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Frequency of Convergence Insufficiency and treatment it with vision exercise in Optometry Clinic

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ABSTRACT

Introduction: Convergence insufficiency (CI) is a common binocular vision disorder characterized by difficulty in establishing near motor fusion. A common characteristic of CI is that patients have more symptoms, such as eyestrain and headache, after close work.

Purposes: The purpose of this study was to determine the frequency of insufficiency convergence (Cl) in optometry clinic for one year for cases with age 5 to 20 years in Erbil Medical Technical Institute. Also, the aim of this study was to determine the prevalence cases with convergence insufficiency with gender and age in a sample of age between 5 to 20 years, also do vision exercise to them.

Material and methods: In the present study optometric and ophthalmologic examinations were performed on all participants. Clinic records of 735 children were randomly selected and reviewed according to a standard protocol, Subject age was 5 to 20 years at year 1 of follow-up at 1 optometry clinic. Measurements included refractive error, distance and near phoria, interpupillary distance (IPD), prism bar fusional vergence ranges, and near point of convergence (NPC). Records were reviewed for demographic and clinical data. Data on Cl-related symptoms were obtained at one of the sites. minimal refractive error (-0.50 to +1.00 D and < or = 1.00 D of astigmatism in either eye, and < or = 1.00 D of anisometropia); and no strabismus were evaluated for Cl-related characteristics. Records that met the eligibility criteria of: good visual acuity (20/30 or better in both eyes), Eligible children were classified according to the direction of their near heterophoria and the number of the following clinical signs present: (1) exophoria at near > or = 4 prism than at far; (2) receded near point of convergence (NPC) of > or = 6 cm break or > or = 10.5 cm recovery. near break point of convergence (NPC) ≥ 6 cm. Children were then classified as: no Cl (no exophoric at near or < 4 prism difference between far and near); or NPC little than 6 cm.

Results: Ninety-six percent (706/735) of the records met the eligibility criteria and had complete data on phoria, NPC. The age (mean age +/- SD) of the study population was (12 +/- 1.3) years. The percentage of children rated as symptomatic increased with the number of Cl-related clinical signs present. A total of 706 participants' records were evaluated. Of those, 421 (59.7%) cases were female and 285 (40.3%) case were male. The prevalence of CI (177 cases) 25 % of patients were insufficiency convergence eye. In the present study, from eye cases with CI (177) cases from 706 cases, 40 normal eye cases (5.6%) had CI, 137 cases of cases with refractive errors had CI, 13 cases with mixed astigmatism from 149 cases (9%) had CI, 4 cases with CHA from 149 cases (3%) had CI, 7 cases with SHA from 149 cases (5%) had CI, 6 cases with SH from 149 cases (4%) had CI, 64 cases with CMA from 149 cases (43 %) had CI, 23 cases with SMA from 149 cases (15%) had CI and , 20 cases with SM from 149 cases (13%) had CI. The more CI prevalence there were in CMA. According to the results, 60 cases (60%) from 95 cases of myopic eyes that they had all types of myopia refractive errors had CI, 17 cases (43%) with all types of hypermetropic eyes from 39 cases with hypermetropic eyes had CI. It shows the cases with myopic eyes more than hypermetropic eyes.

Conclusions: The prevalence of clinically significant convergence insufficiency in this sample. CI is a separate and unique clinical condition and can occur without a combined condition. These findings suggest a high frequency of Cl in optometry clinic populations and a potential correlation between patient symptoms and the number of Cl signs person. These results suggest that for myopic children convergence ranges decrease for both distance and near viewing during the school years as near phoria becomes more exophoric.

Keywords: *Convergence insufficiency, School screening, near point of convergence, near work, phoria, vergence.*

