ORIGINAL ARTICLE

Prevalence of Convergence Insufficiency among Young Adults presenting in the Tertiary Care Hospital: A Descriptive Cross-Sectional Study

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Abstract

Introduction: Convergence insufficiency is one of the most common binocular vision dysfunctions among young adults. This study aimed to determine the prevalence of convergence insufficiency among young adults presenting at a tertiary care hospital in Pokhara, Nepal.

Methods: This was a descriptive cross-sectional study conducted among 96 respondents aged 18 to 25 years from December 2024 to May 2025. Ethical approval was obtained from the Institutional Review Committee (Reference number: MCOMS/IRC/622). Non- probability purposive sampling method was applied. A standard proforma was used to collect socio-demographic and clinical variables. The Convergence Insufficiency Symptom Survey (CISS) questionnaire was administered to assess the symptoms. Convergence insufficiency (CI) was diagnosed if one or more of the following were present: symptomatic CISS scores, near point of convergence (NPC) ≥8 cm, exophoria greater for near than distance by at least 6 prism dioptres (PD), and reduced positive fusional vergence (PFV) (≤15 PD). The statistical methods used were mean, frequency, and percentage.

Results: The mean age of patients with convergence insufficiency was 21.15 (±2.19) years. Convergence insufficiency was predominant in females (40.4%). The overall prevalence of convergence insufficiency was 34.4% (95% confidence interval: 25% - 45%). 13.5% were symptomatic based on the Convergence Insufficiency Symptom Survey (CISS) questionnaire. In clinical signs, the majority had 0 clinical sign (71.9%), followed by 2 signs (15.6%) and 1 sign (9.4%).

Conclusions: The prevalence of convergence insufficiency in young adults was 34.4%. Measurement of convergence insufficiency in young adult enables early diagnosis and management, which is important for enhancing their quality and productivity of life.

Keywords: Binocular vision; convergence insufficiency; prevalence; young adult

Introduction

Convergence insufficiency (CI) is the inability to accurately converge or to maintain convergence at near.[1] The symptoms can vary from redness, pain in and around the eyes, blurred vision, frontal headache, and intermittent diplopia for near vision.[2] Convergence insufficiency may present with symptoms or without symptoms.[3] The exact prevalence of convergence insufficiency in the general population is unknown due to the absence of population-based epidemiological studies.[4] There is great variability in the reported prevalence of convergence insufficiency from 1.75% to 33%.[2]

Young adult is a developmental period that occurs between the ages of 18 to 25 years, during the transition from adolescence to adulthood. Young adults spend most of their time using smartphones, tablets, computers as well as reading. Intensive near work and increased exposure to electronic devices increase the likelihood of developing convergence insufficiency.[5] Limited studies of convergence insufficiency have been conducted in Nepal. Moreover, the study of convergence insufficiency in young adults is lacking in Nepal. This present study was conducted to eliminate this lacuna. The findings of this study would contribute to the improvement of the academic performance and quality of life among young adults.

The objective of the study was to determine the prevalence of convergence insufficiency among young adults presenting in

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the tertiary care hospital in Pokhara, Nepal.

Methods

This was a hospital-based, cross-sectional study conducted at the Ophthalmology Outpatient Department (OPD) of Manipal Teaching Hospital, Pokhara, Nepal, from December 2024 to May 2025. The study was conducted after obtaining an ethical approval letter from the Institutional Review Committee of the Manipal College of Medical Sciences, Pokhara (Reference number: MCOMS/IRC/622). Informed verbal and written consent was taken from all the patients. Respondents aged 18-25 years whose best corrected visual acuity of 6/6 were included in the study. The respondents whose best corrected visual acuity less than 6/6, strabismus or amblyopia, history of ocular trauma, surgery, and any infective ocular diseases were excluded from the study. The respondents who didn't give consent were also excluded from the study. Non- probability purposive sampling method was used for the selection of cases.

The sample size was calculated by using the formula:

$n=3.84\ pq/d^2$ (Where, n = sample size, p = prevalence 6.7%,[6] q = 93.3, d= desired level of precision i.e., 5% for this study)

n= 3.84 x 6.7 x 93.3 / 25 = 96.0. Hence, this study was conducted among 96 respondents.

A predesigned proforma was used to collect the socio-demographic and clinical variables of the respondents. Visual acuity was measured with Snellen's vision chart; Best corrected visual acuity (BCVA) with retinoscopy and subjective refraction. Ocular examination was done with slit lamp biomicroscopy and fundus was evaluated with +90 D lens.

Convergence Insufficiency Symptom Survey (CISS) questionnaire was administered to find out the symptoms of convergence insufficiency. The 15-items revised CISS questionnaire (with each item scored on a scale of 0 to 4, where 4 represents the highest frequency of occurrence of symptoms "always" and 0 represents no symptom) was administered to selected participants. All 15 items scores for each participant were summed to obtain the total CISS score. For the patient of 18 years, a total score of 16 and higher was considered symptomatic. For the ages between 19 years to 25 years, a CISS score greater than or equal to 21 was considered symptomatic as per the CISS questionnaire.[3,7]

For the assessment of clinical signs, Near point of convergence (NPC) was measured with Royal Air Force (RAF) rule, Phoria examination (for near and distance) was done with cover/uncover test. Amount of phoria (for near and distance) and positive fusional vergence (PFV) was assessed with the Prism Bar cover test.

