

# Frequency of Convergence Insufficiency in a Refraction Clinic of Karachi

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## ABSTRACT

**Purpose:** To find out the frequency of convergence insufficiency in a refraction clinic of Karachi.

**Study Design:** Cross Sectional Study.

**Place and Duration of Study:** Al-Ibrahim Rye Hospital, Karachi from June to December 2019.

**Methods:** A total of 150 patients were included in the study (52 males and 98 females). Patients with uncorrected visual acuity of  $\geq 6/9$  and age between 16 – 35 years were included. Patients who had received treatment for convergence insufficiency (CI), mentally retarded patients, patients with Manifest strabismus or any other ocular pathology were excluded. Near point of convergence (NPC), near phoria and positive fusional vergence (PFV) were measured for the diagnosis of CI.

**Results:** Mean age of the patients was 23.55 years. Gender wise distribution showed that 52 (34.7%) were males and 98 (65.3%) were females. Out of 150 patients, 64 patients had CI and 42 were normal with no reduction in NPC, PFV or exophoria. Rest of the patients had only one of the three criteria of CI but did not qualify our definition of CI. Twenty-five male patients and 39 female patients had CI. CI was more common in teenagers. With increasing age, the frequency of CI was reduced. CI due to remote NPC was seen in 12 (8%) and CI due to decreased PFV was seen in 21 (14%).

**Conclusion:** Females are affected more with CI than males especially in the younger age group.

**Keywords:** Convergence insufficiency, near point of convergence, Positive fusional vergence.

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## INTRODUCTION

Convergence insufficiency (CI) was first described by Von Graefen 1855 and later details were given by Duane.<sup>1</sup> Evans defined CI as a condition that involves the inability of the eyes to obtain or maintain sufficient convergence for comfortable binocular vision at near distance.<sup>2</sup> Convergence insufficiency is a typical condition in young and aging adults and may be

isolated and idiopathic or associated with other neurologic diseases.<sup>3</sup> It can cause problem in reading, for which parents or teachers might think of the child having problem in learning rather than having an eye disorder.<sup>4</sup> It is characterized by exophoria that is greater at near than at distance, a remote near point of convergence (NPC) or decreased positive fusional vergence (PFV) at near.<sup>5</sup>

Near visual tasks such as reading can prompt the symptoms of convergence insufficiency. If near work is continued for a long time, the symptoms are increased. Extreme tiredness (fatigue) can also generate symptoms. The potential symptoms include; headache, double vision, eye fatigue, blurred vision, sleepiness when reading, needing to re-read things a few times, trouble concentrating on reading, words

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seem to move, jump, or float on the page, motion sickness and/or vertigo. Some people may also observe moving of one eye outwards while reading. The person may close one eye while reading to avoid double vision.<sup>6</sup>

Young adults commonly present with CI despite the fact that it can be present almost at any age. Although 1% of the general population presents with exodeviation, the incidence of CI is estimated to be 0.1 to 0.2% and 11 – 19% of children with exodeviation have CI. The prevalence of CI in the pediatric and young adults ranges from 2.25 to 8.3%.<sup>7</sup> The prevalence of convergence insufficiency in United States ranges from 2.25% to 8.30% in adults and children respectively.<sup>8</sup> A survey conducted in Britain showed 1 in 300 children had CI,<sup>9</sup> and one in 100 of the symptomatic patients had CI in a study conducted in Spain.<sup>10</sup> A study conducted in the Romanian population showed that 3 in 5 (60.4%) adolescents who complained of blurred vision while performing near task had CI.<sup>11</sup> In Iranian population CI was found to be 5.46%.<sup>12</sup> However, it was 16.5% and 17.6% in Indian urban and rural arms, respectively.<sup>13</sup> With effective conservative therapies, prognosis of CI is excellent in most of the patients. In order to restore CI a small percentage of patients may require surgery.<sup>14</sup>

The purpose of this study was to find out the frequency of convergence insufficiency in a refractive clinic of Karachi.

## METHODS

A cross sectional study with non-probability convenient sampling technique was conducted on 150 patients at al Ibrahim Eye Hospital Malir Karachi during a span of 6 months to determine the frequency of convergence insufficiency. Patients with uncorrected visual acuity greater than or equal to 6/9 and age between 16 – 35 years were included in the study and those having any ocular pathology or manifest strabismus were excluded from the study.