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1. INTRODUCTION

Convergence insufficiency (CI) is a common ocular motility disorder characterized by an insufficient amount of convergence required to achieve and maintain clear, binocular vision at near fixation. It was first described in 1855 by Graefe, and later investigated in detail by Duane[1]. "Vergence" is the simultaneous movement of the eyes in opposite directions to obtain or maintain single binocular vision[2]. Convergence insufficiency (CI) is a sensorimotor anomaly that affects the binocular vision system resulting in an inability to adequately converge or sustain convergence during near visual tasks[3]. The classic clinical picture of this condition is characterized by: 1. Exophoria that is more pronounced at near than at distance, 2. Displacement of the near point of convergence to a greater distance, 3. Decreased positive fusional convergence. According to research by Mohney et al. and Govindan et al. this condition is estimated to be present between 10 and 20% of children with exodeviation[4]. In vergence anomalies, the eyes are unable to fixate and stabilize a retinal image accurately, and the visual axes may move away from each other (divergence) or move towards each other (convergence)[5]. In both adults and children, CI is frequently associated with asthenopia symptoms like headache, transient blurred vision, diplopia, eyestrain or difficulty in concentrating while conducting near work[6]. Convergence insufficiency (CI) is a common binocular vision disorder with a reported prevalence of 2.5% to 25%[7]. According to Blum et al., the goal of vision screening is to identify children with a visual problem or an eye condition so that they can be referred to a qualified professional for a complete evaluation. The early detection of CI is beneficial as this problem responds well and quickly to vision therapy[8].The most frequently reported symptom for CI is discomfort after reading or computer work which usually occurs at the end of the day. Other symptoms include frontal headaches eye ache, a pulling sensation, heavy eyelids, sleepiness diplopia loss of concentration blurred vision tearing and dull orbital pain. Less common complaints include nausea, motion sickness, dizziness, panoramic headaches gritty sensation in the eyes, and general fatigue. These symptoms affect the person's quality of life and lead to decreased academic, occupational and sports performance[9]. Some CI patients report poor ''depth perception,'' e.g., trouble parking a car or trouble playing tennis. Two other common complaints noted by patients with CI are car sickness and migraines, which, in this author's experience, decrease with therapy[1]. Apart from idiopathic, CI is also associated with number of other diseases and conditions such as: myasthenia gravis, intoxications, infections, inflammations, neurodegenerative diseases (Parkinson's disease, progressive supranuclear palsy and Huntington's chorea), Parinaud syndrome, head trauma and intracranial ischemia[10]. Surveys represent one of the most common types of research in the health, social, and human sciences. Particularly in the health sciences, the prospect of studying the evolution of a specific disorder and monitoring the efficacy of a specific treatment based on assessment surveys has been considered a great advantage, because they are easily accessible and inexpensive[11]. Orthoptic exercises for convergence insufficiency have been in use for over 70 years[12]. Refractive and accommodative-vergence mechanisms are part of the visual efficiency system, and refractive errors play a dynamic role in the etiology and treatment of binocular vision anomalies, including CI[5]. Other risk factors for CI include uncorrected hyperopia, under-corrected myopia and poorly centered spectacle lenses[13]**.** The lack of strong evidence was identified by the Convergence Insufficiency Treatment Trial (CITT) Group in designing a large multicenter trial comparing the effects of different treatment regimens on convergence insufficiency, a condition where most professionals agree that exercises are effective[14]. Insufficiency convergence can cause headache, blurred vision, visual fatigue, eye strain, double vision, and other symptoms[15]. These symptoms commonly occur or become worse after reading or other types of near work. Previous studies have investigated the effect of near work on the following binocular vision functions in normal subjects: associated phoria[16], dissociated phoria, vergence, and accommodation[17]. The fact that CI subjects complain more after near work indicates that visual system function in CI patients may be affected by visual fatigue induced by prolonged near work.

If this is the case, it would be wise to evaluate binocular vision after visual fatigue in patients who are suspected to have CI. Uncorrected refractive errors are a primary cause of binocular anomalies, including convergence insufficiency. Symptoms of asthenopia in both refractive and binocular vision anomalies are similar. Despite the relationships that exist between them, the extent of association between refractive errors and convergence insufficiency has not been studied extensively[18]. Purposes: The purpose of this study was to determine the prevalence of insufficiency convergence in optometry clinic for one year for cases with age 5 to 20 years in Erbil Medical Technical Institute.

2. MATERIAL AND METHODS

The study design was cross-sectional sampling was carried out from students of the 2023-2024 and comprised data from 706 cases with complete data aged 5-20 years, who were randomly selected from 735 cases in optometry clinic. In the final sample, 421 (60%) cases were female and 285 (40%) case were male. This study does in the present study optometric and ophthalmologic examinations were performed on all participants. Far vision and near vision was tested and corrected. Convergence insufficiency tested with eye movement examination and use from a ruler. NPC measured. A room

examination was provided by the optometry department where the visual examinations were conducted. The purpose and procedures were thoroughly explained to each participant prior to the eye screening. To ensure that the participants understood all the instructions, trial testing was performed for complex tests, such as accommodative facility and fusional vergences. Validated optometric instrument and procedures were used as described in standard optometry books[2] and used in previous studies[19-21]. The test procedures and testing conditions across participants and study sites were standardized as far as possible, and an average of three test measurements were obtained for near tests. In the first station, trained personnel obtained case histories and participants' demographic details and visual acuities measurement. In the second station, measurements of the binocular functions were performed by an optometrist. To minimize bias, the assistant who collected the participants' demographic details worked independent of the optometrists. A normal NPC value is around 8-10cm, a distance less than 5cm is excessive, and greater than 10 is insufficient. NPC is the most commonly present abnormality and the most commonly used single diagnostic criterion for investigating CI. To determine the NPC can be used: an adjustable target or RAF-ruler, a pen with a lamp or a pen with a lamp and red-green glasses, as well as Jump convergence[1]. **The following tests were performed:** Preliminary tests: The preliminary tests included visual acuity (VA at both distance (6 m) and near (40cm). Ocular health status was evaluated using a direct ophthalmoscope. Suppression was evaluated at near using the Worth-4-dot test. The unilateral cover test was first performed to rule out strabismus. Stereoacuity was assessed using the Randot stereo test and ocular motility was evaluated using the Broad H test. Non-cycloplegic refractive errors were evaluated objectively using an autorefractor (Huvitz) and subjectively using the phoropter. Positive Fusional Vergence: PFV is the amount of convergence required to maintain binocular near fusion and the amount required to overcome bulbar temporal disparity. To determine it, the patient is given to look at Snellen's signs, and prisms are gradually added in front of him. The moment when fusion of the images into one is no longer possible, diplopia will occur, and this moment is known as the breaking point. The amount of prism added to cause diplopia is a measure of the amount of fusional convergence[22]. Vergence tests: The near point of convergence (NPC) was measured using the ruler. The break point was recorded for analysis when the case reported diplopia or at a point where the eye diverges. In cases in which the subjects did not report diplopia, the point when the eye diverges was recorded. Near point of convergence was assessed by the standard push-up technique using a single column of letters of 6/9 (20/30) equivalent at 40 cm on a near point rule.

