

Screening of the Squint among Residents Visiting a Tertiary Care Hospital in Uttarakhand

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ABSTRACT

Background: Squint is also known as Strabismus and includes Latent and Manifest varieties. It contributes to childhood visual impairment and amblyopia, adding to the stress of loss of functional vision. The regular surveys of such entities help to assess the magnitude, and measures needed for prophylaxis and treatment. The aim of the study is a screening of the Squint among residents visiting a tertiary care hospital in Uttarakhand.

Subjects and Method: This was a cross-sectional hospital-based study conducted over a period of one year at Shri Mahant Indiresht Hospital, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun. A total of 100 patients who found with tropias and phobias were further evaluated to provide them with the correct diagnosis and optimum guidance regarding management. The variables of this study were a demographic profile, Age, Gender, type of squint, convergence insufficiency, power of convergence, and prevalence of squint. SPSS was used to assess the data. A $p < 0.005$ was suggestive of significance.

Results: Out of a total of 4,280 patients, 2,240 (52.28%) were males, 2,044 (47.71%) were females, 100 (2.3%) cases were found to be of horizontal tropias, while Convergence Insufficiency (CI) was noted in 720 (16.8%). Esotropia was more common (65%) than Exotropia and the difference was statistically significant with a p-value less than 0.001. The common feature of both the exotropia and esotropia was the age of presentation which was 11 to 15 years. While the age group with the majority of cases CI (16.8%) was between 5 to 10 years.

Conclusion: This study the magnitude and distribution of strabismus and CI in the region. It also helps to understand the importance of timely assessment and management for the optimum growth and development of an informed individual and community.

Keywords: Strabismus, convergence, prevalence

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BACKGROUND

Misalignment of the visual axis is known as Strabismus/Squint. It could be in one eye or

affect both eyes leading to an Alternating Squint. A squint can be hidden or latent also known as Phoria. If the deviation is manifest

at presentation, then it is known as a Tropia. Depending on the side of deviation it can be classified as ESO (esophoria or esotropia) when inwards, or EXO when the squint is outwards (exophoria/exotropia). Rapid diagnosis and intervention at the correct time especially below eight years of age, helps in preserving useful vision in children. Strabismus can also be a sign of any pathology that is coexisting or any intracranial pathology. Suspicious signs include a red reflex that's not normal; limited extraocular movements; diplopia; headaches and nystagmus.

The prevalence of squint has been reported to be 0.7% to 5% globally (Sawers et al., 2016). This cross-sectional hospital-based study aims to estimate the squint prevalence among residents visiting the eye Outpatient Department (OPD) in our tertiary care hospital. The study holds relevance as squint can affect not only vision, and binocularity but also the mental and emotional development of an individual (Pathai et al., 2010; Sabri et al., 2006).

In some situations, squint has been reported to affect opportunities in jobs. Hence, the study serves as a tool to understand the distribution of manifest and latent horizontal squint. (Coats et al., 2000). In concomitant squints suggestive of restriction or paralysis, and vertical squints were excluded from the study. The data was collected based on history, ocular examination, and squint evaluation. Visual assessment was done with Snellen's Chart, Hirschberg's test, Cover and Uncover, and Alternate Cover Test was done. Synaptophore was used to assess the grade of Binocular Single Vision (BSV) and power of convergence, or divergence in prism diopters (PD) (Tegegne et al., 2021).

Dilated refraction with the recommended drug for the age group was done systematically to assess the optical power of the eye. Post Mydriatic Test (PMT) for subjective

prescription of glasses, and objective correction where the subjective test was not feasible. A slit lamp examination and dilated fundus evaluation was also performed to rule out ocular abnormality. This study aimed to screen the Squint among residents visiting a tertiary care hospital in Uttarakhand.

SUBJECTS AND METHOD

1. Study Design

It is a hospital-based cross-sectional study, conducted for a duration of one year, screening of squint patients was done among all patients.

2. Population and Sample

The sample size was 4,280 patients who visited the department of ophthalmology and screened for Squint and further evaluated for Latent. A total of 100 patients who manifest squint and convergence insufficiency (CI) were selected using convenience sampling.

3. Study Variables

Demographic profile, age, gender, type of squint, convergence insufficiency, power of convergence, and prevalence of squint.

4. Definition Operational of Variables

Vision: was defined by Snellen's chart, torchlight, and Prisms were used for Squint measurement, and Fundus was evaluated by Direct and Indirect Ophthalmoscopes. Synaptophore for BSV.

5. Study Instruments

Snellen's Chart, Torchlight, Prisms for Cover and Uncover, Alternate Cover Test, Synaptophore for BSV, power of convergence or divergence in prism diopters, Slit lamp examination for anterior segment, Indirect and Direct Ophthalmoscope for fundus examination were used for our study.

