



To Find Out Prevalence of Non-Strabismic Binocular Vision Dysfunction in Patients with Asthenopia in Bhiwani District, Haryana

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Abstract

Aims: To find out Prevalence of non-strabismic binocular vision dysfunction in patients with asthenopia in Bhiwani district, Haryana

Methods: It is a cross-sectional single-centre study including a patient presenting with symptoms of binocular vision anomaly at Tertiary Eye Care Hospital, Bhiwani district, Haryana for 6 months. During 6 months, 39 patients between the age group of 10-30 years were screened.

Results: In this study, a total of 39 subjects were screened, with ages between 10-30years. 27(69.2%) were female and 12(30.8%) were male. The prevalence of non-strabismic accommodative dysfunction was 28.2% (11) and vergence dysfunction was 71.8% (28). The prevalence of specific non-strabismic binocular vision dysfunction was as follows: accommodative insufficiency (20.5%), accommodative excess (7.69%), convergence insufficiency (35.9%), convergence excess (7.69%), divergence insufficiency (7.69%), divergence excess (15.4%), convergence insufficiency with accommodative insufficiency (5.1%).

Conclusions: The present study revealed a high prevalence of non-strabismic binocular dysfunction patients between the ages of 10-30 years old. 71.8% of patients were symptomatic. These findings suggest that it is important to conduct proper eye and binocular vision examinations to detect non-strabismic binocular dysfunction. Therefore, timely diagnosis and management will positively impact their future and increases the quality as well as productivity of life.

Keywords: Non - Strabismic Binocular Dysfunction; Convergence Insufficiency; Convergence Excess; Accommodative Disorders

Introduction

Non-strabismic binocular vision dysfunction is a visual disorder that affects the subject's binocular vision and visual performance, especially when performing tasks requiring near vision [1]. Binocular vision anomalies are the most common visual disorder. Patient complaints include decreased vision, headache, eyestrain, watering, blurred vision while doing near tasks, double vision, a lack of concentration, difficulty focusing near to far or vice versa, and poor reading comprehension. These symptoms have a negative impact on academic performance [2]. These conditions are generally missed out unless a complete orthoptic and binocular vision examination is performed. Treatment of these conditions is very successful with vision therapy lenses and prisms [3]. Many studies have established the correlation between accommodative and non-strabismic binocular dysfunction to learning difficulties [4]. Successful treatment led to a significant improvement in the quality of life of this group of patients.

The most frequently encountered disorder of the binocular vision system includes Convergence insufficiency/ excess and divergence insufficiency/excess. Focusing problems frequently include accommodative insufficiency, excess, spasm, instability, infacility, and ill-Sustained accommodation [4]. Non-strabismic binocular dysfunction is common in the pre-presbyopic population which results in loss of productivity in academic and other near-Vision-oriented tasks [5-7]. The prevalence of accommodative and binocular vision disorder is 8.5 times greater than the prevalence of ocular disease in children between 6-18 years [8].

Garcia, *et al.* [9] 2016 undertook a cross-sectional study on a randomized sample of 175 university students aged 18-35 years. The overall prevalence of accommodation and binocular dysfunction was 13.5% and refractive dysfunction was 45.14%. Excessive near work results in non-strabismic binocular vision dysfunction which directly impact on Academic performance of students [5-7]. This study was conducted to assess the prevalence of non-strabismic binocular vision dysfunction among patients with asthenopia in the Bhiwani district, Haryana.

Subjects and Methods

It is a cross-sectional single-centre study including a patient presenting with symptoms of binocular vision anomaly at Tertiary Eye Care Hospital, Bhiwani district, Haryana for 6 months. During 6 Months 39 patients between the age group of 10-30 years were screened. The criteria for selection were absence of significant uncorrected refractive error, healthy eyes.

Exclusion criteria included strabismus, amblyopia, nystagmus, contact lens users, cataract, ocular pathologies, and previous ocular surgeries which could affect accommodation, and vergence relationship. Each patient has explained the purpose, procedures, and the time involved in the completion of the course of action. All patients underwent comprehensive ocular examination and were enrolled for detailed orthoptic evaluation. The clinical set up divided into two stations. The first station was taking a detailed history of visual symptoms, measurement of visual acuity at distance and near refraction (objective and subjective w/o dilatation), sensory and motor evaluation. The test included the measurement of stereopsis using the Titmus fly test, worth four dots, the cover test for distance and near, the prism bar cover test, measurement of ac/a ratio, by using the gradient method. The second station included an assessment of accommodative and vergence. The different tests for accommodation were measurement of NPA by RAF Ruler each repeated 10 times, NRA and PRA, accommodative facility, MEM. The different tests for vergence were measurement of NPC 10 times, NFV and PFV, and Vergence facility.