In this test, the subject is asked to follow an approaching target until the point where it appears double, or the examiner notes that one eye drifts outwards. Three measurements were made separated by at least 10 s of rest. Break and recovery point values were recorded as the average of the three measurements[23]. **Data analysis:** Statistical analysis was performed using IBM SPSS version 24.0 software. The Kolmogorov–Smirnov test with Lilliefors correction was used to confirm the normal distribution of the collected data. Data were expressed as means (SD) for continuous variables and number and percentage for categorical variables and analyzed using the Chi-squared test and Fisher's exact test. For continuous variables we used either a 2-tailed t-test when normality and homogeneity of variance assumptions were met, or the nonparametric Mann–Whitney U test. Associations between the quantitative variables of interest were measured through Pearson's correlation coefficients. For all statistical tests, significance for a confidence interval of 95% was set at $p < 0.05$.

3. RESULTS

3.1 Complete data

Complete data: According to the figure (3.1), from all cases 735, 706 cases had complete data and in the present study uses of them (96%).

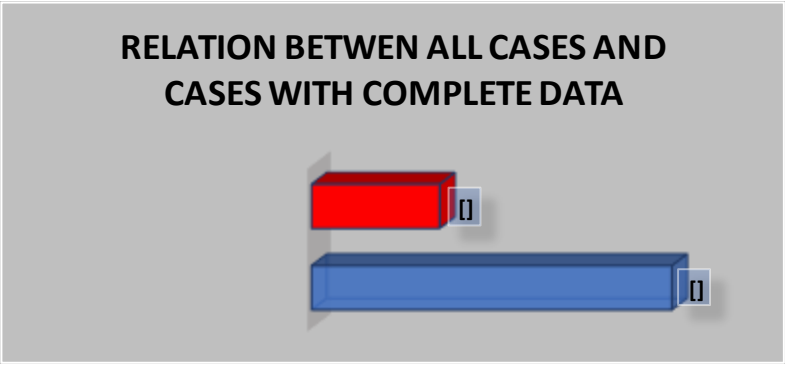

Figure (3.1): Relation between all cases and cases with complete data

3.2 Gender

Gender: A total of 706 participants' records were evaluated. Of those, 421 (60%) cases were female and 285 (40%) case were male. It shows in figure (3.2). In this study the percentage of females more than males.

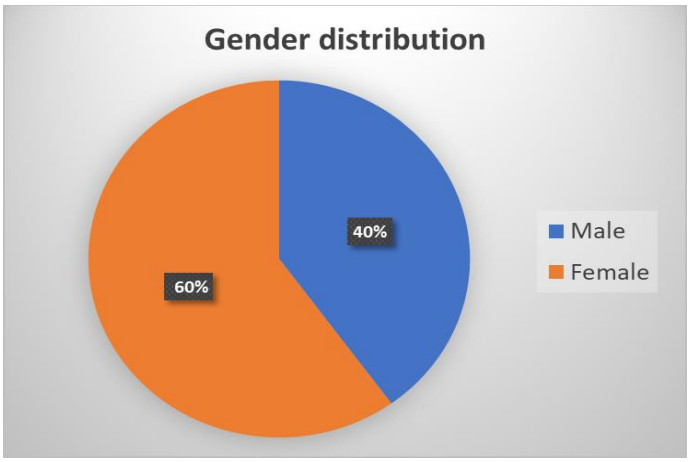

Figure (3.2): Gender distribution

3.3 Prevalence CI

Prevalence CI: According to the Figure (3.3), the one hundred seventy-seven (177) (25 %) of patients were insufficiency convergence eye. All of the cases examined in the present study were 706 cases that 177 cases had CI.

