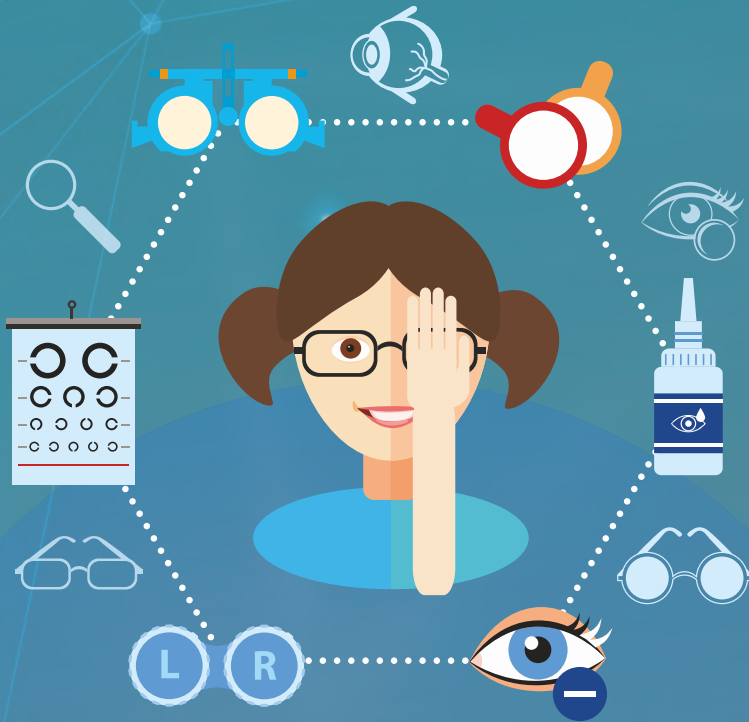


TEACHERS' PERSPECTIVE, AWARENESS AND UNDERSTANDING OF STUDENTS' EYE HEALTH



A STUDY BY
TECH MAHINDRA FOUNDATION
OCTOBER 2020-21

FOREWORD BY CEO



We at Tech Mahindra Foundation (TMF) strongly believe in 'Empowerment through Education' and work towards creating happier and safer classrooms. We foster this vision by empowering teachers, educators, and leaders in knowledge, skills, and attitude domains aiming for effective school governance. Through 'Shikshaantar', one of our flagship programmes in Education, TMF has trained over 36,700 teachers of government schools in major cities of India.

Various workshops under the Shikshaantar umbrella aim at enhancing parental involvement, building capacity of teachers and educators on leadership, pedagogical skills, and competencies related to the subject of teaching-learning and enhancing parental involvement. For creating a conducive and safe learning space, the Foundation has initiated multiple interventions to create awareness about child safety and mental health and capacitate teachers with counselling skills to ensure students well-being.

With this perspective, we initiated this research to put a spotlight on the importance of monitoring eye health of children when they are in schools. Maintaining eye health among children is critical for healthy and productive growth and overall wellbeing. Studies show that 80% of the knowledge is acquired through the information that is visually presented and imparted, making vision a primary learning tool. