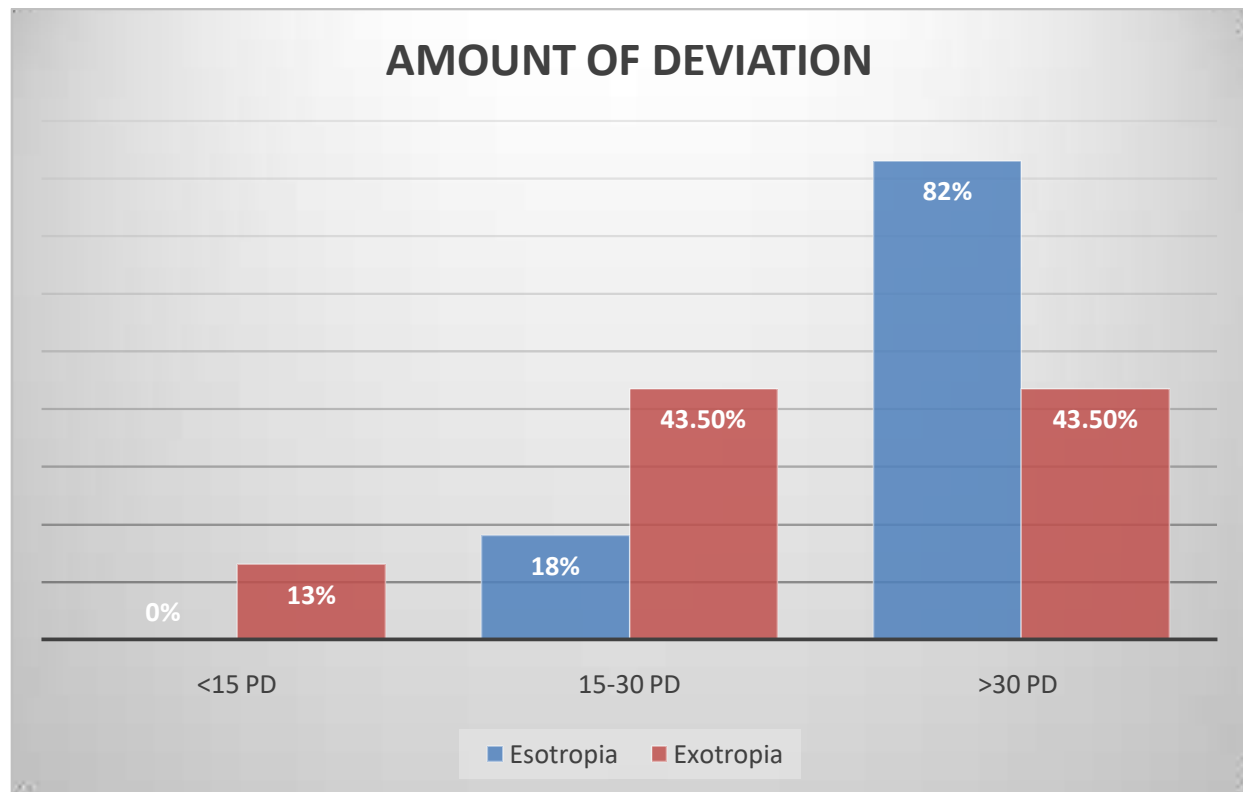
Amount of deviation**Table 5:-** Distribution of patients according to amount of deviation in prism diopters (PD).

Amount of deviation	Esotropia		Exotropia	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)
< 15 PD	0	0	3	13.04
15 – 30 PD	3	17.65	10	43.48
>30 PD	14	82.35	10	43.48

Esotropia: Most cases (82.35%) had a large deviation (>30 PD), while 17.65% had a moderate deviation (15–30 PD). No cases had a deviation <15 PD.

Exotropia: Deviation varied, with 43.48% in both moderate (15–30 PD) and large (>30 PD) categories, and 13.04% showing a small deviation (<15 PD).

Esotropia tends to have larger deviations, while exotropia shows more variation, including milder cases.

**Fig 5:-** Distribution of patients according to amount of deviation in prism diopters (PD).**Refractive error****Table 6:-** Distribution of patients according to refractive error.