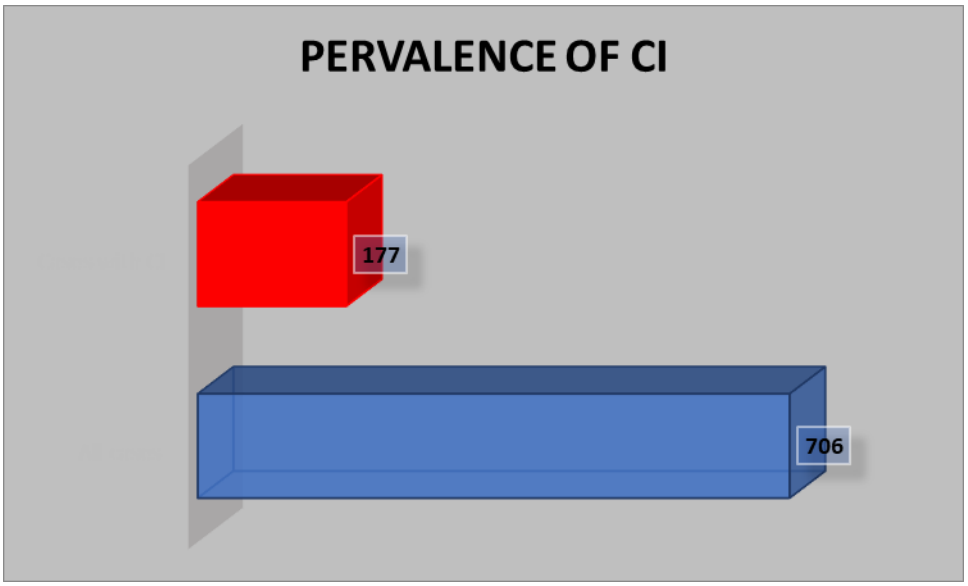

Figure (3.3) Prevalence of CI

3.4 Symptoms of CI

: According to the figure (3.4) there were many types of symptoms in this study, from all of 177 cases with CI, 35 cases (19.77%) had gritty sensation in the eye, 10 cases (5.6%) had dizziness, 25 cases (29 %) had tearing, 90 cases(51%) had bluer vision, 29 cases (16%) had loss concentration, 33 cases (18%) had diplopia, 17 cases (9%) had sleepiness, 22 cases (12%) had heavy eyelid, 19 cases (11%) had pulling sensation, 120 cases (68%) had eye ache, 108 cases (61%) had headache, 76 cases (42%) had discomfort in reading.

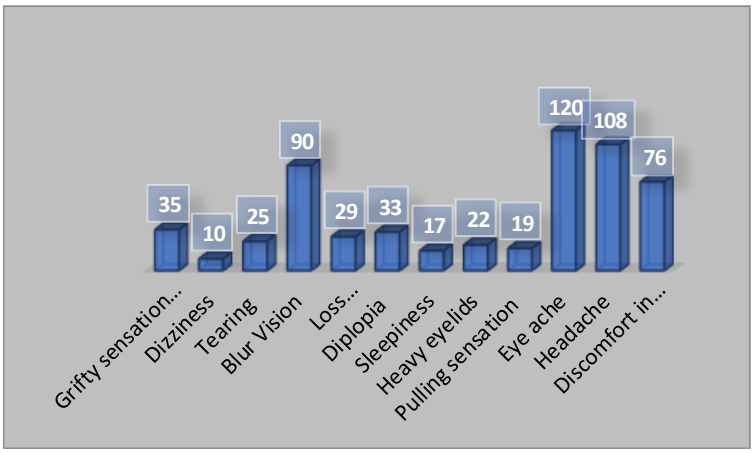

Figure (3.4) Symptoms of CI in the present study

3.5 Prevalence of refractive errors in the present study

According to the figure (3.5) from the all cases with complete data (706) cases, 149 cases (21%) had refractive error.

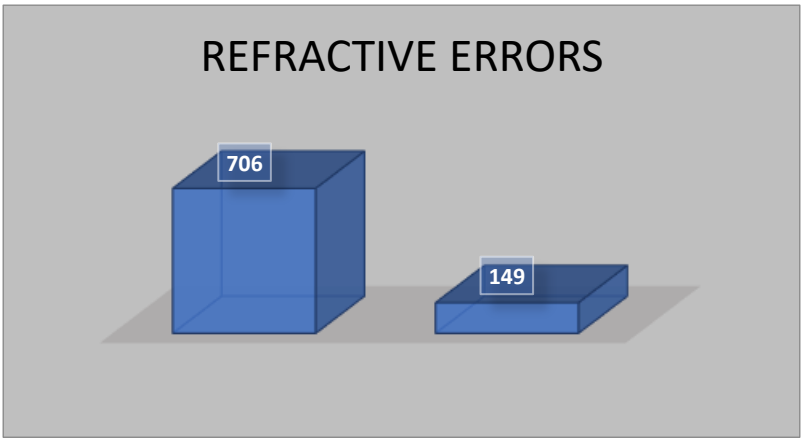

Figure (3.5) Prevalence of refractive errors in the present study

3.6 Types of refractive errors

According to the figure (3.6), in the present study from all the 149 cases with all types of refractive errors, 15 cases (10%) had mixed astigmatism, 12 cases (8%) had compound hypermetropic astigmatism (CHA), 9 cases (6%) had simple hypermetropic eyes (CHA), 18 cases (12%) had simple hypermetropia (CH), 40 cases (27%) compound myopic astigmatism (CMA), 28 cases (19%) had simple myopic astigmatism (SMA) and 27 cases (18%) had simple myopia (SM). It shows to us the percentage of CMA is more than all types of refractive errors in the present study.

