



**“PREVALANCE OF REFRACTIVE ERROR
AND RETINAL ANAMOLY IN CHILDREN
WITH AUTISM IN JAMSHEDPUR EYE
HOSPITAL”**

Submitted in fullfilment of requirement for the award of degree

Of

BACHELOR OF OPTOMETRY

Submitted by

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Batch 2018 -2022

**DEPARTMENT OF OPTOMETRY
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DECLARATION

I hereby declare that the thesis entitled “PREVALANCE OF REFRACTIVE ERROR IN CHILDREN WITH AUTISM IN JAMSHEDPUR EYE HOSPITAL” submitted by me, for the award of the degree of B.OPTOMETRY to ARKA JAIN UNIVERSITY, JHARKHAND is a record of bonafide work carried out by me, at JAMSHEDPUR EYE HOSPITAL. The project work was carried out, under the supervision of INTERNSHIP GUIDE Dr. Rajnish B Singh -Consultant Ophthalmologist Jamshedpur Eye Hospital and Mr.Sarbojeet Goswami Program Coordinator B. Optometry & Assistant Professor School of Allied and Health Sciences.

I further declare that the work reported in this thesis has not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other Institute or University.

Place: Jamshedpur
Date: 18/5/22


Puja Kumari
Signature of the Candidate

CERTIFICATE

This is to certify that the thesis entitled “PREVALANCE OF REFRACTIVE ERROR IN CHILDREN WITH AUTISM IN JAMSHEDPUR EYE HOSPITAL” submitted by PUJA KUMARI, for the award of the degree of B.Optomety, is a record of bonafide work carried out by the student under my supervision, at JAMSHEDPUR EYE HOSPITAL as per the academic code of the University.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other Institute or University. The thesis fulfils the requirements and regulations of the University and in my opinion meets the necessary standards for submission.

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CERTIFICATE

This is to certify that the thesis entitled “PREVALANCE OF REFRACTIVE ERROR IN CHILDREN WITH AUTISM IN JAMSHEDPUR EYE HOSPITAL” submitted by PUJA KUMARI, for the award of the degree of Bachelor Of Optometry, is a record of bonafide work carried out by the student under my supervision, at Jamshedpur Eye Hospital as per the academic code of the University.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other Institute or University. The thesis fulfils the requirements and regulations of the University and in my opinion meets the necessary standards for submission.

Place: JAMSHEDPUR

Date: 18/05/22


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ABSTRACT

Background: In a resources-limited cities visual problems of individuals with any neurodevelopmental problems are often neglected till it becomes severe and significant

Aim: To study the refractive profile and any associated retinal anomaly of a population of children with Autism Spectrum Disorder (ASD) in Jamshedpur Eye Hospital, Jamshedpur, Jharkhand.

Objective: All the autistic children visiting Jamshedpur Eye Hospital will go through complete assessment for any visual anomaly including refractive error and binocular vision defect.

Materials and Methods: Ophthalmic examination was carried out on children diagnosed with autism earlier and was referred to JEH by the Neurologist/Pediatrician. Refractive error was assessed using Retinoscope, Lae paddle, Cardiff Acuity Card, Lae Symbol Chart follow instillation of CTC for cycloplegic refraction. Fundus was examined with Indirect Ophthalmoscope post dilatation.

Result: A total of 42 children were examined in past 8 months (Dated: 1 sep,2021- 30 april,2022), age range was 0-8 years, of whom 32 were male and 10 were female. 6 children had bilateral optic disc pallor,6 had optic atrophy and 24 did not diagnosed with any treatable Vitreo-retinal lesions with normal retinal vasculature.20 children had significant refractive error followed by flick strabismus of whom 6 were astigmatic and 16 were hyperopic and 12 children did not showed significant refractive error,8 aged below 3 years so refractive cannot be determined accurately.

Conclusion: Significant refractive error mainly hyperopia and astigmatism was noted in the children with autism following flick binocular vision defect. This highlights the need to provide regular and comprehensive eye care to this population which may help optimize their visual functioning and impact their activities of daily life in a positive way.

Key Words: Refractive Error, Astigmatism, Autism, Mental Retardation, Visual Anomaly, Hyperopia

INTRODUCTION

Autism is unusually common among blind people, children with autism are more likely to have vision problem than their typical peer. The word "Autism" was first used as a diagnosis in 1943, by Dr. Leo Kanner (Kanner, 1943) of Maryland's Johns Hopkins Hospital ^[1], after studying 11 children he diagnosed to have early infantile Autism. It is one of the fastest-growing developmental disability.

