# Scientific Session 4: Binocular Vision and Paediatric Optometry

## ASSESSMENT OF BINOCULAR VISION PARAMETERS IN KERATOCONUS PATIENTS AND INFLUENCING FACTORS

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**Introduction**: Keratoconus is a bilateral, asymmetric, and progressive corneal ectasia characterised by corneal thinning and protrusion. It typically manifests during early puberty and progresses until the third or fourth decade of life. Optical consequences include unstable refraction, myopia, irregular astigmatism, visual distortion, and deterioration in retinal image quality due to higher-order aberrations. Prevalence ranges from 0.4 to 86 cases per 100,000 individuals. Asymmetry can lead to anisometropia, aniseikonia, heterophoria, and strabismus, impairing binocular performance variably. **Methods**: We searched PubMed, Google Scholar, and the Cochrane databases for English-language studies published and outlined the systematic procedure utilised for a comprehensive literature review spanning the period from 2001 to October 2020. In this systematic review, we aim to measure various parameters of binocular vision in patients with keratoconus and identify the factors that may influence these parameters. **Results:** Binocular function can deteriorate in some adult patients with longstanding asymmetric keratoconus, likely due to prolonged unilateral visual deprivation. This deterioration is reflected in the significant differences in fusional vergences between keratoconus patients and controls. Keratoconus patients exhibit greater magnitudes of exophoria and intermittent strabismus, with negative fusional vergence amplitudes being high and positive fusional vergence amplitudes being low compared to controls. Additionally, the vergence facility is significantly reduced in keratoconus patients, who experience more difficulty with base-out lenses. Both monocular and binocular accommodative facilities are also significantly reduced in the keratoconus group, particularly with plus lenses, likely due to poor positive fusional vergence and constant effort to maintain image clarity during near activities. This explains the frequent complaints of quick fatigue and difficulty with near work among keratoconus patients. **Conclusions**: Keratoconus significantly impacts binocular vision, leading to reduced fusional vergence, exophoria, intermittent strabismus, and decreased accommodative facilities. These effects cause visual fatigue and difficulty with near tasks, highlighting the importance of early diagnosis and targeted interventions to improve visual function in affected patients.

# EFFECTIVENESS OF OFFICE-BASED VISION THERAPY IN PATIENTS WITH CONVERGENCE INSUFFICIENCY

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**Introduction**: Convergence insufficiency (CI) is a common binocular vision (BV) disorder characterized by difficulty in maintaining motor fusion at near. The common symptoms of CI include eyestrain, headache, blurred vision, double vision, difficulty in concentrating, moving prints, and loss of comprehension after short periods of reading or performing near activities. The diagnosis of CI was based on Convergence Insufficiency Treatment Trial (CITT).The aim of this study is to assess improvement in subjective and objective clinical signs in patients with CI with 6 weeks of office based vision therapy. **Methods**: This was a hospital-based observational cohort study including 48 Nepalese population with the age group of 15 to 35 years of age attending orthoptic department of Nepal Eye Hospital.CI was diagnosed on the basis of CISS score which was calculated by recording the respondent's answers of the standard question given by CITT. Patients diagnosed with convergence insufficiency were called for 12 sessions over a period of 6 weeks in vision therapy department. **Results:** In this study, after 6 weeks of treatment, the mean NPC was 6.81 ± 1.91 cm. The effect of treatment on the NPC was highly significant (t = 14.83± 5.56, P < 0.01). After post-vision therapy, the mean CISS score was 6.458± 2.387. The effect of treatment on CISS score was highly significant (t= 28.0625± 6.25489, p<0.001). The effect of vision therapy on PFV was: for distance break (t=6.041±2.315, mean =13.333 ±8.164) and recovery (t=3.958 ±2.315, mean = 11.416±2.607) and for near, break (t=6.416± 2.796, mean= 13.166± 2.364) and recovery (t= 4.3125± 2.674, mean = 1.375± 2.375). After post- vision therapy on AC/A ratio was (t=5.05±0.63, mean = 2.94±0.50, P= 0.05). **Conclusions**: Vision therapy for subjects with convergence insufficiency, the effectiveness was highly significant. There was improvement in AC/A ratio, PFV, NPC, CISS score after successive treatment of vision therapy within 6 weeks and were able to make treatment guidelines for CI.

