Prevalence of Non Strabismic Binocular Vision Disorder in College Student

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Abstract:-

➢ *Background:*
Several studies have reported a high prevalence of accommodative and vergence anomalies in the university student's population in different states of India. Their findings were diverse owing to differences in diagnostic techniques and the criteria used to define the variables. Different type of influential factors and geographical variation has also an impact on their variable result. This current study is aimed to assess find the prevalence of non-strabismic binocular vision disorder (NSBVD) in a randomised population of college students in Mangalore, India.

➢ *Method:*
A randomized sample of 600 college students (300 males and 300 females), aged 18-23 years were included in this cross-sectional study. To evaluate the prevalence of NSBVD all the subjects undergone through a comprehensive ophthalmic examination including visual acuity testing, assessment of anterior and posterior segment, assessment of ocular motility and binocular vision.

➢ *Result:*
Prevalence of NSBVD in college students is 76.5%. Convergence insufficiency was the most prevalent (27.5%) in college students followed by convergence excess (24%) and Accommodative Insufficiency (22.5%) among all type of NSBVD. Prevalence of NSBVD is more in females than male.

➢ *Conclusion:*
Early detection of NSBVD is important because without treatment these disorders may lead to strabismus resulting in loss of stereopsis and development of suppression. If any accommodative of vergence disorder is found, then effective treatment should be prescribed immediately. Timely identification and proper treatment of NSBVD will allow a student to performing at his or her full potential.

Keywords:- Accommodative Dysfunction; Prevalence; Convergence insufficiency; Non Strabismic Binocular Vsion Disorder; Vergence Dysfunction; Convergence Excess.

I. INTRODUCTION

In 21st century with the advanced technology computer, smartphones and other visual devices become a part of life for college students not only to complete their daily academic task but also used for entertainment and to connect with different social media. For the same, uses of visual devices increased dramatically among college students. With additional factors like, poor lighting, glare, screen brightness, uncorrected refractive error and improper workstation setup extended use of visual devices results in different accommodative, vergence dysfunction in a large percentage of college student's population. This group of disorders is known as NSBVD [1, 2]. Non strabismic binocular vision dysfunctions are the common visual disorder which occurs specially in the population who works in an environment where performance of continuous near work for extended period more without proper break. These disorders often result less productivity in academic and other near vision-oriented tasks by adding additional stress. If these dysfunctions left undiagnosed and without proper treatment this may appear as a symptom of discomfort and produce negative on academic activity and clinical training [3, 4, 5]. Several studies have provided new insights into NSBVD and eye teaming (vergence) that reinforce the need for comprehensive eye examinations and follow-up care for university students who are suffering from these disorders. These disorders may occur even in individuals with the 6/6 visual acuity. Active accommodation and convergence are involved in any active near work activities. Although there is a wide variety of symptoms reported in patients with NSBVD. Individuals with this disorder suffer from fatigue, loss of place when reading, and difficulty completing assignments, loss of efficiency and provoking visual symptoms. Common symptoms of NSBVD are blurred vision, eyestrain difficulty focusing at distance and near, tired eyes, burning sensation, headache and ocular pain, redness and diplopia and asthenopia [2, 6, 14]. In this present study to find out the prevalence of NSBVD in a randomized sample college students' population we have evaluated all accommodative and vergence disorder. Accommodative disorder included accommodative insufficiency, accommodative excess, accommodative infacility and ill sustained accommodation. Vergence disorder included fusional vergence dysfunction, convergence excess, convergence insufficiency, basic esophoria, basic exophoria.