Studies in multiple countries have documented a double-digit prevalence of autism among blind children: 12 percent in Turkey, 17 percent in Sweden and 50 percent of the students whom Jure examined at the school for the blind Gigena attended in Argentina^{[2] [3]} Studies of eye clinic records suggest that autistic children are prone to serious vision problems: Among 2,555 children at a university autism clinic, about 11 percent had significant vision disorders, including strabismus, in which the eyes are misaligned, and amblyopia, in which poor vision in one or both eyes ^[7].

Many autistic people confirm that bright lights and sunshine disturb them and often cause distortions. There are autistic children born to parents who do not fit the autistic parent personality pattern. Parents who do fit the description of the supposedly pathogenic parent have normal, non-autistic children. Frequently siblings of autistic children are normal. Autistic children are behaviorally unusual "from the moment of birth.

Symptoms of Autism Includes:

- Repetitive Behaviour
- Restricted Interests
- Difficulty understanding facial expressions and body language
- Often comes with Co-occurring medical condition
- Challenges with Social Communication
- Difficulty expressing thoughts ,understanding other's speech
- Poor eye contact
- Looking beyond/through objects
- Absence of reciprocal play
- Extreme fear of heights or absence of appropriate fear of heights
- Tracking moving objects accurately
- Maintaining eye contact with people
- Eye alignment (eye turns)

- Keeping their eyes from wandering (amblyopia/lazy eye)
- Light sensitivity
- Head turning (looking at objects from the side of the eyes)
- Fleeting views or rolling eyes
- Visual stimming (flapping fingers in front of eyes)

"There is a consistent ratio of three or four boys to one girl. Males are more prone to ASD.

According to research, children with ASD present with a higher incidence of strabismus (eye turn) ranging from 21-50 percent prevalence, as compared to children without ASD^{[5][8][4]}. WTR astigmatism was common among autistic children during childhood, with higher prevalence than in the normal population. Early diagnosis and correction of refractive error is an essential component of medical care for autistic children. It is reported Nirmalan P, Vijayalakshmi P, Sheeladevi S, et al.^[9] to occur in all racial, ethnic, and socioeconomic groups. So no one is immune but there is variation in severity of autism symptoms. Whereas some children with autism have strong intellectual and language abilities, others require lifelong care. The aim of this study is to describe the refractive profile of a population of children with ASD.

Vision therapy is a highly effective treatment method, designed to enhance visual skills and the neurological connections between the eyes and brain.

A vision therapy program for a child with ASD will facilitate improved visual processing, enabling them to understand their surroundings with greater certainty— and consequently improve associated behaviour such as anxiety, social skills, and verbal skills.

Each therapy program is personalized to the needs of the child, and includes age-appropriate exercises and activities.

Common vision therapy goals for children with ASD include the improvement of:

- Visual-spatial organization
- Peripheral stability
- Central vision
- Efficient eye coordination
- Visual information processing

Many times, vision problems, specifically visual-spatial misperceptions such as body/objects/people moving in space, can cause a child with ASD to feel anxious, confused, or distressed— resulting in certain behavioral responses, discussed above.

Prism lenses have been created to help children with ASD to use their vision in a more effective and positive way. For example, prisms can create immediate improvements in posture, balance, and attention— significantly increasing the child's feelings of physical safety and comfort, while decreasing anxiety and sensory overload.

The prism lenses can be worn daily or just for the duration of a vision therapy program, and typically facilitate significant improvements.

LITERATURE REVIEW

Year/Place of Publication	Author/s	Title	Methodology	Result
November 2019, Journal of Health and Human Services, USA	Theodor Sauer, Linda Lawrence, Liana Mayo, Rosa Oyama Ganiko, Stephen Schroeder	Refractive error and ocular findings among infants and young children with severe problem behavior and developmental disabilities	A retrospective review of Ophthalmic Examination of very Young Children in Peru with behavioral problems and at risk for developmental disorders.	222 children between the age of 0-4 years were examined and 100 had an abnormal ocular exam, prevalence of refractive error was 33% and Nystagmus was 12% and strabismus was 10 %.