## IMPACT OF PARENTAL MOTIVATION ON AMBLYOPIA MANAGEMENT

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**Introduction**: Amblyopia is one of the common causes of visual impairment in childhood. Amblyopia has long been a challenge for many clinicians. Achieving optimum outcomes, where the amblyopic eye reaches the best achievable visual acuity, is often impossible in many patients despite the maximum input from the clinician. **Methods**: 394 children with amblyopia with at least 20% interocular difference aged 3 to 8 years who underwent amblyopic therapy were recruited to this prospective study at "Child Eye" Colombo during the period of January 2019 to December 2019. The subjects in the controlled group were prescribed only the conventional treatment protocol in amblyopic therapy, while the experimental group was augmented with an additional parental motivator to easily visualise the visual prognosis at a glance. This visually noticeable chart yields to understanding of the visual prognosis of the child's amblyopic status and thereby influences parents to adhere to the treatment protocol accurately and more responsibly. **Results:** The mean of the visual improvement in the experimental group was 39.57%, while 28.43% improvement in the control group. Numerically it has an 11.14% level of significance than the conventional method. **Conclusions**: Parental motivation through the visually catchable and understandable amblyopia chart makes a significant impact on the success of amblyopia management. Numerically it has an 11.14% level of significance than conventional methods. Therefore the results can be generalised globally.

## DEVELOPMENT OF IMPLIED MOTION PERCEPTION IN SCHOOL-AGED CHILDREN

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**Introduction**: Perceiving moving objects is vital as the world that we live in is dynamic. In addition to real object motion, humans can also perceive implied motion (motion from form) which share similar processing mechanisms. Motion perception is reduced in several developmental conditions such as amblyopia, autism etc. Motion sensitivity can be used for early diagnosis and monitoring of these conditions. It is hence first important to ascertain normal development to provide a baseline for detection of abnormalities. This study investigated normal development of implied motion coherence threshold (rotational and translational) in children. **Methods**: A total of 169 children, 6 to 16 yrs, (15 – 16 children in each age group, mean age: 10.92 ± 3.18 yrs) and 32 adults (24.19 ± 3.79 yrs) with normal ocular health participated in the study. Translational and rotational dynamic Glass patterns consisting of 9 frames of static Glass pattern were used. Each static Glass pattern was displayed for 6 frames then replaced by an independently generated pattern with same global orientation (translation/ rotation) creating illusionary implied motion. The observer ' s task was to discriminate rightward vs leftward translation and clockwise vs anti-clockwise rotation. A 2:1 adaptive staircase with 100 trials or 10 reversals was used for data collection. The implied motion coherence thresholds (MCT) was calculated as the mean of the last seven reversals. **Results:** The mean implied MCT were lower for rotational compared to translational motion in majority of age groups (9,11,13 years and adults) ($p < 0.05$). Both mean rotational and translational implied MCT improved with age. The thresholds for both rotational and translational patterns were statistically lower for 6- and 7-year-olds compared to adults ($p<0.05$) with no significant difference thereafter. **Conclusions**: The implied motion coherence thresholds for rotational and translational patterns improve with age and reach adult levels at 8 years of age. Both children and adults have better sensitivity to rotational implied motion than the translational motion.

# COMPARISON OF REACTION AND ANTICIPATION SKILLS AMONG CONTROLS & SPORTS PLAYERS USING A CONSTRUCTED ANTICIPATION TIMER

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**Introduction**: In sports, precise navigation through dynamic environments is crucial for coordinating speed and balance. Athletes in fast-paced sports rely heavily on complex perceptual abilities to excel. This study aims to assess the impact of training anticipation and reaction skills among boxers and controls. **Methods**: We conducted a prospective experimental study with 20 subjects who provided informed consent and underwent comprehensive eye examinations. Subjects excluded were with visual acuity worse than 6/6, N6, and those with ocular or systemic diseases. An anticipation timer was constructed using LED lights, push buttons, a resistor, and an Arduino board. Participants were instructed to anticipate and press the button when they expected the last LED light to illuminate. The discrepancy between the 'exact time' and the participants' anticipated time' was quantified as an error. Training involved three speed modes (1x, 1.5x, and 2x), each with a 30-minute session followed by a 5-minute break before post-training measurements. Boxers and controls were compared. **Results:** Participants had a mean age of 20.51 ± 2.35 years. Shapiro-Wilk test showed that the data was not normally distributed ($W=0.758$; $P < 0.001$). Wilcoxon signed-rank tests evaluated changes in error counts before and after training. Post-intervention, error counts were significantly decreased in all three modes (Mode 1: $Z = -1.836$, $p = 0.05$; Mode 2: $Z = -1.88$, $p = 0.04$; Mode 3: $Z = -1.59$, $p = 0.012$). Median error counts pre-training were Mode 1: 5.1, Mode 2: 8.6, Mode 3: 4.5, and post-training were Mode 1: 3, Mode 2: 6.5, Mode 3: 1.7. Mann-Whitney U tests revealed no significant differences in error counts between sports and non-sports groups (Mode 1: $p = 0.47$, $U = 0.63$; Mode 2: $p = 0.89$, $U = 0.373$; Mode 3: $p = 0.114$, $U = 0.91$). **Conclusions**: This study demonstrates significant improvements in error counts following training, indicating its effectiveness in enhancing reaction accuracy and speed. No significant differences were found between sports and non-sports participants.

## NON-STRABISMIC BINOCULAR VISION ANOMALIES (NSBVA) IN PATIENTS WITH ASTHENOPIA

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**Background:** Non-strabismic binocular vision anomalies (NSBVA) are more common these days. Most patients present with asthenopia have some forms of NSBVA. NSBVA reduces their quality and comfort of vision, hence reducing their working efficiency and productivity. Detailed work ups and timely interventions can help them stay free from asthenopia and work efficiently. **Clinical problem:** Non-Strabismic Binocular Vision Anomalies (NSBVA) affect the accommodative and vergence systems of the eye, impacting binocular single vision perception during near work. This study investigates NSBVA prevalence in Nepalese patients, focusing on asthenopic symptoms. NSBVA can lead to eye strain, headaches, and decreased productivity, making early diagnosis crucial. **Existing solution(s) and its shortcoming:** Timely work up, accurate diagnosis and timely management is most important. **Clinical pearls:** Convergence measurement, accommodation assessment, fusional vergence measurement considerations. Take home message: Detailed binocular single vision assessment in all cases of asthenopia is mandatory and accurate diagnosis with timely interventions are very necessary.

## CLINICAL PROFILE AND CHARACTERISTICS OF NEWLY DIAGNOSED GLAUCOMA AT TERTIARY EYE HOSPITAL IN NORTH INDIA

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**Introduction:** In this era leading causes of blindness are cataract and glaucoma in India. It is estimated that 66.8 million people are affected by primary glaucoma worldwide, with 6.7 million persons being bilaterally blind due to the disease. The reported prevalence of primary open angle glaucoma (POAG) from various population- based studies among caucasians varies between 1 and 3%. Recent epidemiological studies in india have reported a higher prevalence, ranging from 3.6% in the Andhra Pradesh Eye Disease Study (APEDS) to 4.73% in the Vellore Eye Study (VES). **Methods:** All the newly diagnosed glaucoma patients were enrolled in this study who came for the routine eye examination at our tertiary eye hospital, Dr Shroff's charity eye hospital, New Delhi between November 2021 and October 2022. A detailed history was obtained and all the glaucoma investigations were performed including best corrected visual acuity, Von Herrick grading, gonioscopy, optic disc assessment with 90D lens, applanation tonometry, cirrus HD OCT and automated perimetry. Various parameters like visual field index (VFI), retinal nerve fire layer (RNFLl), intraocular pressure (IOP), rim area, disc area, average and minimum ganglion cell complex-inner plexiform layer, average cup disc ratio, vertical cup disc ratio and cup volume were evaluated. **Results:** We recruited total 79 subjects who were able to complete all the investigations and fulfilled the inclusion criteria. 65.82 % subjects were diagnosed as primary open-angle glaucoma (POAG). We found that 83.5% patients were having vision equal or better than 6/18 and 81.01% had iop up to 21 mmhg. VFI had positive correlation with average RNFL thickness, rim area, disc area, average and minimum gcc-ipl. It also had negative correlation with average cup disc ratio, vertical cup-disc ratio and cup volume. On the basis of mean deviation, half of the subjects had mild glaucoma. **Conclusions:** POAG was the most frequently observed glaucoma subtype in tertiary eye hospital in north india. It is essential to evaluate every POAG patient through all the glaucoma investigations.