6. Data Analysis

SPSS was used to assess the data $p < 0.005$ was suggestive of significant, using the Chi-square test.

7. Research Ethics

Due to the approval of the ethics committee and after obtaining informed consent from the guardians of patients, the squint cases were further evaluated and categorized into latent, manifest, and eso/exo deviations.

RESULTS

Out of 4,280 patients screened, 100 (2.3%) patients were found to have Manifest Hori-

zontal Squint (Esotropia/Exotropia). The latent squint/ Phoria was detected in 720 (16.8%) out of all patients in the eye OPD. Out of 4,280 patients, 47% were females and 53 % were males. The Chi-square Test shows there was no difference statistically between the number of males screened versus the females. Also, there was no statistical difference number between males and females with either manifest squint or CI.

Table 1. Sample Characteristics

| Characteristic | Category | SQUINT | | | | p |
|--------------------|----------|---------------|----------------|---------------|----------------|--------|
| | | No | | Yes | | |
| | | Frequency (n) | Percentage (%) | Frequency (n) | Percentage (%) | |
| Age (years) | 1-5 | 11 | 11.0 | 2 | 2.0 | 0.776 |
| | 6-10 | 13 | 13.0 | 4 | 4.0 | |
| | 11-15 | 19 | 19.0 | 7 | 7.0 | |
| | 16-20 | 5 | 5.0 | 0 | 0.0 | |
| | 21-30 | 17 | 17.0 | 5 | 5.0 | |
| | 31-40 | 5 | 5.0 | 0 | 0.0 | |
| | 41-50 | 3 | 3.0 | 1 | 1.0 | |
| | >50 | 7 | 7.0 | 1 | 1.0 | |
| Gender | Female | 37 | 37.0 | 9 | 9.0 | 0.920 |
| | Male | 43 | 43.0 | 11 | 11.0 | |
| Esotropia | No | 34 | 34.0 | 0 | 0.0 | <0.001 |
| | Yes | 46 | 46.0 | 20 | 20.0 | |
| Exotropia | No | 46 | 46.0 | 20 | 20.0 | <0.001 |
| | Yes | 34 | 34.0 | 0 | 0.0 | |

This study found Esotropia (65%) to be more common than Exotropia and the difference was significant (p<0.001). The age of presentation of esotropia was similar to that of exotropia with the majority (3%) between 11 to 15 years of age. The test used was Chi-Square, with a (p<0.001), being statistically significant. Out of 4,280 patients screened, CI was detected in 720 (16.8%) cases. 70%

of cases of CI belonged to the age group between 5 to 10 years. There was a statistically not significant difference between the number of males and females. Table 3 shows 70% of cases in the age group of 5 to 10 years showed a power of convergence in the range of 0 to 10 PD, 20% in the range of 10-15PD, and 10% in the range of 15-20PD.

Table 2. Analysis Chi-square convergence insufficiency

| Variables | SQUINT | | | | OR | p |
|-----------|--------|------|-----|------|------|-------|
| | No | | Yes | | | |
| | N | % | N | % | | |
| Absent | 68 | 68.0 | 20 | 20.0 | 0.28 | 0.117 |
| Present | 12 | 100 | 0 | 0 | | |

Table 3. The Power of Convergence

| Age group 5 to 10 years (Percentage) | Power of convergence (Prism Diopter) |
|---|---|
| 70 % | 0 -10 PD |
| 20 % | 10 -15 PD |
| 10% | 15 -20 PD |

DISCUSSION

In the present study, the prevalence of Squint was found to be 2.3%, which is similar to other studies conducted in India and globally. In an analytical cross-sectional study of a nationally representative sample of 14,980 children aged 3 years, enrolled in the Millennium Cohort Study, from the United Kingdom, three hundred forty-three children had strabismus, amounting to a prevalence of around 2.1% (CI 95%= 1.80 to 2.40) (Pathai et al., 2010). Strabismus prevalence in school-going children residing in Bahir Dar city has been reported to be 5% (Tegege, 2021). In a retrospective study that was carried out for a duration of 5 years in Nigeria, strabismus constituted 0.01% of pediatric ophthalmic presentations, where children amounted to 3,197 (15.6%) of the total number of patients seen (Bodunde et al., 2014). In a cross-sectional study conducted among 328 children from four primary schools in Sakaka, the prevalence of strabismus was reported to be 21% (Alnuma et al., 2021).