Year/Place of Publication	Author/s	Title	Methodology	Result
November 2020, Archives of Medical and Clinical case Reports, Bangalore	Debapriya Mukhopadhyaya, Parikshit Gogate, Rajiv Khandekar, Shreyasi Banerjee, Harinath Mukherjee	Prevalence of Ocular and Visual Anomalies in Students with Autism Spectrum Disorder (ASD)	Comprehensive Ocular and Vision Examination also included Accommodation by Dynamic Retinoscopy and Convergence was done.	120 students with ASD aged 2-12 years, out of which 62 needed spectacle correction, 57 was myopic, 5 was hyperopic, and 5 had

				significant astigmatism.
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Year/Place of Publication	Author/s	Title	Methodology	Result
Septmber 4 2017, Nigerian journal of ophthalmology	I R Ezegwui, L lawence, A E Aghaji, OI Okaye, EN Onwasigwe, PO Ebigbo	Refractive errors in children with autism in a developing country	Ophthalmic examination was carried out on children diagnosed with autism attending aschool for mentally challenged	A total of 21 children with autism were selected, 22% of which has astigmatism and 11% of them had hypermetropia.

Year/Place of Publication	Author/s	Title	Methodology	Result
December 2019, journal of medical science and clinical research	Mariam M, bahjah abdulahamid hamad esehiyb	Types of refractive error in autistic children	Ophthalmic examination was carried out on children diagnosed with autism attending a pediatric eye clinic	This study shows 42.3% of autistic children have astigmatism, 38.5% have hypermetropia.

Year/Place of Publication	Author/s	Title	Methodology	Result
March 2020, Clinical Ophthalmology and visual science	Dr. Russel Lazarus	Vision and Autism	Vision assessment was done in school going children diagnosed with mild ASD,aged between 5-8 years	1 in 59 children are affected by ASD – a higher prevalence reported among boys with 1 in 37 as compared to 1 in 92 girls.

Year/Place of Publication	Author/s	Title	Methodology	Result
March 2012, investigative ophthalmology of visual science	Kathryn M. Haider, jingym wang, dana l. Donaldson, heather A. smith, sarah jones.	Refractive error characterstics in children with autism	In this study 92 autistic children were included who underwent complete ophthalmic examination outcome measures include type of astigmatism after examination.	This study concludes that significant WTR astigmatism was prevalent among autistic children in all age group

METHODOLOGY

Prior permission was brought from the parents for their data to be used for the purpose of study and their attendances were asked all through the examination of the children and special pediatric clinic was dedicated for children priorly diagnosed with autism and was referered for ophthalmic evaluation at Jamshedpur Eye Hospital.

First of all detailed birth history was noted down which included following:

- Gestation Period
- Type of Delivery
- Birth Weight
- Whether cried immediately after birth
- Any history of neonatal jaundice or Phototherapy given
- Any history of incubation
- Any history of convulsion and seizures
- Health condition of mother during pregnancy
- Any co-relating ocular condition of siblings if any

Meanwhile, toys/candy of different colours and sizes were offered to children and their behavior towards them was thoroughly observed.

An Unaided visual acuity (VA) for distance and near was assessed objectively using Retinoscope and subjectively using Lea symbols/Cardiff Acuity Cards, the former was performed at a distance of 3 m and the latter at 40 cm. For those who could read, Snellen's chart was used for subjective refraction.

For the children who could not respond to subjective methods, objective value was taken as reference. None of the children had ever worn spectacles previously.

and APCT was performed on those who co-operated.

Anterior segment was examined with torch light. Strabismus was assessed by Hirschberg test and cover-uncover test and APCT was performed on those who co-operated. Ocular motility was assessed and pupillary reaction to light was also checked.

Posterior segment was examined with indirect ophthalmoscope after dilation of the pupils with tropicamide 1% and cyclopentolate 1% eye drops. All children who could co-operate underwent cycloplegic refraction 1 hour after instillation of the aforementioned drops.

Spectacles was prescribed to those with significant refractive error and follow ups every 3 month was recommended.