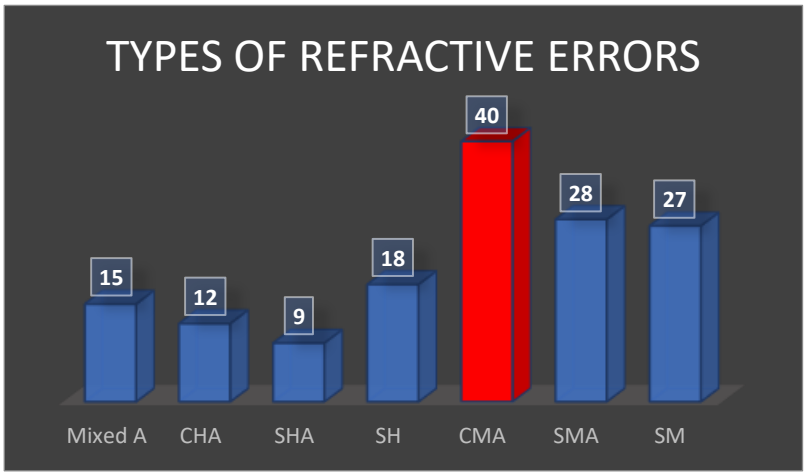

Figure (3.6) The prevalence of refractive errors in the present study

3.7 Distribution of CI in all type's refractive errors

Figure (3.7) shows, from eye cases with CI (177) cases from 706 cases, 40 normal eye cases (5.6%) had CI, 137 cases of cases with refractive errors had CI, 13 cases with mixed astigmatism from 149 cases (9%) had CI, 4 cases with CHA from 149 cases (3%) had CI, 7 cases with SHA from 149 cases (5%) had CI, 6 cases with SH from 149 cases (4%) had CI, 64 cases with CMA from 149 cases (43 %) had CI, 23 cases with SMA from 149 cases (15%) had CI and , 20 cases with SM from 149 cases (13%) had CI. According to the figure (7) the more CI prevalence there were in CMA.

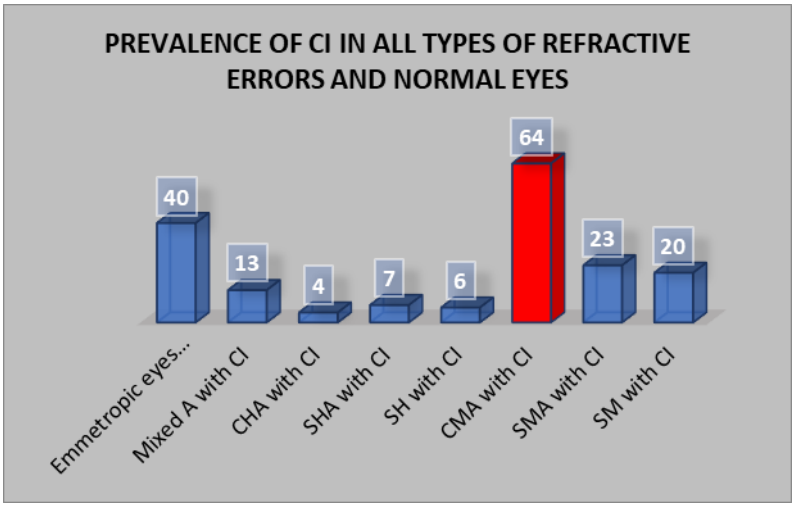

Figure (3.7) Distribution of CI in all types of refractive errors in this study

3.8 Comparison CI in myopic eyes with hypermetropic eyes

Figure (3.8) shows 60 cases (60%) from 95 cases of myopic eyes that they had all types of myopia refractive errors had CI, 17 cases (43%) with all types of hypermetropic eyes from 39 cases with hypermetropic eyes had CI. It shows the cases with myopic eyes more than hypermetropic eyes.