	Myopia		Hypermetropia		Emmetropia	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)	No. of patients	Percentage (%)
Esotropia	2	11.76	13	76.47	2	11.76
Exotropia	14	60.87	5	21.74	4	17.39

Esotropia was strongly associated with hypermetropia (76.47%), while a small percentage had myopia (11.76%) or were emmetropic (11.76%).

Exotropia, on the other hand, was more frequently linked with myopia (60.87%), while fewer patients had hypermetropia (21.74%) or emmetropia (17.39%).

This suggests a significant correlation between hypermetropia and esotropia, as well as myopia and exotropia.

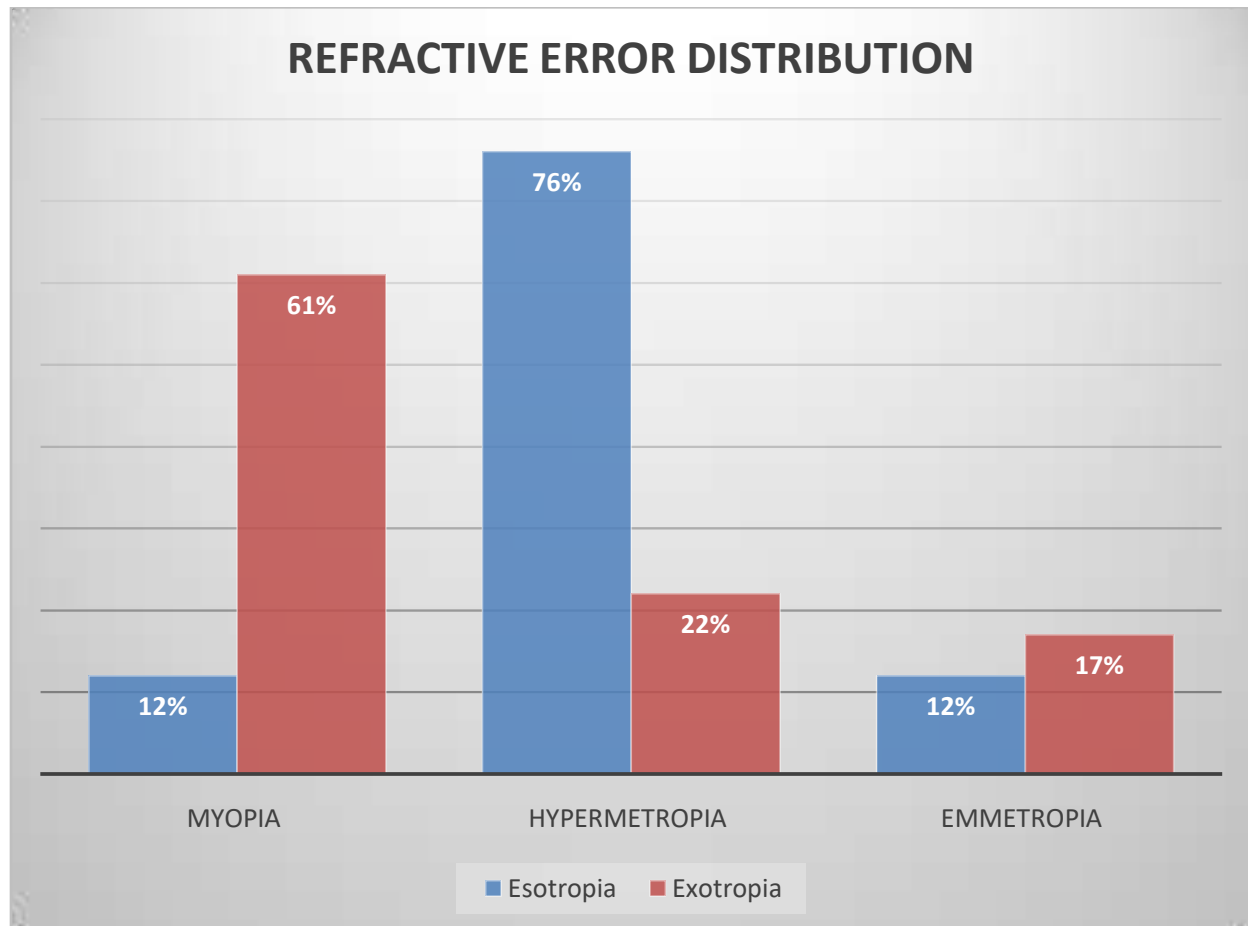


Fig 6:- Distribution of patients according to refractive error.