# Scientific Session 5: Innovation and Technology in Vision Care

## CONSTRUCTION AND VALIDATION OF AN AI-BASED MOBILE PHONE APP FOR MEASURING TEAR BREAK UP TIME (TBUT)

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**Introduction**: Dry eye syndrome burdens global eye health, causing discomfort to visual impairment. Tear Film Break Up Time (TBUT) is crucial for diagnosing and monitoring dry eye. However, using a slit-lamp biomicroscope limits screenings in eye camps. We developed an AI-based TBUT measurement algorithm. Our study aims to construct and validate this AI-based TBUT algorithm. **Methods**: We analysed 42 videos totalling 2056 seconds, averaging 48.95 seconds each, at 60 fps, generating 123,360 frames. Frames not focused on the cornea, containing eyelashes, or blurred were excluded, standardised to 1745x880 pixels. Our software employs YOLOv8 for real-time detection of multiple objects via bounding box prediction on a grid. The algorithm was trained on 446 corneal frames: 34 with fluorescein spread evenly and 412 with black spots annotated by an optometrist. Training utilized 792 frames; testing, 110 frames, achieving 54% black spot detection accuracy. Videos were captured with a Vivo V21 5G phone, utilizing a cobalt blue filter near the camera light. Volunteers from Dr. Agarwals Optometry Institute participated in this cross-sectional study. After fluorescein enhancement, subjects blinked thrice and then refrained from blinking. Videos of 150 eyes from 75 subjects were recorded with the same mobile setup. TBUT was measured conventionally using a slit-lamp, excluding subjects with non-dry eye ocular diseases. Mobile and conventional TBUT tests were performed on different days by different examiners, randomized using Excel. Intra-class correlation and Bland-Altman plots were used at a 95% confidence interval. **Results:** We studied 150 eyes from 75 subjects (ages 18-70, 25 males, 50 females). The ICC was 0.801 (95% CI, $p<0.001$). The Shapiro-Wilk test confirmed normal distribution of differences between methods ($p=0.483$, $W=0.930$). Bland-Altman analysis showed a mean bias of 6.33 seconds (LoA: 8.43 to -4.22 seconds, 95% CI). **Conclusions**: There is a substantial equivalence between the conventional TBUT test and the AI-based mobile app for TBUT. Hence, the mobile TBUT test can be used for remote dry eye screening in rural areas with no clinical facilities.

**DEEP LEARNING-BASED DETECTION OF OCULAR SURFACE SQUAMOUS NEOPLASIA FROM OCULAR SURFACE IMAGES**

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**Introduction**: Ocular Surface Squamous Neoplasia (OSSN) is a broad entity encompassing a spectrum of squamous neoplasms of conjunctiva and cornea. This study aims to explore the utility of Artificial Intelligence (AI) models in detecting OSSN from slit lamp (SL) images. **Methods**: This is a retrospective observational study. Slit lamp (SL) images of OSSN disease, non-OSSN ocular surface lesions and normal ocular surfaces were collected (2013-2023). Images with minimum resolution of 1024 x 1024 pixels, under diffuse illumination were included. Data was divided into training, validation and test sets (70:10:20). In binary classification, Deep learning (DL) algorithms were applied on OSSN and Non-OSSN images and in ternary classification, DL algorithms were used on OSSN, Non-OSSN and normal images. The results of three DL algorithms were then compared. **Results:** 159 images in OSSN group, 184 in non-OSSN group and 269 normal images were included. Data augmentation was performed to increase and balance the data. For binary classification, accuracy in OSSN detection for MobileNet, Xception and DenseNet was 86.8%, 81.9% and 89.6%, while for ternary classification, these values were 79.2%, 80% and 78.3% respectively. MobileNet and Xception both had a sensitivity of 89.8% for OSSN screening in binary classification, while Xception had the highest sensitivity (77.1%) for OSSN screening in ternary classification. **Conclusions**: In the present study, AI models showed good performance in image based OSSN detection. AI models may provide a promising tool for OSSN screening in primary health care centres and for teleconsultation from remote areas in the future.

# MAGIC OF SCLERAL CONTACT LENSES IN OCULAR SURFACE DISORDERS: A CASE SERIES STUDY

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**Introduction**: Ocular Surface Disorders (OSD) are the multifactorial diseases of the ocular surface that affects ocular adnexal connective tissues. The buffered saline filled scleral contact lens vaults the cornea and limbus and gently rests on sclera that continuously bathe, protect and restore the ocular surface. The purpose of the study is to establish oculo-visual rehabilitation in cases of ocular surface disorders using scleral contact lenses. **Methods**: A retrospective study was carried out in 8 eyes of 5 patients. All the cases were fitted with corneoscleral contact lenses (CSL). The outcome variables were visual acuity pre and post scleral contact lens trial. The subjective response for comfort level of the patient with and without scleral contact lens were also assessed. **Results:** We report a case series of 5 different cases of ocular surface disorder in which the male to female ratio was 2:3, with mean age of 29.2± 7.42 years. All patients were clinically and symptomatically better in both room and sunlight conditions. Case 1 was a 20-year male with bilateral penetrating keratoplasty for keratoconus. Pre and post CSL visual acuities were 1/60 and 6/12 in the both eyes respectively. Case 2 was a 32-year male with right eye corneal scar with aphakia post open globe injury repair. With CSL vision was restored from counting fingers close to face to 6/6. Case 3 was a 40-year female with Stevens-Johnson Syndrome. She had a drug reaction with Azithromycin during the pandemic Covid -19 and was admitted to the general hospital for 3 months. Pre and post CSL visual acuities were 1/2/60 and 6/18 in both eyes respectively. Case 4 was a 28-year female with right eye adherent leucoma following with corneal ulcer. Pre and post CSL visual acuities were 1/60 and 6/60 respectively. Case 5 was a 26-year female with Granular Dystrophy. Post CSL vision was improved from 1/2/60 to 6/60 and 1/60 to 6/36 in right and left eyes respectively. **Conclusions**: Oculo-visual rehabilitation with scleral contact lenses is an excellent option for management of ocular surface disorders.