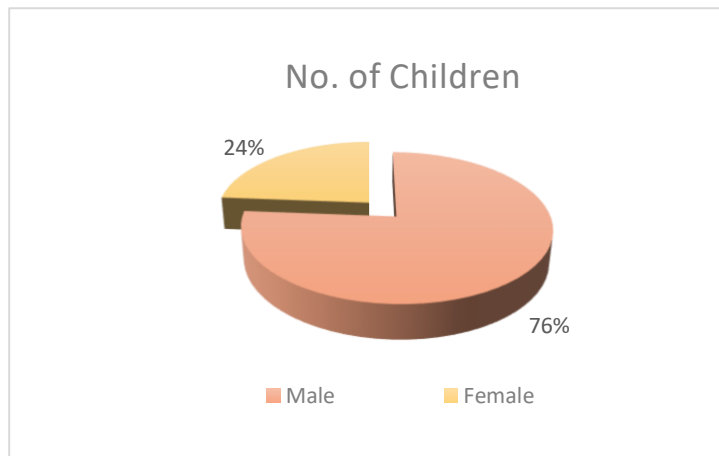
RESULT

A total of 42 children were examined, out of which 4 were of age below 1 years for whom refractive error assessment was not accurately determined as they were not co-operative. 8 children aged 2years- 3 years. 18 children aged between 3 years-5 years and 12 children were of age between 6 years – 8 years ,for this age group strabismus assessment and refractive error assessment was done and treatment were provided as required.

Analysis I: Based on Gender

A total of 42 children were examined of whom 32 were male and 10 were female; age range was 0-8 years.

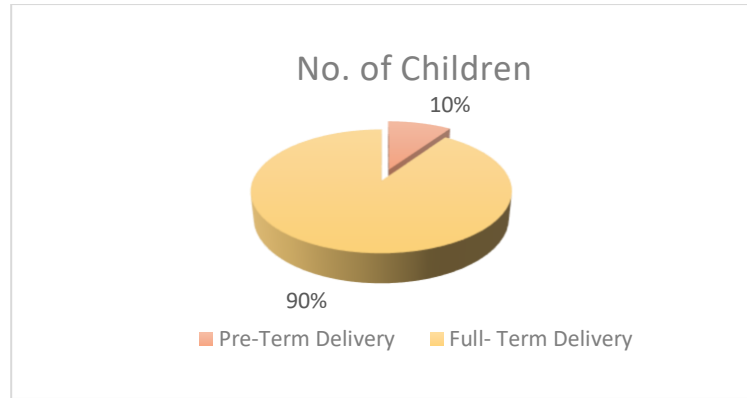
Gender	No. of Children
Male	32
Female	10



Analysis II: Based on Gestation Period

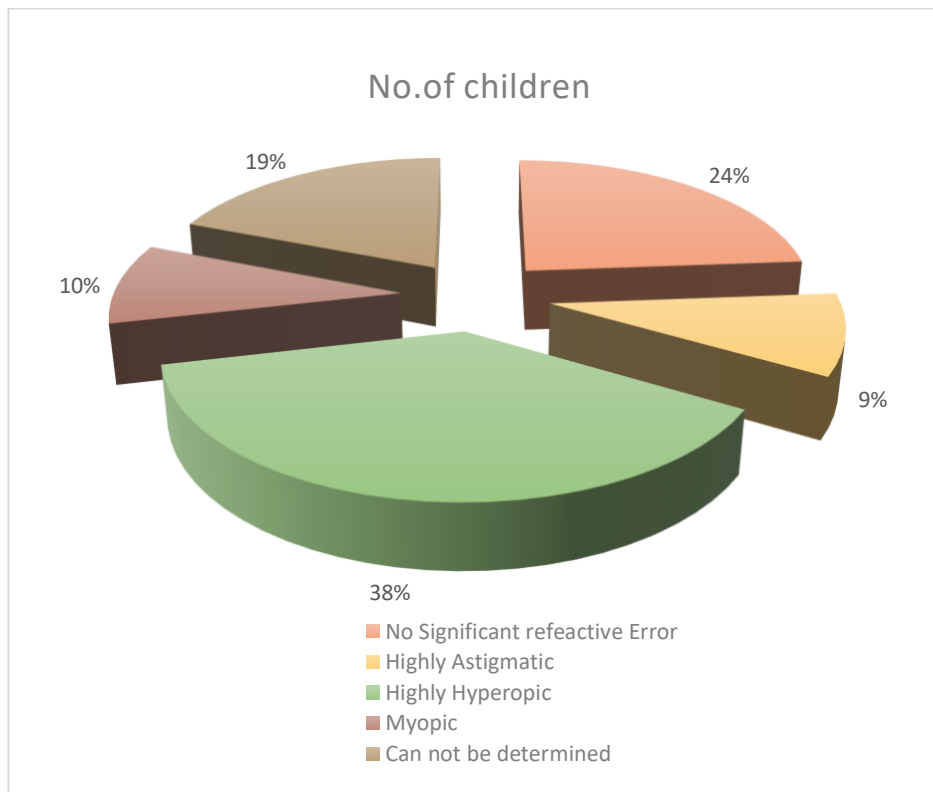
Out of examined 42 children 38 had completed full term gestation period and 4 was pre borned.