Amblyopia profile

Table 7:- Distribution of patients according to amblyopia.

	Present		Absent		Could not be assessed	
	No.of patients	Percentage (%)	No.of patients	Percentage (%)	No.of patients	Percentage (%)
Esotropia	4	23.53	5	29.41	8	47.06
Exotropia	4	17.39	15	65.22	4	17.39

Esotropia:

23.53% of cases had amblyopia, 29.41% did not, while 47.06% could not be assessed. Exotropia: Amblyopia was present in 17.39% of cases, absent in 65.22%, and unassessed in 17.39%.

This indicates that amblyopia is more commonly associated with esotropia than exotropia.

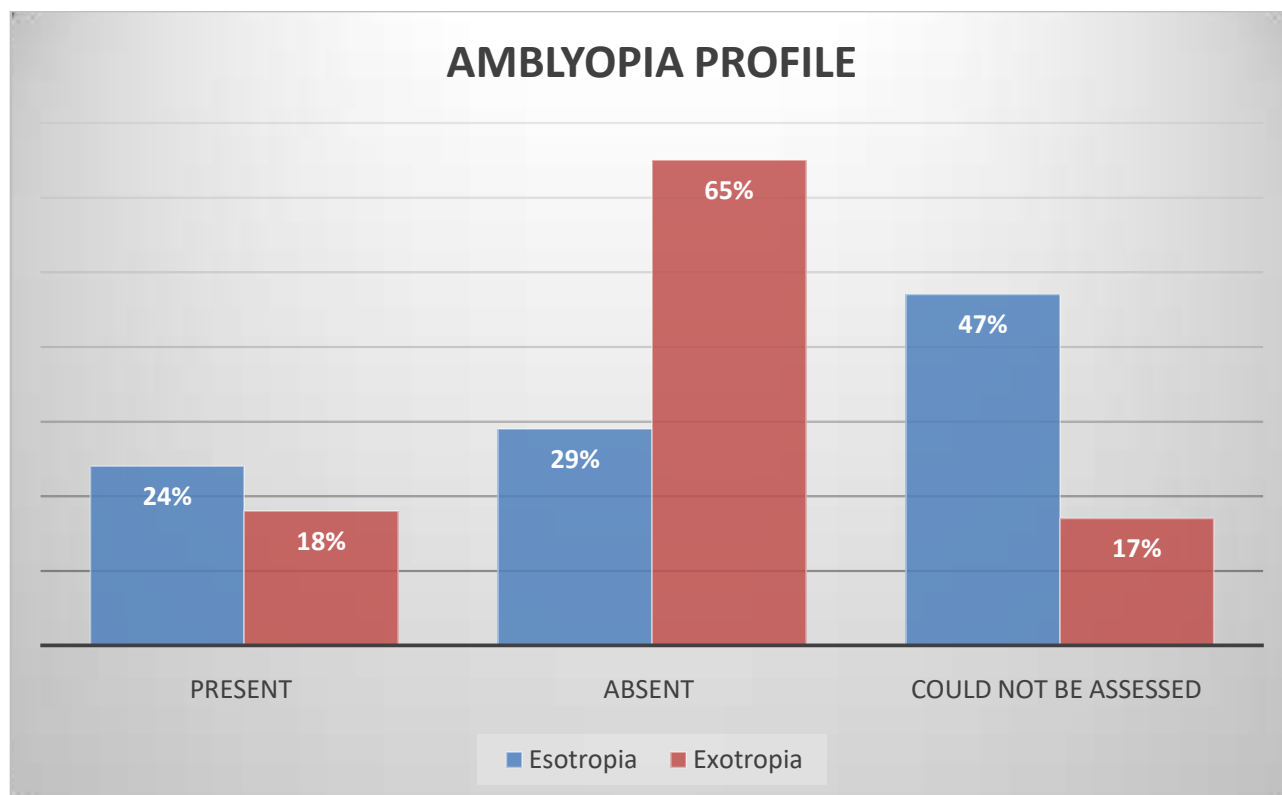


Fig 7:- Distribution of patients according to amblyopia.