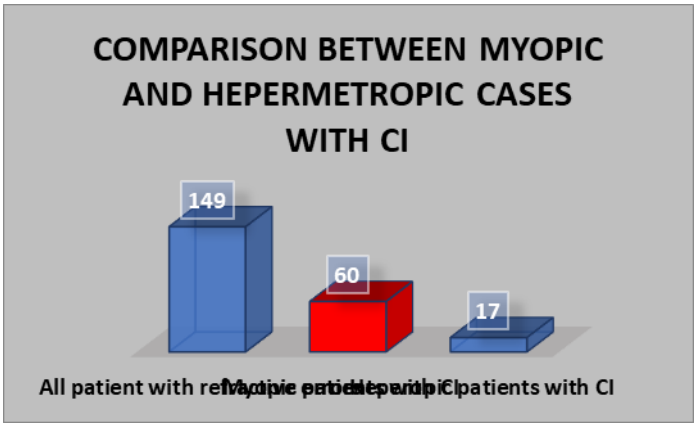

Figure (3.8) Comparison CI in myopic eyes with hypermetropic eyes

3.9 Relation between age and distribution of CI

Figure (3.9) shows from all 706 cases, 4 cases (0.5%) in age group 5-7 had CI, 23 cases (3%) in age group 8-10 had CI, 28 (4) cases in age group 11-13 had CI, 48 cases (7%) in age group 14-16 had CI and 74 (10%) cases in age group 17-20 had CI. It shows with increase age CI growth.

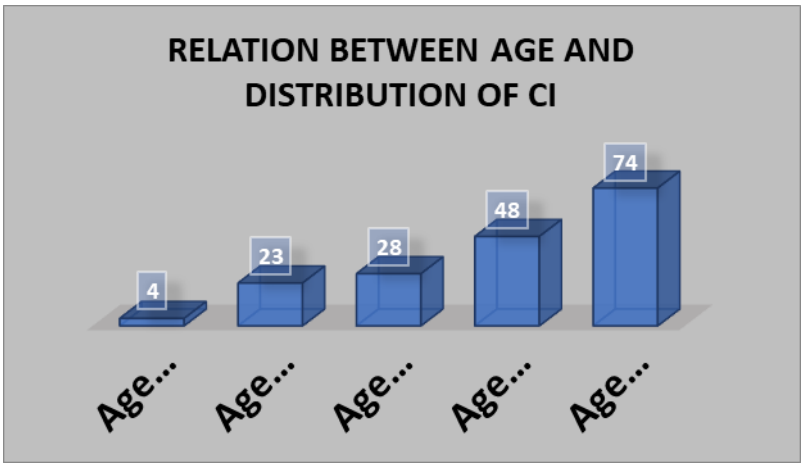

Figure (3.9) Relation between age and distribution of CI

3.10 Mean break fusional point (cm) with changes in age groups

Figure (3.10) shows, Mean break fusional point (cm) for group age 5-7 was 10 cm, Mean break fusional point (cm) for group age 8-10 was 13 cm, Mean break fusional point (cm) for group age 14-16 was 21 cm and mean break fusional point (cm) for group age 17-20 was 25 cm. It shows with the increase age, increase CI.

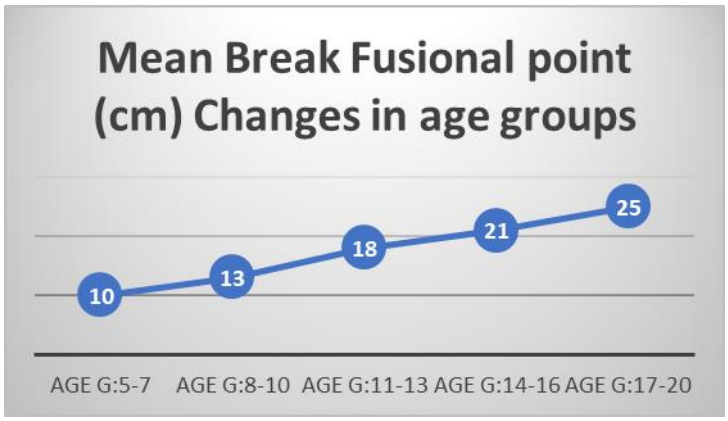

Figure (3.10) Mean break fusional point (cm) with changes in age groups

3.11 Relation between NPC and phoria (Exophoria) in simple myopic eyes

Table (3.1) shows with the increase degree of refractive errors in myopic eyes decrease convergence and with decrease convergence increase NPC and also increase CI.

Table (3.1) Relation between NPC and phoria (Exophoria) in simple myopic eyes in this study

	Range (1)	Range (2)	Range (3)	Range (4)	Range (5)
Refractive Error	-2.00 ±1.00 D	-3.00 ±1.00 D	-4.00 ±1.00 D	-5.00±1.00 D	-6.00 MORE
Range of NPC (cm)	12±1	13±1	15±1	17±1	19±1

Phoria represent a natural ocular alignment that is the best evaluated by performing an alternating Cover test and neutralizing eye movements, through which their size is determined. Phoria can be temporally deviated ocular alignment-exophoria or nasally deviated alignment-esophoria. The most of patients with CI have exophoria at near, while orthophoria or mild exophoria at distance. In addition to the Cover test, the investigation of phoria can also be done with the Von Graefe technique or the modified Thorington technique[24].