Gestation Period	No. of Children
Pre-Term Delivery	4
Full- Term Delivery	38



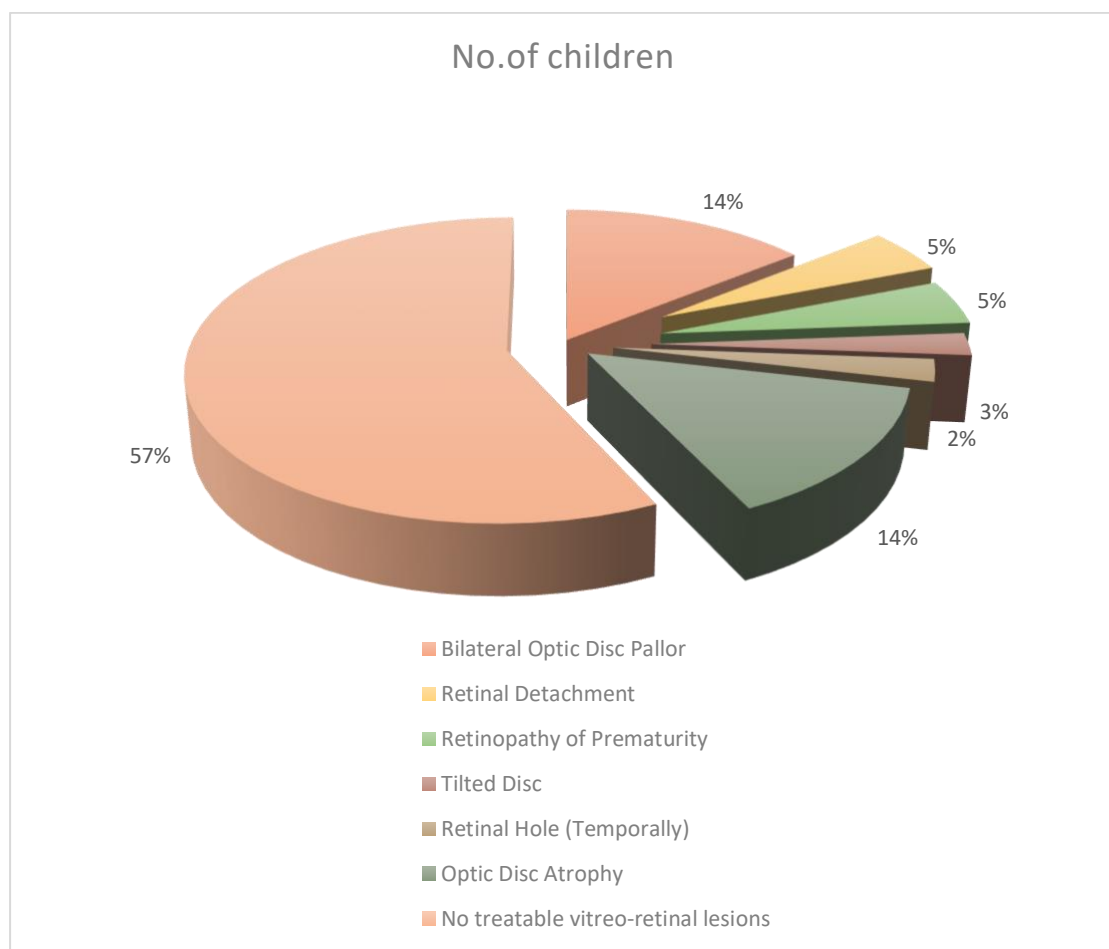
Analysis III: Based on Refractive Error

Type of Refractive Error	No. of children
No Significant refractive Error	10
Highly Astigmatic	04
Highly Hyperopic	16
Myopic	04
Can not be determined	08