**NOVEL PUPILLOMETRY: DETECTING SUBTLE ABNORMALITIES IN PUPIL RESPONSES AND EXPLORING UNDERLYING FACTORS IN CLINICALLY NORMAL EYES**

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**Introduction**: Pupillometry, the measurement of pupil responses, is a valuable diagnostic tool for detecting neurological and ophthalmological conditions. Traditional methods like the swinging flashlight test are widely used but may miss subtle abnormalities in clinically normal eyes. This study introduces a custom-made novel pupillometer, Pupil +, designed to enhance the sensitivity and specificity of pupil response assessment. By investigating pupil reactions in normally functioning individuals, this research aims to validate the effectiveness of the Pupil + device and explore potential underlying factors contributing to abnormal pupil responses in individuals without evident clinical pathology. **Methods:** A cohort of 500 normal subjects was included to evaluate pupil responses. Pupil responses were assessed using the pupil + device and compared with results from the swinging flashlight test. Thirteen subjects exhibited abnormal pupil responses, showing a 17% inter-eye discrepancy. Due to logistical constraints, follow-up on abnormal cases was not possible. Additionally, a subgroup of 99 subjects under 35 years of age, based on convenience sampling, underwent comprehensive eye examinations, excluding those with visual impairments. Four subjects with abnormal pupil responses underwent further assessments, including electroretinography (ERG) for retinal pathology evaluation and near point of convergence (NPC) testing for eye dominance assessment by a blinded examiner. **Results:** Thirteen out of 500 subjects exhibited abnormal pupil responses, indicating a 17% inter-eye discrepancy, consistent with previous research. Among the 99 subjects under 35 years old, seven displayed abnormal pupil responses. Subsequent assessments revealed dissimilarity in pupil and ERG responses, although the sample size is limited to make any correlation between them. **Conclusions**: The study demonstrates the efficacy of the pupil + device in detecting abnormal pupil responses, with sensitivity and specificity comparable to the swinging flashlight test. Notably, the pupil + device identified abnormal cases that were missed by the swinging flashlight test, highlighting its value in detecting subtle abnormalities. Further research is warranted to elucidate the underlying factors contributing to abnormal pupil responses in otherwise healthy individuals and to explore the potential of ERG and NPC testing in understanding any possible underlying retinal pathology and eye dominance issues in such individuals.

**EFFECTIVENESS OF REVITAL VISION IN AMBLYOPIA AND DIFFERENT OCULAR PATHOLOGIES - CASE SERIES**

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**Background:** REVITAL is a vision training software program clinically and scientifically proven to improve vision in adults with amblyopia, eye disease, low vision, and visual impairment. It is clinically proven to improve vision in people experiencing poor vision due to various eye diseases, such as retinal diseases, keratoconus, nystagmus, and more. The recent evidence shows that Gabor patch treatment improves BCVA in Stargardt patients. Another study reported the efficacy and safety of neuro-vision correction technology, a non-invasive perceptual learning computerized program to enhance the UCVA and uncorrected contrast sensitivity function (CSF) in individuals with low myopia. The mean improvement of 2.1 lines in log MAR uncorrected visual acuity was of sufficient magnitude clinically. **Purpose:** The aim of this case series was to investigate the effectiveness of REVITAL vision in improvement of visual acuity in patients with amblyopia and different ocular pathologies. **Results:** Initially, there is 0.12 line visual acuity improvement, according to the case series. During this therapy program, all the subjects have individual attention. All subjects must follow a therapy program continuously and follow up after each and every 10 sessions. **Conclusions:** According to the case series , REVITAL therapy programs improve visual Acuity in amblyopia patients and different ocular pathologies. For patients with persistent vision issues, including amblyopia, REVITAL vision may offer advanced treatment options and potential vision improvement.