3.12 Management and Treatment of CI:

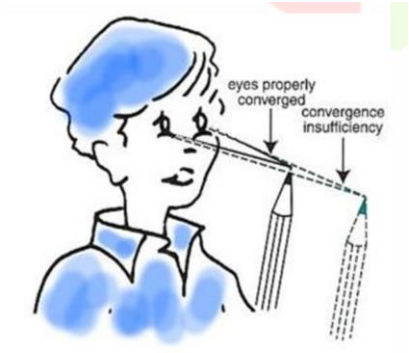

Figure (3.11) Test insufficency Convergence

Refractive errors and convergence insufficiency play major roles in reading efficiency. Uncorrected refractive errors are a primary cause of binocular anomalies, including convergence insufficiency. Symptoms of asthenopia in both refractive and binocular vision anomalies are similar. Despite the relationships that exist between them, the extent of association between refractive errors and convergence insufficiency has not been studied extensively.

Before starting any treatment, the patient should be adequately corrected for any refractive errors. It should be advised that work at close range be in a well-lit room with adequate rest periods. Orthoptic therapy is the first line of treatment for CI. The idea is to model the plasticity of the fusional reflex convergence system through exercises. Today there are various types of exercises and techniques used in daily clinical practice to treat CI. From a didactic point of view, they are divided into passive and active techniques, depending on the way they control CI. The most commonly used passive treatment of CI is using reading glasses with a prism, while active techniques include pencil exercises at home, various visual techniques at home or in the office, exercises with prisms, stereograms, etc.[25].

Range of NPC break was from 6 cm to 35 cm. Conventional therapeutic modalities for convergence include home-based pencil push-ups, jump convergence exercises, stereograms and convergence cards (variable and non-variable tranaglyphs, variable vectograms), as well as prism exercises. In a more recent period, a program for computerized convergence exercises is also used, which is based on a random dot stereogram[26].

Office part of the treatment includes 4-5 exercises, lasting one hour a day for a period of one week. Office exercises are a combination of prism, Brock string, stereograms, vectograms, fusion cards, etc. While at home, the patient continues with convergence strengthening procedures such as pencil exercises (pencil push-ups) 5 times a week for fifteen minutes. In this way, the treatment of CI is classically carried out, the patient is monitored on a weekly basis or every few weeks depending on the current condition. Orthoptic treatment can be repeated in several sessions[8].

In refractory cases of conventional, classic therapy, the last possible but controversial option is surgical treatment. It includes recession-resection of the lateral and medial rectus respectively, especially of the non-dominant eye. It is important to note that many surgeons and ophthalmologists do not agree with this method of treatment, due to the fact that it is accompanied by a high risk of consecutive esotropia, diplopia and developing A-V syndromes postoperatively[27].

Prognosis and Monitoring: The prognosis for patients with idiopathic CI is generally good. According to the Convergence Insufficiency Treatment Trial Study Group, 73% of people who practiced appropriate therapy for more than 12 weeks had significant improvements in vergence movements. The follow-ups of patients with CI should usually be performed every 4 to 8 weeks. Patients with acquired CI due to trauma or other disease need a longer recovery period[28].

3.2 Table association between gender and the occurrence of convergence

CI	Female	%	Male	%	**Total**
Yes	106	15.0%	71	10.1%	**177**
No	315	44.6%	214	30.3%	**529**
Total	**421**	**59.6%**	**285**	**40.4%**	**706**

Chi-square test=0.006, p=0.936

The results in table (3.2) show that 15.0% of females and 10.1% of males in the sample have convergence insufficiency (CI), while 44.6% of females and 30.3% of males do not have CI, out of a total of 706 participants. The Chi-square test result ($\chi^2 = 0.006$, $p = 0.936$) indicates that there is no statistically significant association between gender and the occurrence of convergence insufficiency in this population, as the difference in CI prevalence between females and males is minimal

and not significant.