After taking consent the patient's history was taken. Test performed included visual acuity, refraction, near point of convergence (measured using the RAF ruler), exophoria at near (measured using Maddox wing) and positive fusional vergence (measured with prism bar). Those patients who had any two of the following criteria were regarded to have Convergence Insufficiency. NPC > 10 cm, PFV < 15

prism diopter (Base Out) and Exophoria > 4 prism diopters.

Statistical analysis was done from statistical package for social science (SPSS) version 20.0 all the continuous variables were presented as Mean  $\pm$  SD and the entire categorical data was presented as frequency and percentage.

## RESULTS

Mean age of the patients was 23.55 years. Gender wise distribution showed that 52 (34.7%) were males and 98 (65.3%) were females. Out of 150 patients, 64 (42.6%) patients had CI and 42 (28%) were normal with no reduced NPC, PFV or exophoria. Rest of the patients had only one of the three criteria of CI but did not qualify our definition of CI. Twenty-five male patients and 39 female patients had CI. CI was more common in teenagers. With increasing age, the frequency of CI was reduced. CI due to remote NPC was seen in 12 (8%) and CI due to decreased PFV was seen in 21 (14%). For details see table 1.

**Table 1:** Parameter of convergence insufficiency with percentage.

Parameter	Percentage
NPC < 10cm	101 (67.3%)
NPC > 10cm	49 (32.7%)
PFV < 15 prism diopters	82 (54.7%)
PFV > 15 prism diopters	68 (45.3%)
Exophoria of < 4 Prism Diopters	98 (65.3%)
Exophoria > 4 Prism Diopters	52 (34.7%)

## DISCUSSION

Vergence anomalies have become more troublesome in the current times as computer usage and near tasks have increased over the past few decades. CI is the most predominant and treatable form of vergence anomaly. Patients with CI develop ocular fatigue due to breakdown of binocular vision leading to asthenopia during near tasks.

A study conducted in Iran on the students of Iran University of medical sciences showed that 10% of the students had CI disorder out of which 7.5% had CI and 2.5% were pseudo CI.<sup>15</sup> Our percentage was quite higher than Iranian study. Another study that was conducted in India showed that 27.5% of the population had CI<sup>16</sup> and a study conducted in china showed CI to be present in 9.6% of the patients.<sup>17</sup>

This study demonstrated that more CI patients displayed reduced NPC and PFV than only reduced NPC or PFV. CI due to remote NPC was seen in 12 (8%) and CI due to decreased PFV was seen in 21 (14%). This contrasted with the findings of a previous study that was conducted in Sudan in which 20.36% of students with CI had reduced NPC and CI due to reduced PFV was seen in 1.22% of the students.<sup>18</sup>

In this study CI was seen in 42.6% in which males were 25 (39%) and females were 39 (60.90%). A study conducted in Mashhad city of Iran showed that 5.51% of the population had CI out of which 4.78% was seen in males and 5.86% in females. This shows that females are affected more than male and also there is a large gap in the percentage of CI in both the studies.

The discrepancies in the reported CI may be due to differences in the definition of CI (in this study CI was defined on 3 diagnostic criteria and the study mentioned above used 4 diagnostic criteria). The other reason could be the sample population. The study mentioned was a general population study and this study was a clinical study. The above study used cluster sampling but we used convenient sampling in our study. Different methods of analysis and differences in testing protocols (in this study NPC was measured using the RAF ruler while the study mentioned used scale to measure the NPC) can also be the reasons for difference in the results. As it is mostly symptomatic patients who present to clinics, such studies are expected to find higher rates compared to population-based studies.<sup>19,20</sup>

Limitation of our study is that it was a clinic-based study. The results cannot be regarded as a true picture of general population. The sample size was small and it was a single-centered research.

## CONCLUSION

Convergence insufficiency is quite high in patients presenting in the refraction clinic. Females are affected more than males regarding CI.

## Ethical Approval

The study was approved by the institutional review board/ethical review board. (REC/IPIO/2020/008)

## Conflict of Interest

Authors declared no conflicts of interest.

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### Authors' Designation and Contribution

Izmal Urooj; Senior Lecturer: *Concepts, Design, Literature search, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

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