

Original Research Article

Evaluation of Effect of Refractive Error on Visual Evoked Potential in Medical Students

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Abstract: *Background:* Visual Evoked Potentials (VEPs) are objective electrophysiological tests which are used to evaluate the functional integrity of the visual pathway from the retina to the occipital cortex. Myopia being one of the most common refractive errors affecting young adults and may influence neural processing of visual stimuli. *Objective:* To evaluate the effect of refractive error (myopia) on Visual Evoked Potential parameters among medical students. *Methods:* A cross-sectional study was conducted among 50 medical students aged ≥ 18 years. Participants were further divided into two groups: 25 individuals with normal vision (control group) and 25 individuals with myopia (study group). VEP recordings were obtained using standard pattern-reversal stimuli following the international 10–20 electrode placement system. Latency and amplitude of N75 and P100 waves were therefore recorded and analysed statistically. *Results:* This study demonstrated significant increase in N75 and P100 latency in myopic individuals compared to controls. Additionally, VEP amplitudes were significantly reduced in participants with myopia. The findings indicate delayed conduction and reduced neural response strength in the visual pathway. *Conclusion:* Myopia is associated with measurable alterations in VEP parameters, particularly there is increased latency and decreased amplitude. VEP may also serve as a useful non-invasive diagnostic tool for assessing visual pathway changes associated with refractive errors.

Keywords: Visual evoked potential, myopia, refractive error, latency, amplitude, visual pathway.

INTRODUCTION

Vision plays a very critical role in human interaction with the environment, and any disturbance in this visual system can significantly affect the quality of life. Refractive errors are among the most common visual disorders worldwide, with myopia being one of the most prevalent form, particularly among students and young adults. Myopia occurs when parallel rays of light entering the eye are focused in front of the retina due to elongation of the eyeball or excessive refractive power of the cornea or lens. This further leads to blurred distance vision and may also influence visual processing mechanisms in the brain (1).

Visual Evoked Potentials (VEPs) are electrophysiological responses generated in the visual cortex following visual stimulation. They are widely used to evaluate the functional integrity of the visual pathway from the retina through the optic nerve, optic chiasma, optic tract, lateral geniculate body, optic radiations, and ultimately the occipital cortex (2). The most commonly studied components of VEP are the N75, P100, and N135 waves. Among these, the P100 component is particularly very significant because it shows minimal inter-subject variability and provides

reliable information regarding visual pathway conduction (3).

Previous studies had suggested that refractive errors such as myopia may influence VEP parameters, particularly latency and amplitude (4). Increased latency may indicate delayed conduction in the visual pathway, whereas reduced amplitude may reflect decreased neural responsiveness or reduced signal strength reaching the visual cortex (5).

Medical students represent a population at high risk for refractive errors due to prolonged near work, digital screen exposure, and academic stress (6). Despite the high prevalence of myopia in this group, limited studies have evaluated its effect on electrophysiological visual responses.

Therefore, the present study was conducted to assess the impact of refractive error (myopia) on Visual Evoked Potential parameters among medical students and to explore whether VEP can serve as an objective marker for visual pathway changes associated with refractive errors. Aims of the to evaluate the effect of refractive error on Visual Evoked Potential (VEP) parameters in medical students.

MATERIALS AND METHODS

Study Design - Cross-sectional study.

Study Setting – Neurophysiology Lab in the Department of Physiology in collaboration with the Department of Ophthalmology, Shri Shankaracharya Institute of Medical Sciences, Bhilai.

Study Population - Medical students aged 18 years and above.

Sample Size - Total sample size: 50 subjects

- Control group (Normal vision): 25 participants
- Study group (Myopia): 25 participants

Inclusion Criteria

- Medical students aged ≥ 18 years
- Individuals willing to participate
- Subjects with normal vision or diagnosed myopia

Exclusion Criteria

- History of ocular disease other than refractive error
- Neurological disorders affecting visual pathways
- Use of medications affecting visual or neural function

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to the study.

VEP Recording Procedure

Visual Evoked Potentials were recorded using a computerized VEP system (Allengers Scorpio) under standardized conditions. Prior Appointments & Instructions were given. Participants were seated comfortably in a dimly lit room to minimize visual distractions. Pattern reversal stimuli were presented on a monitor positioned at 1 meter from the participant. Electrodes were placed according to the International 10–20 EEG system: Active electrode: Occipital region (Oz), Reference electrode: Fz, Ground electrode: Cz.

The scalp was cleaned with alcohol to reduce impedance before electrode placement. The following parameters were recorded: N75 latency (ms), P100 latency (ms), N75 amplitude (μV), P100 amplitude (μV). Multiple recordings were taken to ensure reliability, and the average value was used for analysis. (7)

Statistical Analysis

Data were analysed using statistical software.