II. METHODS AND SUBJECTS

In this cross-sectional study 600 Subjects were participated. Out of 600 Subjects 300 were males and 300 were females. Age of the subjects were ranging from 18 to 25 years. The subjects included for the study are the graduate students of Mangala College of Para Medical Sciences, Mangalore. Subjects were included in this study only if they were emmetrope and absence of strabismus, amblyopia, nystagmus, history of chronic systemic illness, ocular infection, and if the subjects are not on medication against any systemic diseases. Even smokers, alcoholics, Psychoactive substance user, and subjectswith known psychiatric illness were excluded from this study. To evaluate the of NSBVD all the subjects undergone through a comprehensive ophthalmic examination. After anterior and posterior segment evaluation with the help of slit lamp biomicroscope and direct ophthalmoscope all th subjects were also examined for ocular motility and binocular vision as below: Visual Acuity Assessment was done for distance with the help of Snellen distant acuity chart and for near with Log Mar near acuity chart. To understand Ocular motility broad H test was performed in all nine-cardinal position of eye. TNO test booklets is used to test the stereopsis with a red and green spectacle. Direct cover test, cover-uncover test and alternate cover test was done for both distance (6m) and near (33cm). Maddox rod test was done to assess the amount of phoria. To perform this test a Maddox rod was placed in one eye and pinhole is placed on the other eye and a torch light is flashed on the eye and readings are recorded according to patients responds. Prism bar cover test as performed to rule out the strabismic subjects. Both NPA (Near Point of Accommodation) & NPC (Near point of convergence) was measured with the help of RAF ruler. Blur, break and recovery were measured binocularly for NPC and Blur and recovery were measured to assess NPA for monocular and binocular. Both NPC & NPA are recorded in centimetres (cm). AC/ A ratio was measure by gradient method. MEM (Monocular Estimated Method) test was performed to assess lead and lag of accommodation. MEM cards are used to test and the procedure is done at 33cm in a semi dark room. Neutralized movement with appropriate lenses was recorded. NRA (Negative Relative Accommodation) & PRA (Positive Relative accommodation) was measured as per the standard protocol to obtain the sustained blur point with plus and minus lens. NFV (Negative Fusional Vergence) & PFV (Positive Fusional Vergence) were performed for both distance and for nearby. For NFV a Horizontal prism bar is placed with base IN and base OUT for PFV. Blur, Break, Recovery was recorded in prism dioptre. +/-2 Accommodative flippers was placed with a near target with N8 to assess accommodative facility (AF). Result was recorded in cycles per minute(cpm). 3 BI and 12 BO Vergence prism flippers was used to assess vergence facility. Procedure was performed in 1minute duration and values are recorded in cycles per minute (cpm). All data were entered into a Microsoft Excel 2007 database and analysis was conducted with SPSS-V.18.0. statistical comparison were made using Z-test for proportions with the p-value cut-off of 0.05 for statistical significance.

III. RESULTS

Result of this study shows that prevalence of NSBVD is high in randomized sample college students. Out of total 600 participants 76.5% is diagnosed with either convergence disorder or with accommodative disorder. Convergence Insufficiency (27.5%) is the most common binocular disorders followed by convergence excess (24%) and accommodative insufficiency (22.5%) both male and female students. The least frequent NSBVD are fusional vergence dysfunction, basic esophoria and basic exophoria. Compare to male, female.

Table 1: Frequency and percentage distribution of samples according to the Age of the sample

AGE	FREQUENCY	PERCENT
18	90	15%
19	132	22%
20	132	22%
21	162	27%
22	42	7%
23	36	6%
24	0	0%
25	6	1%

Table 2: Frequency and percentage distribution of samples according to the Gender of the sample

GENDER	FREQUENCY	PERCENTAGE
MALE	300	50
FEMALE	300	50
TOTAL	600	100

Table 3: Prevalence of non strabismic binocular dysfunction in college students

	Prevalence (%)	
NORMAL BINOCULAR VISION	*23.5*	*141*
OVERALL NON STRABISMIC BINOCULAR VISION DISORDERS	*76.5*	*459*
ACCOMMODATIVE INSUFICIENCY	22.5	135
ACCOMMODATIVE EXCESS	0.0	00
ACCOMMODATIVE INFACILITY	1	6
ILL-SUSTAINED ACCOMMODATION	1.5	9
CONVERGENCE EXCESS	24	144
CONVERGENCE INSUFFICIENCY	27.5	165
DIVERGENCE EXCCESS	0	00
DIVERGENCE INSUFFICIENCY	0	00
FUSIONAL-VERGENCE DYSFUNCTION	0	00
BASIC ESOPHORIA	0	00
BASIC EXOPHORIA	0	00

Tables 4: Frequency and percentage distribution of non- strabismic binocular vision disorder among males and females' participants.