**ALTERNATIVE OF ATROPINE FOR MANAGEMENT OF SPASM OF NEAR REFLEX : TWO CASE REPORTS**

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**Background:** Two adolescent children (11/F and 14/F) were seen in our Binocular Vision and Orthoptics OPD with asthenopic symptoms and blurred vision. We presumed uncorrected refractive error to be our first differential diagnosis. Both children had suboptimal visual acuity (VA) for distance and near (worse than 20/25 and N8). Vacillating myopic retinoscopy reflex was observed. Speculating it as SNR-A, cycloplegic (cyclopentolate 1%) refraction was performed, which revealed a low hypermetropic refractive error in both children. Having ruled out other ocular causes of sub-optimal vision, the children were called for a post-mydriatic test after 4 days. In that visit, we performed a modified optical fogging technique that can relax the SNR-A. We prescribed spectacles and an accommodative flipper (+1.50DS ) for home vision therapy. **Clinical problem:** Variable refractive power and visual acuity (for both distance and near) had made the subjective acceptance difficult with normal fogging technique. Post Cyclopentolate refraction still the variability was present and atropine was the conventional management option. But atropine also has its side effects and limits some of the daily activity work. **Existing solution(s) and its shortcoming:** Atropine is the conventional management option for spasm of near reflex. But atropine also has its side effects and limits some of the daily activity work. **Clinical pearls:** 1) Modified optical fogging technique can be a good option for the management of Spasm of near reflex.2) Accommodative flipper can prevent the recurrence of spasm of near reflex. **Take home message:** 1) Cycloplegic refraction is mandatory in cases of variable reflex. 2) Modified optical fogging technique can be the good option for the management of spasm of near reflex. 3) Vision therapy need to be considered along with spectacle to prevent recurrence of spasm of near reflex.

## CO-RELATION BETWEEN GANGLION CELL LAYER THICKNESS AND MACULA PIGMENT OPTICAL DENSITY

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**Objective:** The aim of the study is to identify co-relation between the ganglion cell thickness and macula pigment optical density in the patients with glaucoma compared with a control group. It is a cross-sectional descriptive study to collect data within a period of 2 months. **Methods:** Voluntary subjects 40 (Eyes) who was diagnosed with glaucoma eyes (20) and normal eyes (20) at the Vision Care Optical Services (Head office) were recruited. The age ranged from 19 to 75 years old. The measurements were reviewed after 1 year with these glaucoma patients, all of them were already using eye drops. **Results:** Ganglion cell layer (GCL) Thickness was captured by CIRRUS 6000 and macula pigment optical density (MPOD) were captured by VISUCAM 500. Our study confirmed a significant positive correlation between ganglion cell thickness (GCL) and macular pigment optical density (MPOD) in both glaucomatous and healthy subjects. The findings will be shared at the presentaton. **Conclusions:** According to the outcome of the study, it was found that there was a strong positive correlation between ganglion cell thickness and macular pigment optical density in both glaucoma and healthy subjects.

# Scientific Session 6: Vision Rehabilitation

## RE2030: INCREASING THE REFRACTIVE ERROR COVERAGE IN INDIA

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**Introduction**: This report analyses the existing scenario in India and provides a forward plan to improve refractive error coverage in the country. The current data on refractive error and associated parameters are patchy. As per the WHO, globally, only 36% of people with vision impairment due to refractive error have received access to an appropriate pair of spectacles. **Methods**: The report has two phases. First, a comprehensive literature review was undertaken, analysing articles, published and unpublished, between 2003 and 2024 on topics related to optometry in India, vision screening, refractive error prevalence, and socioeconomic impacts. Second, interviews were conducted with 29 eye care leaders from various sectors, including ophthalmology, optometry, the ophthalmic industry, NGOs, hospitals, regulatory bodies, public health, and education. Participants were asked about key strategies, obstacles, and opportunities for increasing refractive error coverage in India. **Results:** The report identifies key obstacles and forwarded ideas for overcoming them to improve refractive error coverage in India, such as lack of awareness, limited access to eye care services, affordability issues, ignorance, and a shortage of trained eye care and public health professionals. It highlights opportunities for improvement through leveraging technological advancements, fostering stakeholder collaborations, and garnering government support. Additionally, the report recommends strategies to overcome these challenges. **Conclusions**: The list of recommendations that arise from this report is shared in the public domain and with major publications. This document can be used by stakeholders working in the refractive error space, including educational institutions, ophthalmic industries, private and government bodies, and blindness control societies, who are strategically looking at overall eye health for the Indian population.

**PATIENT KNOWLEDGE ON AGE-RELATED MACULAR DEGENERATION: CROSS-SECTIONAL STUDY**

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**Introduction**: Age-related macular degeneration (AMD) is the primary cause of visual impairment and severe vision loss in developed countries. AMD is an incurable disease characterized by widespread low awareness globally and compounded by poor treatment compliance. The aim of this study is to assess the level of knowledge among patients diagnosed with AMD. **Methods**: This study was conducted among patients diagnosed with AMD in Kuala Lumpur. A total of 120 respondents participated, completing validated and reliable self-administered questionnaires assessing their knowledge of AMD symptoms, risk factors, treatment, management, monitoring of vision, and consequences. **Results:** Among the 120 patients, the majority (45.8%) exhibited low knowledge scores, while 42.5% demonstrated moderate scores. Only 14 respondents (11.7%) achieved high knowledge scores. The study revealed significantly higher odds of achieving high knowledge scores among male patients compared to females (OR: 0.176, CI: 0.040 - 0.778). Participants with secondary education also had higher odds of achieving high knowledge scores compared to those with tertiary education (OR: 0.104, CI: 0.018 - 0.610). **Conclusions**: The data collected serve as a baseline for targeted interventions in future studies. Establishing these baseline knowledge scores facilitates the appropriate targeting of interventions, such as health education, and allows for the measurement of their effectiveness in these populations.