A hospital-based retrospective observational study was conducted at a tertiary care hospital in India, for one year and has reported a magnitude of 6.9% (95% CI= 6.60 to 7.20). (Saxena et al., 2016). A prospective study conducted over 2 years on children between 3 to 16 years of age from Vishakhapatnam has reported a prevalence of squint of 0.6% (Attada et al., 2016). In a study from Mathura, out of 1,000 students, the squint cases constituted to 2.7% (Sharma DJ et al., 2017). In this study, out of 4,280 patients, 2,240 (47%) were females, while

2044 (53%) were found to be males, and there was no statistical difference between the two genders. Among 100 squint cases of Tropia, there were 54 (54%) males and 46 (46%) females and the difference was statistically insignificant. The most common age group of children presenting with Exotropia or Esotropia squint was found to be 11 to 15 years amounting to 34% and this was found to be statistically significant with a $p > 0.001$.

In a study from Nigeria, where a total of 20,463 patients were seen in the eye clinic during the study period, only 3,197 (15.6%) constituted children. They found 1,687 (52.8%) males and 1,510 (47.2%) females (Bodunde et al., 2014). The gender disparity in the presentation of squint cannot be generalized as it depends on geography, demography, culture, and awareness. In another study from Saudi Arabia, the most common age of presentation was found to be 12 years (Alnuman et al., 2021). There are many studies have reported a delayed age of presentation, and have highlighted their implications in the development of amblyopia and functional loss.

In the current study, we found statistically significant ($p < 0.001$) more Esotropia (65%) than Exotropia (35%). In a study conducted in Rajasthan, exotropia was found to be more than esotropia, however, another study by Saxena et al. (2016) found equal presentation of both Exotropia and Esotropia. This suggests that sometimes the outcome might depend on the nature of the population and demography. The prevalence of CI in the age group 5 to 20 years in our study amounted to 16 percent among the

4,500 patients who were screened. The prevalence of CI was documented to be 2 to 13 %, with the most common figure estimated to be 5 % in school-age children (Rouse et al., 1999).

This increased percentage can be compared with a study by Patwardhan et al wherein the convergence percentage came to 7.9 % in a total of 250 residents who were screened for CI (Patwardhan et al., 2008). Convergence Insufficiency incidence was 7.7%, The study was performed to evaluate Synaptophore efficacy treatment comparing it with home exercises as a treatment for CI. 2162 cases were evaluated, of the age group 15 to 35 years of primary CI amounting to 7.7 %, as compared to our study where 4,280 residents were evaluated, 720 amounted to CI, giving an incidence of 16.8% (Desai et al., 1990). Studies in the USA by Goering et al. (2023), have reported an adverse effect of the use of computers on CI, based on an Academic behavior survey (ABS). There was shown marked improvement in CI by home-based treatment. Office-based convergence therapy (OBVT) with home-based exercises is documented to be the first-line treatment option for symptomatic CI in children. In a study by Dusek et al. (2011), the treatment category for convergence insufficiency was found to be irrespective of age or refractive error. Normal distribution was depicted in all age groups using The Kolmogorov-Smirnov Test for all measurements.

In this study, we have observed that CI has increased over the years due to more near work, and digital media usage in this generation therefore markedly increase in the percentage of CI (16.8%) which can be compared with studies by Patwardhan et al in which it amounted to 7.7 % and another study by Desai et al. (1990) in which CI amounted was 7.9%. Over the years it was considerably increased and appears to be significant. Successful treatment outcomes

have been noted after proper exercises at home as well as in the institution, accommodative therapy with reinforcement, pencil exercises, prism reading glasses, and target pushups. Studies have reported improvement in academic behavior among children subjected to treatment for CI in the form of exercise performed either with pencils or with computers (Nunes et al., 2019; Borsting et al., 2012; Scheiman et al., 2005)

Screening of squint has become more common due to the spread of information and technology in recent times. Also, the accessibility of the healthcare system has enabled more exposure to people living in far-flung areas. However, the importance of the study lies in the assessment of the magnitude of the problem, its distribution in various groups, and the measures that can be formulated to contain it. In times of digital media and its applications, the problem of CI needs emphasis. The study suggests the existing status especially of CI, with a humble contribution to global data. The study does not include vertical squints, or children with congenital anomalies or squints presenting with some ocular pathology, with an age group between 5 to 20 years. This study only includes the screening of one tertiary care hospital in Uttarakhand and might need more collaboration from other sources for a more generalized outcome.

AUTHOR CONTRIBUTION

Dr. Vatsala Vats and Dr. Priyanka Gupta conceived and designed the study. Data collection was conducted by Dr. Vatsala Vats, Dr. Divija Arora, and Dr. Priyanka Gupta. Analysis and interpretation of results were performed by the same team. Dr. Vatsala Vats, Dr. Divija Arora, and Dr. Priyanka Gupta collectively prepared the draft manuscript. Each author made significant contributions to the study, from its

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CONFLICT OF INTEREST

None.

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