- Mean and standard deviation were calculated.
- Student's t-test was used to compare parameters between groups.
- p-value < 0.05 was considered statistically significant

RESULTS

Table 1: Comparison of VEP Latency Between Control and Myopia Groups

Parameter	Control Group (Mean \pm SD) 25 subjects	Myopia Group (Mean \pm SD) 25 subjects	p value
N75 Latency (ms)	73.2 \pm 4.5	79.8 \pm 5.1	< 0.05
P100 Latency (ms)	100.4 \pm 5.8	110.6 \pm 6.2	< 0.05

Both N75 and P100 latency were significantly increased in the myopia group, indicating delayed visual signal transmission.

Table 2: Comparison of VEP Amplitude Between Control and Myopia Groups

Parameter	Control Group (Mean \pm SD) 25 subjects	Myopia Group (Mean \pm SD) 25 subjects	p value
N75 Amplitude (μV)	6.8 \pm 1.2	5.1 \pm 1.0	< 0.05
P100 Amplitude (μV)	8.9 \pm 1.4	6.7 \pm 1.3	< 0.05

Amplitude of VEP responses was significantly reduced in myopic individuals, suggesting decreased neural response strength.

Chart 1: Comparison of P100 Latency Between Groups

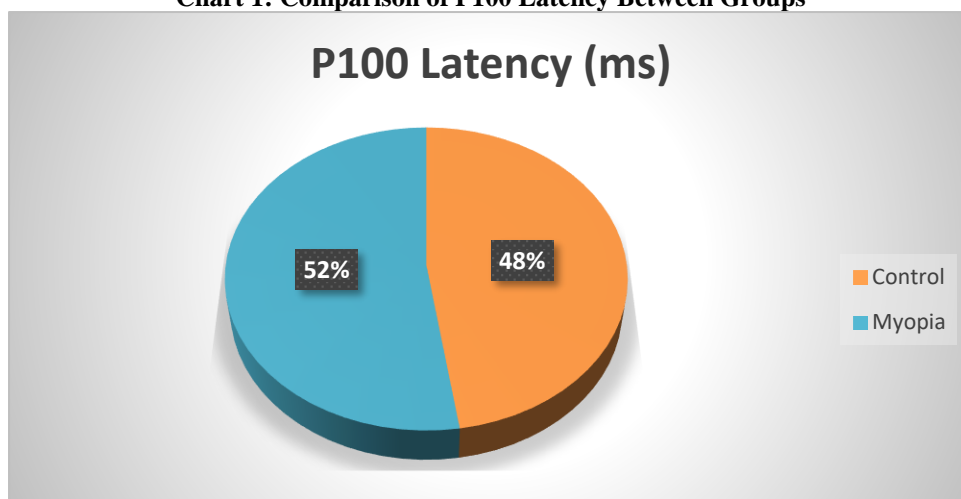
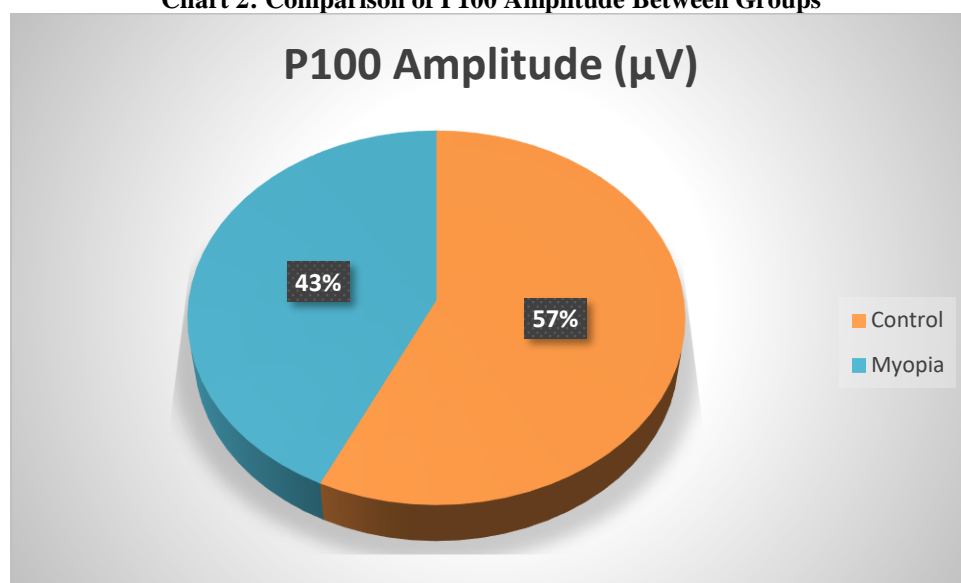