## VISION SCREENING AMONG WEAVERS IN TAMIL NADU

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**Introduction**: Good vision is critical for weavers as their work involves detailed and precise tasks such as handling fine threads and intricate patterns. Impaired near vision can reduce productivity and quality of work. Providing eye care and glasses to those in need helps maintain their efficiency and comfort, increasing income earning capacity and benefiting their work and well-being. **Methods**: A total of 3,531 individuals from weaver communities in Tirupur, Salem, Namakkal, Arrakonam and Chennai were screened. Comprehensive vision assessments were conducted, including visual acuity tests and preliminary eye examinations to identify refractive errors and other ocular pathologies. **Results:** Of the individuals screened, 27.6% had no refractive errors or ocular pathologies, 52.8% were diagnosed with refractive errors, and 19.5% required referrals for cataract or other ocular ailments. After 6 months, through a spectacle compliance survey, we found that a significant number of users reported positive impact on their productivity and improved distance vision with spectacles. **Conclusions**: The project demonstrated a substantial burden of vision problems among the weaver communities in Tamil Nadu. The provision of spectacles had a transformative impact, with a majority of beneficiaries reporting significant improvements in their vision and productivity. The high compliance rate and positive feedback underscore the importance of accessible vision care.

**RELATIONSHIP BETWEEN INTRAOCULAR PRESSURE AND AGE: A POPULATION-BASED STUDY IN NEPAL**

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**Introduction**: Few studies have assessed the distribution of IOP from the Indian subcontinent, despite its large population and high burden of glaucoma. The objective of this study was to assess the distribution of IOP measurements from adults living in a lowland region of Nepal. **Methods**: In a population-based cross-sectional study, all individuals aged 60 years and older from an area of lowland Nepal were invited for an IOP assessment with a rebound tonometer. **Results:** Of 160 communities (28,672 people aged ≥ 60 yr.) enrolled, 79 (13,808 people aged ≥ 60 yr.) were randomly selected for IOP testing. Of those eligible, 10,017 (72.5%) individuals underwent tonometry. Mean IOP decreased monotonically over 5-year age groups, from 14.1mm Hg (SD: 3.6) among those aged 60 - 64 years to 13.0mm Hg (SD: 4.2) among those 80 years or older. The 97.5th percentile IOP measurement was 21.0 mm Hg for all age groups. In adjusted analyses, younger age, self-reported diabetes, and higher population density were each associated with higher IOP, and self-reported cataract surgery was associated with lower IOP. **Conclusions**: Mean IOP was lower among older individuals in Nepal, consistent with many studies from East Asia and in contrast to many studies from western populations. These results suggest that ethnic background might be a consideration when diagnosing ocular hypertension.

**PREVALENCE OF VISUAL IMPAIRMENT AND REFRACTIVE ERROR IN RURAL NEPALESE CHILDREN UNDER FIVE-YEAR OF AGE**

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**Introduction**: To determine the prevalence of vision impairment and refractive errors in rural Nepalese children under-five years of age. **Methods**: A community-based cross-sectional study using a multistage random sampling was conducted in the targeted 6 to 59 months old children of 5 selected rural municipalities of the Rupandehi district, Nepal. Eye examinations (visual acuity, binocular vision, cycloplegic refractions and anterior and posterior segments) were performed at community health centers following enumeration of eligible participants at household visits. Refractive errors were determined by cycloplegic retinoscopy and recorded as spherical equivalent (SE). Overall prevalence of refractive errors was determined based on SE myopia ≤-0.50 Dioptre (D), SE hyperopia ≥ +2.00 D and astigmatism ≥ 1.50 and the multivariate analyses were conducted to determine the associations with age, gender and ethnicity. **Results:** Of 2226 participating children, visual acuity of 93.4% of children were clinically tested and documented. Of which,6.2% had moderate/severe visual impairment. Overall prevalence of refractive errors was 14.2%, n=317 (95% CI:12.8, 15.7). Prevalence of myopia, hyperopia, emmetropia with astigmatism were 10.8%, n=240 (95% CI: 9.6-12.1); 2.7%, n=59 (95% CI:2.0-3.3) and, 0.8%, n= 18 (0.4-1.2) respectively. Multivariate logistic regression analysis showed that infants have significantly higher (odds ratio, 4.9, 95% CI: 2.6-9.2) possibility of having hyperopia compared to pre-schoolers ($p < 0.001$), and toddlers have higher (odds ratio, 1.2, 95% CI; 0.87-1.5) likelihood of developing myopia while gender and ethnicity did not show any significant associations. **Conclusions**: The prevalence of refractive errors, particularly myopia was substantially higher among rural Nepalese children under five-years of age. Importantly, myopia was more prevalent in toddlers, indicating high likelihood of developing and progressing myopia as they grow older.