The result obtained from accommodative amplitude, NPC, gradient AC/A ratio, MAF, BAF, MEM retinoscopy, and vergence facility were compared with tables of established expected values by Scheimann and Wick Table 1 [10]. The results from distance and near lateral phoria, NFV, PFV, NRA, and PRA were compared with expected values by the optometry extension program in Table 2 [11]. All tests were done three times repeatedly and average values were analysed. The results of each of the test performed were first compared with the normal values and then were grouped according to deviation from the expected values.

Results

In this study, a total of 39 subjects were screened, with ages between 10-30years. 27(69.2%) were female and 12(30.8%) were male. The prevalence of non-strabismic accommodative dysfunction was 28.2% (11) and vergence dysfunction was 71.8% (28). The prevalence of specific non-strabismic binocular vision dysfunction was as follows: accommodative insufficiency (20.5%), accommodative excess (7.69%), convergence insufficiency (35.9%), convergence excess (7.69%), divergence insufficiency (7.69%), divergence excess (15.4%), convergence insufficiency with accommodative insufficiency (5.13%) [Figure 1]. 28 patients (71.8%) reported symptoms such as headache, blur after reading and asthenopia while 11 patients (28.2%) reported symptoms watering, eye

Test	Expected Findings
NPA Push-up test(RAF)	18-1/3 age
NPC Accommodative target	Break/recovery: 5cm/7cm
Gradient AC/A Ratio	4:1
MAF 13-30yr old	11cpm
BAF13-30yr old	10cpm
MEM	+0.50D
VF (12 base- out/3 basein)	15cpm

Table 1: Expected findings: Binocular vision testing (Scheimann and Wick) [10].

NPA: The amplitude of the accommodation

RAF: Royal air force

NPC: Near point of convergence

AC/A: Accommodative convergence/accommodation ratio

MAF: Monocular accommodative facility

BAF: Binocular accommodative facility

MEM: Monocular estimation method retinoscopy

VF: Vergence facility testing.

Case Finding	Expected
Distance lateral phoria	0.50 Exo
Near lateral phoria	6 Exo
PFV Base-out (distance)	blur/break/recovery: 7/19/10
NFV Base-in (distance)	break/recovery: 9/5
PFV Base-out (near)	blur/break/recovery: 15/21/15
NFV Base-in (near)	blur/break/recovery: 14/22/18
NRA	+1.75D to +2.00D
PRA	-2.25D to -2.50D

Table 2: Optometric extension program expected findings [11].

PFV: Positive Fusional Vergence

NFV: Negative Fusional Vergence

NRA: Negative relative accommodation

PRA: Positive relative accommodation.

pain. According to ages non-strabismic binocular dysfunctions are more prevalent between the age of 10-18 years of age as shown in [Figure 2].

Graphical representation of prevalence of non strabismic binocular dysfunction

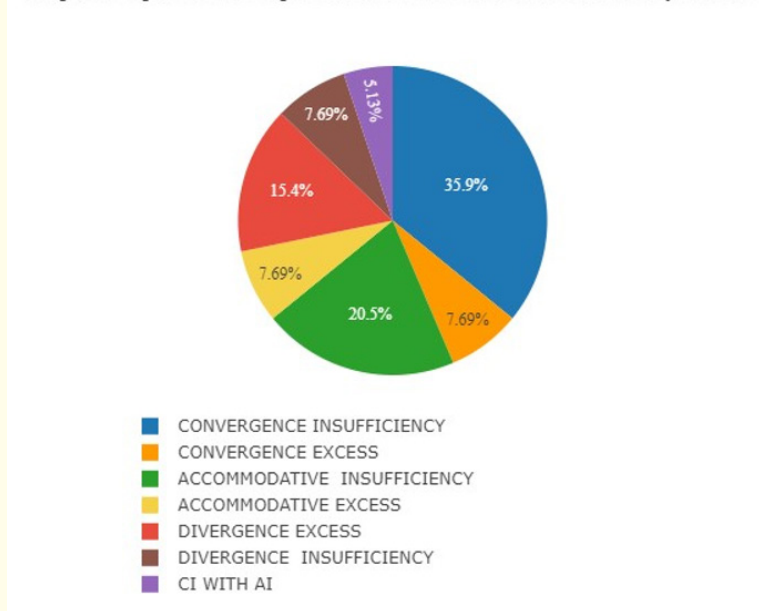


Figure 1: Graphical representation of prevalence of non strabismic binocular dysfunction. CI with AI: Convergence Insufficiency, AI: Accommodative Insufficiency.