Chart 2: Comparison of P100 Amplitude Between Groups



DISCUSSION

The present study evaluated the effect of refractive error, specifically myopia, on Visual Evoked Potential parameters among medical students. The results showed significant prolongation of N75 and P100 latency in individuals with myopia compared to those with normal vision. Increased latency suggests delayed conduction in the visual pathway, possibly due to optical defocus or altered retinal image formation affecting cortical processing (8). Similarly, the reduction in VEP amplitude observed in the myopia group indicates decreased neural response strength within the visual cortex. This may result from reduced quality of visual input reaching the retina and subsequently the visual cortex (9). These findings are consistent with the study conducted by Halliday et al., who reported that refractive errors can significantly influence VEP parameters due to altered visual input (10). Another study by Odom et al. demonstrated that visual pathway conduction time is sensitive to changes in retinal image quality (11).

Our results are also comparable with the findings of Porciatti et al., who observed prolonged P100 latency in

individuals with refractive errors (12). Similarly, Bobak et al. reported reduced amplitude of VEP responses in subjects with visual abnormalities (13). The correlation between severity of myopia and VEP changes suggests that refractive errors may influence neural processing of visual information. This supports the concept that VEP can be used as a non-invasive tool to objectively evaluate functional integrity of the visual pathway (14). Medical students are particularly prone to myopia due to prolonged near work and extensive use of digital devices (15,16,17). Therefore, early detection and monitoring of visual pathway alterations may help prevent long-term complications.

Overall, the findings of this study reinforce the importance of incorporating electrophysiological assessment in the evaluation of visual function in individuals with refractive errors.

CONCLUSION

The present study demonstrates that myopia is associated with significant alterations in Visual Evoked Potential parameters. Key findings included - Increased latency of

N75 and P100 waves in myopic individuals, Decreased amplitude of VEP responses in the myopia group, Evidence of delayed and weakened visual processing in myopic medical students. These results suggest that Visual Evoked Potentials can serve as a valuable non-invasive diagnostic tool for assessing functional changes in the visual pathway associated with refractive errors.

Further studies with larger sample sizes are recommended to better understand the relationship between refractive errors and electrophysiological visual responses.

REFERENCES

1. Guyton AC, Hall JE. Textbook of Medical Physiology. 13th ed. Philadelphia: Elsevier; 2016.
2. Halliday AM. Evoked Potentials in Clinical Testing. London: Churchill Livingstone; 1993.
3. Odom JV, Bach M, Brigell M, Holder GE, McCulloch DL, Mizota A. ISCEV standard for clinical visual evoked potentials. Doc Ophthalmol. 2016;133(1):1-9.
4. Porciatti V, Falsini B. Visual evoked potentials in refractive errors. Vision Res. 1992;32(7):1343-1348.
5. Tobimatsu S, Celesia GG. Studies of human visual pathophysiology with visual evoked potentials. Clin Neurophysiol. 2006;117(7):1414-1433.
6. Morgan IG, Ohno-Matsui K, Saw SM. Myopia. Lancet. 2012;379:1739-1748.
7. Liu S, Xiang K, Lei Q, Qiu S, Xiang M, Jin K. An optimized procedure to record visual evoked potential in mice. Exp Eye Res. 2022;218:109011. doi:10.1016/j.exer.2022.109011.
8. Bobak P, Bodis-Wollner I. Visual evoked potentials in ophthalmology. Surv Ophthalmol. 1998;42:523-542.
9. Hood DC, Greenstein VC. Multifocal VEP and visual function. Prog Retin Eye Res. 2003;22:201-251.
10. Halliday AM, McDonald WI, Mushin J. Visual evoked response in diagnosis of multiple sclerosis. Br Med J. 1973;4:661-664.
11. Odom JV. Pattern visual evoked potentials. Handb Clin Neurol. 2019;160:79-90.
12. Porciatti V, Ventura LM. Visual evoked potentials in optic nerve disorders. Curr Opin Neurol. 2004;17:61-67.
13. Bobak P, Bodis-Wollner I. Evoked potentials and visual pathway disorders. Neurol Clin. 1991;9:97-114.
14. Holder GE. Pattern electroretinography and visual evoked potentials. Eye. 2001;15:612-620.
15. Saw SM, Katz J, Schein OD. Epidemiology of myopia. Epidemiol Rev. 1996;18:175-187.
16. Ciuffreda KJ, Rosenfield M. Nearwork-induced transient myopia. Ophthalmic Physiol Opt. 2006;26:462-467.
17. Norton TT, Siegwart JT. Animal models of myopia. Exp Eye Res. 2013;114:2-6.