Discussion:-

In our study 50% of patients were below 5 years of age. This is in accordance with a study conducted in Ethiopia, which reported that 43.8% of their patients were below 5 years of age.⁽⁸⁾ Mahajan et al. reported that convergent squint was more prevalent (71.6%) in children under 5 years of age.⁽⁹⁾ A similar observation was made in our study.

There was no gender predominance noted in our study. 50% patients were male while 50% were female. Recent studies have examined the gender distribution of comitant horizontal strabismus across different populations. A comprehensive meta-analysis found no significant difference in the prevalence of horizontal strabismus between males and females in population-based studies. However, clinic-based studies showed a higher proportion of females seeking treatment, particularly for exotropia, suggesting a gender bias in healthcare access.⁽¹⁰⁾ However a study in North India reported a higher prevalence of male patients (57.88%) in orthoptic clinics.⁽¹¹⁾ In this study, among patients with esotropia, females (52.94%) were slightly more affected than males (47.06%). In cases of exotropia, males (52.17%) had a marginally higher prevalence than females (47.83%). Contrary to this, a Brazilian study reported esotropia as more common in males and exotropia in females.⁽¹²⁾

In our study 42.5% had esotropia and 57.5% had exotropia. This was contrary to a study conducted by Trivedi et al, in which 64% had esotropia and 36% exotropia.⁽¹³⁾ Recent studies indicate that exotropia is more prevalent than esotropia among children in Asia, particularly in China and Singapore. In Singapore, exotropia was found to be twice as common as esotropia, with 72% of children presenting with exotropia compared to 28% with esotropia.⁽¹⁴⁾ Similarly, in Hong Kong, exotropia was more prevalent, with 65.2% of patients having exotropia versus 27.4% with esotropia. Furthermore, the proportion of exotropia cases has been increasing over time in both Hong Kong and China.⁽¹⁵⁾ These findings contrast with patterns observed in Western populations, where esotropia is typically more common.⁽¹⁶⁾

Most common form of exotropia reported in our study was intermittent exotropia. This is in accordance with studies conducted by Khorrami et al.⁽¹⁷⁾ and Sarosh et al.⁽¹⁸⁾

Majority of our cases had large angles of deviation with 32.5% having deviations between 15 – 30 PD and 60% having deviations more than 30 PD. This is contradictory to the findings in other studies, which reported majority of patients having deviations less than 35 PD.^(9,19)

Research consistently shows a strong association between refractive errors and strabismus in children. In our study esotropia was strongly associated with hypermetropia (76.47%) and exotropia was more frequently linked with myopia (60.87%). This is in accordance with studies conducted by Tang et al.⁽²⁰⁾, Zhu et al.⁽²¹⁾, Lee et al.⁽²²⁾ and Cotter et al.⁽²³⁾

In our study 8 out of 40 patients (20%) had amblyopia. Trivedi et al. reported 28% of patients had amblyopia in their study.⁽¹³⁾ Amblyopia was present in 15.25% of children with strabismus in the study by Tarakeswara Rao Attada et al.⁽²⁴⁾

Conclusion:-

This study provides valuable insights into the clinical profile of comitant horizontal strabismus in children and young adults from a rural tertiary care setting. Our findings highlight the predominance of exotropia over esotropia, the strong association of esotropia with hypermetropia and exotropia with myopia, and the significant presence of amblyopia, particularly in esotropic cases. The gender distribution was nearly equal, and age-related trends revealed that esotropia manifests earlier, while exotropia becomes more apparent with age.

The persistence of esotropia and the intermittent nature of exotropia underscore the need for tailored management approaches. Early detection and intervention remain critical in preventing amblyopia and improving long-term visual outcomes. Given the psychosocial impact of strabismus, holistic treatment strategies should not only address ocular misalignment but also consider the emotional well-being of affected individuals.

This study contributes to the growing body of literature on strabismus epidemiology, particularly in low-resource settings. Future research with larger sample sizes and long-term follow-up will further enhance our understanding of treatment outcomes and help refine clinical protocols for better patient care.

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