Analysis IV: Based on Retinal Anamoly

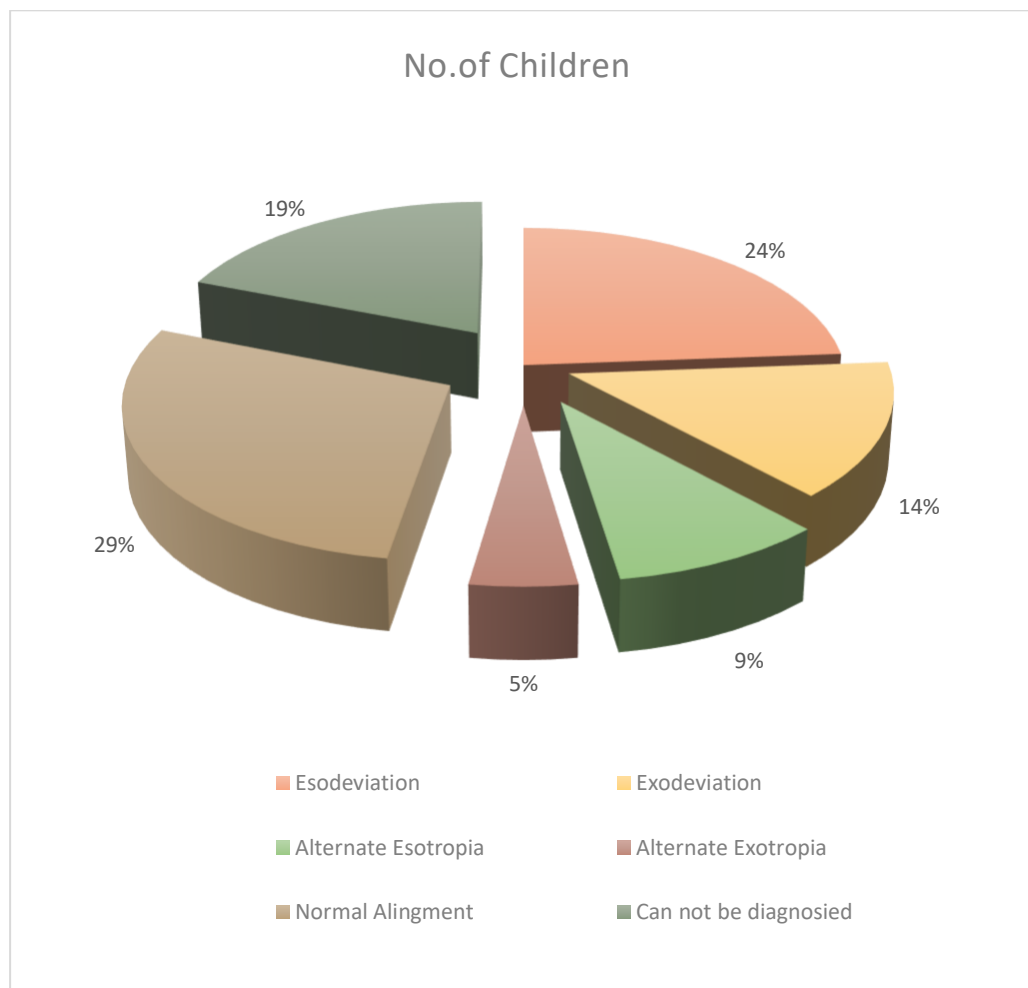
Type of Anamoly	No.of children
Bilateral Optic Disc Pallor	6
Retinal Detachment	2
Retinopathy of Prematurity	2
Tilted Disc	1
Retinal Hole (Temporally)	1
Optic Disc Atrophy	6
No treatable vitreo-retinal lesions	24



Analysis V: Based on Strabismus

(Out of 42 children, 6 also had Nystagmus with other related ocular condition)

Type of Strabismus	No.of Children
Esodeviation	10
Exodeviation	06
Alternate Esotropia	04
Alternate Exotropia	02
Normal Alignment	12
Can not be diagnosed	08



DISCUSSION

Overall, in this study 24 out of 42 children had significant refractive error and 43 % children had other associated retinal anomaly, this high percentage could be contributed to the fact that they were referred patients (earlier diagnosed with autism) that came for visual screening to Jamshedpur eye Hospital.

Optic Disc pallor and optic Atrophy comes out to be most common retinal anomaly, which was not been discussed in earlier studies done on autistic children in Jamshedpur

Visual problems are very common in children with ASD. Often, the signs of these vision problems can be masked by the behaviors that autistic individuals use to cope with the sensory overload of the world around them. Examining this patient population is difficult and it is rare to be able to study so many children at one time.