# PREVALENCE AND DETERMINANTS OF SPECTACLE NON-COMPLIANCE AMONG SCHOOL CHILDREN OF EASTERN NEPAL

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**Introduction**: The use of spectacles is one of the cost-effective ways to correct refractive errors and prevent visual impairment. This study aimed to determine the prevalence and determinants of spectacle non-compliance among school children, who were provided spectacles free of cost. **Methods**: This cross-sectional study was conducted among 237 school children who were randomly selected from 29 schools of Sunsari and Morang districts of Koshi Province, Nepal. Participants included children who had received free spectacles in the past through the school screening program of Biratnagar Eye Hospital in 2021. Spectacle compliances of the selected school children were noted, and students were marked as compliant if they wore spectacles or non-compliant if they did not wear spectacles at the time of examination. The prevalence of spectacle non-compliance, reasons for spectacle non-compliance, current status of spectacle were explored. Moreover, the spherical equivalent of refractive error was calculated, and based on this, types and magnitudes of refractive errors were recorded. **Results:** The mean age (mean ± SD) of participants was 13.82±1.83 years, with 51.5% being male. The majority (74.5%) of children who received spectacle in the past were myopic, with the magnitude (spherical equivalent) between -0.50 D to -3.0 D). The prevalence of spectacle non-compliance was 86 (36.3%). The most common reasons for spectacles non-compliance were broken spectacles (23.3%), followed by difficulty in wearing spectacles (17.4%) and feeling shy (11.6%). **Conclusions**: The prevalence of spectacle non-compliance among school children was over one-third, regardless of spectacles being provided free of cost. Regular follow-up is necessary through the school screening program for effective spectacles compliance and also there is a need for educating children regarding the advantages of wearing spectacles. Importantly, new effective strategies are needed to improve spectacle compliance if resources are to be maximised.

## BRUCH' S MEMBRANE OPENING IN HIGH MYOPIA AND ITS CORRELATION WITH AXIAL LENGTH

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**Introduction**: High myopia has become a matter of global concern as it is a major risk factor of glaucoma.This might lead to difficulty in detecting pathologies associated with high myopia through conventional funduscopy examinations only. Bruch's Membrane Opening (Area and Minimum Rim Width) is considered an anatomically more accurate and reliable landmark than the conventional clinical disc margin. **Methods**: : A cross sectional study was at tertiary level eye center of Nepal. 80 eyes of 40 subjects (40% male and 60% female) aged 18-35 years with high myopia (Spherical Equivalent (SE) $\geqslant$ -6D) were taken as case. Among them, RE of 39 and LE of 34 myopic subjects were included in the study. Spectral Domain-Optical Coherence Tomography of both the eyes of myopic patients was performed using Glaucoma Module Premiere Edition (GMPE) with Anatomic Positioning System (APS) to measure Bruch's Membrane Opening (Area and Minimum Rim Width). Axial length in myopic patients was measured using Partial Coherence Interferometry (IOL Master). **Results:** Among 40 myopic subjects, 16 (40%) were males whereas 24 (60%) were females. The mean age of myopic subjects was 24.64 $\pm$ 5.10 years with minimum and maximum age 18 years and 35 years respectively. The mean BMO area was 2.28 $\pm$ 0.48 mm2 in right eye and 2.15 $\pm$ 0.59 mm2 in left eye. BMO area in high myopic patient was significantly correlated with axial length. The correlation analysis of BMO area with axial length in RE and LE was found to be statistically significantly at ($r=0.465$, $p<0.003$) and ($r=0.374$, $p< 0.029$) respectively. Likewise, the mean BMO-MRW was 325.69 $\pm$ 96µm in right eye and 339.20 $\pm$ 79.50µm in left eye. There was significant correlation of BMO-MRW with axial length in both the eyes of myopic subjects. Moreover, there was significant negative correlation of inferior and temporal quadrants. **Conclusions**: BMO area enlarges in high myopia with increase in axial length. Additionally, BMO-MRW thinning occurs along with the BMO enlargement and increase with axial length. There was no significant differences in refractive error, axial length, BMO area and BMO-MRW between right eye and left eye.