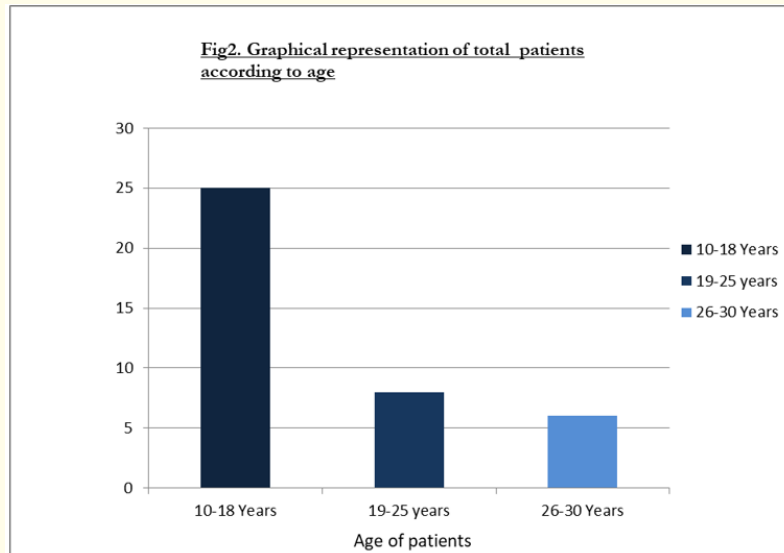


Figure 2: Graphical representation of total patients according to age. y-axis represents the number of patients and x-axis represents the age of the patients.

Discussion

This is the first cross-sectional hospital-based study using a complete binocular vision and orthoptic evaluation to find out the prevalence of non-strabismic binocular vision disorder with asthenopia in patients of 10-30 years of age groups presenting Tertiary Eye Care Hospital in Haryana, India.

In a study, Angel Garcia Munoz, *et al.* reported that binocular disorders were more prevalent compared to accommodative disorders [9] but the overall prevalence was 13.5% and the prevalence of accommodative dysfunction was 2.29% and another binocular dysfunction was 8%. They found that convergence insufficiency was the most prevalent disorder among all accommodative and binocular dysfunction. Our current study also supports this statement, but in our study prevalence of overall vergence, disorder was higher at 71.8% and accommodative disorder was 28.2%. Several other studies also reported that a high prevalence of convergence insufficiency was the most prevalent disorder and the absence of significant prevalence disorder and absence of a significant relationship between gender and convergence insufficiency [12,13]. Our study also shows similar results. In this current study although there is a higher frequency of convergence insufficiency present in the female group of participants.

Another study by Manish Dahal on the optometry student's population has reported the most prevalent non-strabismic binocular dysfunction, vergence dysfunction significantly higher than accommodative disorder which supports our study. Among all types of accommodative disorder accommodative insufficiency was the most prevalent disorder [14]. Although our study result shows the most prevalent non-strabismic binocular dysfunction is convergence insufficiency followed by convergence excess. The prevalence of accommodative insufficiency is higher compared to other accommodative dysfunctions.

Non-strabismic binocular dysfunction is a growing problem. It is very important to know about the population at higher risk and its prevention and management as early as possible. Timely diagnosis of the condition can improve the prognosis of binocular dysfunctions. This condition is usually associated with prolonged work. More research is needed following well-designed epidemiological studies and uniform diagnostic criteria, prevalence information on these binocular vision anomalies in patients with asthenopia would enable optometrists to help and support health policies to improve the visual health of patients.

Conclusion

The present study revealed a high prevalence of non-strabismic binocular dysfunction patients between the ages of 10-30 years old. Non-strabismic binocular dysfunctions are highly prevalent among school children and the prevalence increases with age. These findings suggest that it is important to conduct proper eye and binocular vision examinations to detect non-strabismic binocular dysfunction. There is a lack of proper epidemiological studies about the prevalence of accommodative and non-strabismic binocular dysfunction in subjects with asthenopic symptoms. The wide discrepancies in prevalence figures are due to both sample population and lack of uniformity in diagnostic criteria so it makes it difficult to compile results. Therefore timely diagnosis and management will positively impact their future and increases the quality as well as productivity of life.

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