	Male	(%)	Female	(%)	P value
Accommodative insufficiency	57	9.5%	78	13%	0.002
Accommodative Excess	0	0%	0	0%	
Accommodative Infacility	3	0.5%	3	0.5%	0.964
Ill-Sustained Accommodation	3	0.5%	6	1%	0.0001
Convergence Insufficiency	75	12.5%	90	15%	0.002
Convergence Excess	57	9.5%	87	14.5%	0.0001
Fusional Vergence Dysfunction	0	0%	0	0%	
Basic Esophoria	0	0%	0	0%	
Basic Exophoria	0	0%	0	0%	
Divergence Excess	0	0%	0	0%	
Divergence Insufficiency	0	0%	0	0%	

Gender- based analyses of the prevalence of non-strabismic binocular vision disorders revealed a significant increase in prevalence in the female students and these results were statistically significant. Statistically significant differences were observed for the subtypes of convergence insufficiency and accommodative insufficiency (Z-test, p<0.002), convergence excess (Z-test, p<0.0001), and ill sustained accommodation (Z-test, p<0.0001).

IV. DISCUSION

In a study Angel Garcia Munoz et.al reported that binocular disorders were more prevalent compare to accommodative disorder [6] but the overall prevalence was 13.5 percent and in that prevalence of accommodative dysfunction was 2.29 percent and other binocular dysfunction was 8 percent. They found that convergence insufficiency was the most prevalent disorder among all accommodative and other binocular dysfunction. Our current study report also supports this statement but in our study prevalence of overall NSBVD was higher (76.5 percent). Several other studies also reported a high prevalence of NSBVD with convergence insufficiency was the most prevalent dsorder and absence of significant relationship between gender and convergence insufficiency. Convergence insufficiency was reported either due to decrease NPC or due to reduced positive fusional vergence. [7, 8] Our study also shows a similar results.in this current study although there is a higher frequency of convergence insufficiency present in the female group of participants. With a same sample size in a clinic population study Francisco Lara's in 2001 reported that binocular dysfunction was more (12.9%) prevalent compare to accommodative anomalies (9.4%). Convergence excess was the most prevalent (4.5%) disorder. Allover prevalence of NSBVD was 22.3% [9]. In another study SC Hokoda had found the most commonly encountered condition was accommodative dysfunction (16.8%) in a group of population with asthenopia. [10] Sample size was less in this study compare to this current study. Even the result was dissimilar in this study compare to our current study. In a study D J Risovic found that the result of stereopsis is significantly worse as per Titmus test and they have also found that participants was with worse convergence and fusion amplitude and

higher degree of exophoria in myopic population.[11] In the study of Esteban Porcar et.al they have reported Accommodative Excess was most prevalent disorder in university student population.[2] But our study reported that Convergence Insufficiency is the most prevalent disorder followed by Convergence Excess and Accommodative Insufficiency in the population of college students. In another study of Manish Dahal on Optometry student's population he has reported most prevalent NSBVD was accommodative disorder followed by vergence and oculomotor disorder. Among all type of accommodative disorder accommodative insufficiency was the most prevalent disorder. [18] Although our study result shows that most prevalent NSBVD is Convergence Insufficiency followed by Convergence Excess; the prevalence of Accommodative Insufficiency is higher compare to other accommodative disorder.

V. CONCLUSION

The study shows a significant prevalence of non-strabismic binocular vision disorder in college students. Early detection of NSBVA is important because these anomalies will be an additional stress to any activities which requires eye co-ordination either for distance or near. Without proper treatment it may become strabismic resulting in loss of stereopsis and development of suppression. This will make a negative impact in day to day activities. If any accommodative of vergence disorder is found, then effective treatment should be prescribed immediately. Timely identification and proper treatment of NSBVD will allow a student to performing at his or her full potential.

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