Study of Moon HE, et al ^[1] have reported on the significant visual impairment found at older ages when neuro-ophthalmic development is complete. Early diagnosis is essential for early intervention. Behavioral research by Bölte S, Bartl-Pokorny KD, Jonsson U, et al ^[2] has shown the effect of vision impairment on early development is profound and by the first year of life visually handicapped children already begin to developmentally fall behind similar sighted children.

Hypermetropia was the major refractive error in the series followed by of Astigmatism. More than half students with ASD had at least one ocular morbidity, the commonest being refractive errors followed by strabismus^[3]. This is similar to the findings of Denis *et al.* Ikeda *et al*^[3] in their study remarked that significant refractive error, strabismus and amblyopia in that order of occurrence are some of the ophthalmologic disorders found in children with autism.

As has been reported ^[5] by Shirama A, Kanai C, Kato N, et al. co-operation for vision screening in children with autism is poor. Many of the common VA testing charts (Lea's symbols, HOTV chart and Snellen's chart) require interaction between the child and the examiner. The flawed verbal and non-verbal communication skills of a child with autism may become a challenge during VA assessment.

Spectacle prescription was based on retinoscopy findings; due to lack of co-operation for subjective refraction. Maximizing VA for activities of daily living is felt to be important for children^[6]. Although Gogate *et al.* ^[7] in a study on ocular disorders in children with learning disabilities similarly dispensed spectacle prescriptions based on retinoscopy findings if subjective refraction was not possible.

Assessment should be followed by action oriented remedial or care system to monitor the improvement and progress in quality of life of the child Hypermyopia is linked with depressed visuocognitive ability, reading ability, and visual attention in young children.

In this study the boys: girls ratio is approx 3:1 with a slight predominance of males. However, it may be noted that current research relating to possible sex differences in the autism

phenotype suggests that females with autism may be under- or mis-diagnosed and that the sex ratio of males and females diagnosed with autism may change over time. Earlier studies done by Miller Miller T et al, Ezegwui IR, Aghaji AE, Uche NJ, Onwasigwe EN et al^{[7] [8]} have reported that the ASD group showed the dominance of male and difficulty in maintaining fixation especially when there was no fixation target.

This study, also showed poor pursuits and visual tracking because of that. More than half of students with ASD had at least one ocular morbidity. The commonest was refractive errors followed by strabismus. Periodic and comprehensive ocular assessment of autistic students is recommended. Referrals should be followed up dedicatedly

This study is limited by the small number of participants and also the short duration of the study. Therefore, further continuation of screening and changes in the findings is advocated.

CONCLUSION

In conclusion, hyperopia was noted in the children with autism to be the main refractive error. Astigmatism was common among children during childhood, with high prevalence than in the normal population. Few also had myopia which could be compensated with regular use of spectacles. Early diagnosis and correction of refractive error is an essential component. Retinal anomaly does not seem to be significant, most of the children did not have any treatable vitreoretinal lesion with normal retinal vasculature. But among the few optic disc pallor and optic atrophy was found to be the commonest. Strabismic evaluation reveals esodeviation to be significantly among the children while 29% children had normal alignment of eye.

Vision screening and refraction services should be part of the general screening for children with autism, to help maximize vision for activities of daily living and improve developmental outcomes.

Comprehensive eye examination by a pediatric ophthalmologist, optimally as a part of a multidisciplinary clinic, for all children diagnosed with autism and related disorders is recommended and referrals should be followed up dedicatedly.

A plan to work in the same environment of those children to gain their cooperation and trust, so more knowledge could be gained regarding this disorder.

Correction and searching of these refractive errors early may enhance improvement of this disorder thus help them to have an agreeable life. This study is limited by a small sample size, and further studies with more patients and including a full clinical case-history analysis are required.

LIMITATIONS

- Small sample size
- Uncooperative autistic children
- Lack of expertise
- Lack of awareness.
- Lack of resources
- Lost follow ups

FUTURE SCOPES

- Detailed study to be done with large sample size
- Progression /regression in visual acuity could be tracked till the age of complete ophthalmic development
- More frequent screening should be done
- Improvement in technologies is required to assess the vision of children with ASD more accurately, objectively.

CONFLICT OF INTEREST

There is no conflict of interest in this study

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