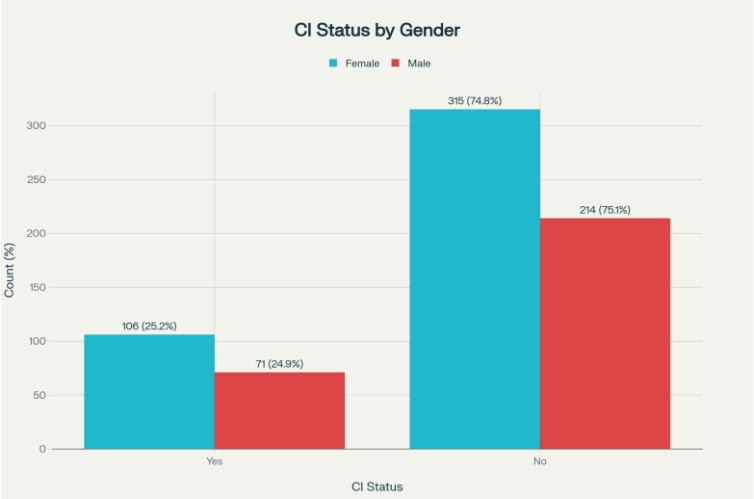

Figure (3.12) CI status by gender

4. DISCUSSION

Convergence insufficiency is one of the most common causes of ocular discomfort, and hence, it is of vast clinical significance. It is often associated with a host of symptoms that occur when doing near work, such as reading and computer viewing. This study provides CI frequency data for Kurdish population cases aged 5 to 20 years. The frequency of CI in the present study was 25%. This frequency is similar to those reported by other authors in children of this age range[29]. Among the various studies published, the data related to the prevalence of this condition range from 1.7 to 33% [30].These discrepancies can be attributed to various factors, from different exclusion criteria (samples not representative of the general population) to measurement methods and diagnostic criteria[31]. According to the CITT group criteria used to diagnose CI, a subject must have three characteristic signs. Our frequency of three CI signs was slightly higher than that obtained in school screenings by the groups of Rouse et al [30] (17.6%) and Dwyer et al [32] (33%). In other studies conducted in populations with similar numbers of boys and girls, as in the present study, similar CI prevalence's were observed in males and females[9, 33]. A Population-based study was conducted on the prevalence of non-strabismic anomalies of binocular vision in ethnic Indians are more than two decades old. Based on indigenous normative data, the BAND (Binocular Vision Anomalies and Normative Data). In four schools, two each in rural and urban arms, 920 children in the age range of 7 to 17 years were included in the study. Prevalence of convergence insufficiency was 16.5% and 17.6% in the urban and rural arms, respectively. There was no gender predilection and no statistically significant differences were observed between the rural and urban arms in the prevalence of non-strabismic anomalies of binocular vision[33]. In a study 4211 students screened, 329 (7.8%) were diagnosed with CI from three types of school. Of these 329, 173 students were male and 156 were female; there was no significant relationship between sex and CI. Standard schools had a higher prevalence of CI (43%) than geographic schools (36%) and there was a significant association between CI and the type of school. Prevalence of CI 7.5%. It has also been reported that there is no significant difference in the prevalence of CI between adults and children. Standard schools had a higher prevalence of students with CI (43%) than geographic schools (36%)[34]. **Phoria and CI:** The most of patients with CI have exophoria at near, while orthophoria or mild exophoria at distance. In addition to the Cover test, the investigation of phoria can also be done with the Von Graefe technique or the modified Thorington technique[35]. The definitive diagnosis of CI is a set of anamnestic data and clinical evaluation that form the diagnostic criteria for establishing this diagnosis: Exophoria greater near than far by at least 4 prism diopters, Displaced near point of convergence (NPC- near point of convergence) of 6cm or more, Insufficient positive fusional vergence (PFV- Positive Fusional Vergence), Symptoms, according to the Convergence Insufficiency Symptom Survey (CISS-Convergence Insufficiency Symptom Survey). **Differential Diagnosis:** Before approaching any CI treatment, the patient should be properly examined, anamnestic ally and clinically followed in order to rule out possible differential diagnostic challenges. Idiopathic CI should be differentially diagnosed from other diseases of oculomotor motility, especially from: exotropia (basic or acquired), diplopia, internuclear ophthalmoplegia, oculomotor paralysis, thyroid ophthalmic disease and myasthenia gravis[36].Our findings point to a need for more exhaustive examinations of the eye in school-aged children, as visual acuity does not offer any information about other deficiency visual skills that could help explain learning or attention problems[37]. In Table (2), reported CI prevalence data are provided, indicating wide variation from 2.7% to 33%[38]. This variation could be attributed to inconsistency and variability in the diagnostic criteria used. Binocular vision dysfunction prevalence studies have analyzed Spanish University students[39], but we lack updated data on CI prevalence for school-aged children in our country.

Table (4.1): Summary of published convergence insufficiency (CI) prevalence studies

Study	setting	Average age	N	Prevalence %
Ma et al [40]	School /Screening	13-18	928	2.7%
Menjvar et al [41]	School /Screening	9-14	282	6.4 %
Brosting et al [19]	School /Screening	8-15	392	17.3 %
Rouse et al [30]	Clinic	8-12	620	17.6 %
The present study	clinic	5-20	705	25%
Dwyer et al [32]	clinic	7-18	144	33 %

5. CONCLUSIONS

CI is common in young age females and males, mostly students with headache as a major complaint. The prevalence of clinically significant convergence insufficiency in this sample. CI is a separate and unique clinical condition and can occur without a combined condition. To the best of our knowledge, this is the first study to determine whether near work impacts binocular and accommodative measurements in subjects with CI. CI is a separate and unique clinical condition and can occur without any refractive errors. Convergence insufficiency (CI) is a common vision disorder that affects approximately 25% of cases in the present study in optometry clinic and is associated with symptoms such as visual fatigue, headaches, and double vision when reading and studying. The clinically significant CI prevalence observed here suggests the need for more binocular vision screening programmers in school settings. Convergence insufficiency is a frequent disorder in ocular motility that primarily affects the young population.

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