Convergence insufficiency (CI) was diagnosed if one or more of the following were present: symptomatic CISS scores, near point of convergence (NPC) ≥8 cm, exophoria greater for near than distance by at least 6 prism dioptres (PD), and reduced positive fusional vergence (PFV) (≤15 PD). The entry and analysis of data were done in Epi-Info version 7. The statistical methods used were mean, frequency, and percentage.

Results

A total of 96 respondents were enrolled in the study. The mean age of the total respondents and the mean age of convergence insufficiency patients were 21.35 (±2.05) years and 21.15 (±2.19) years, respectively.

Females were found to be predominant in both the total respondents and patients with convergence insufficiency. (Table 1)

The overall prevalence of convergence insufficiency was 33 (34.4%) (95% confidence interval: 25% - 45%). 13 (13.5%) were symptomatic based on the Convergence Insufficiency Symptom Survey (CISS) questionnaire. In clinical signs, the majority had 0 clinical sign (71.9%) followed by 2 signs (15.6%), 1 sign (9.4%), and 3 (3.1%). (Table 2)

Table 1: Frequency of gender distribution of convergence insufficiency patients.

Gender		Total Respondents	Convergence insufficiency patients n (%)
	Male	44	12 (27.3%)
	Female	52	21 (40.4%)
Total		96	33 (34.4%)

Table 2: Frequency of different clinical variables of the respondents. (n=96)

Variables		Frequency (%)
Convergence Insufficiency	Present	33 (34.4%)
	Absent	63 (65.6%)
Total		96 (100%)
Symptoms status	Symptomatic	13 (13.5%)
	Asymptomatic	83 (86.5%)
Total		96 (100%)
Clinical signs of convergence insufficiency	0 sign	69 (71.9%)
	1 sign	9 (9.4%)
	2 signs	15 (15.6%)
	3 signs	3 (3.1%)
Total		96 (100%)

Discussion

Convergence insufficiency is the most prevalent and manageable type of binocular vision dysfunction. This study was an attempt to find out the prevalence of convergence insufficiency among young adults aged 18 to 25 years.

The mean age of our overall respondents was 21.35 (±2.05) years, and mean age of patients with convergence insufficiency was 21.15 (±2.19) years. Two different studies found the mean age of 21.58 (±2.2) years and 21.7 (±2.8) years, which are almost similar to our study findings.[8,9] However, three different studies reported the mean age of 22.98 (±1.80) years, 26.54(±17.45) years, and 22.23 (±2.26) years, which are higher than the present study.[10-12]

This study found a higher prevalence of convergence insufficiency in female than in male (Table 1). Similarly, other studies also showed the female preponderance in their study findings.[8,10,11,13] However, one study conducted in Korea showed a high prevalence in males as compared to females.[14] One study conducted in Nigeria found equal prevalence of convergence insufficiency in both male and female genders.[15] The high

prevalence of convergence insufficiency in females could be due to excessive near work due to differences in the occupational role (such as household chores), hobbies like knitting and sewing, and increased use of mobile devices for recreational and social uses.

The prevalence of convergence insufficiency in the present study was 34.4%. Two different studies reported high prevalence of convergence insufficiency than our study.[10,16] However, several other studies noted a low prevalence of convergence insufficiency as compared to this study.[11-13,15,17] The high prevalence of convergence insufficiency in young adults might be attributed to intensive near-visual demands associated with the widespread use of digital devices such as computers, tablets, and smartphones for both work and entertainment.

In our study, the prevalence of symptomatic patients of convergence insufficiency based on the Convergence Insufficiency Symptom Survey (CISS) questionnaire was 13.5%. However, different studies conducted in Ghana, India, and Nigeria found the prevalence of symptomatic patients as 28%, 53.84%, and 30.9%, respectively.[8,11,16]

This study showed that the majority of patients had 0 clinical sign, followed by 2 signs, 1 sign, and 3 signs. One study done in Nigeria had reported that the maximum patients had 1 sign, followed by 2 signs, and 3 signs.[16] However, another study conducted in Ghana noted a high prevalence of 0 clinical sign followed by 1 sign, 2 signs, and 3 signs.[8]

The discrepancies in the prevalence might be due to variation in the study sample (clinical vs. general population), age group of the sample, definition of convergence insufficiency, differing diagnostic cut-off values, and inconsistencies in testing protocols (e.g., some studies assess near point of convergence (NPC) with a pencil, while others use an accommodative target).

Limitation

This study has a few limitations. The data used for the present study is a single-centre, cross-sectional, and hospital-based study, which may not accurately represent the entire population. Hence, further studies involving larger, multi-centre samples are necessary to enhance the validity and generalizability of the results.

Conclusions

The overall prevalence of convergence insufficiency in young adults was 34.4%. Therefore, a comprehensive ocular and optometric examination is mandatory for its timely diagnosis. Early management of convergence insufficiency may help to improve the academic performance, health-related quality of life, and overall productivity in young adults.

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Conflict of Interest: None

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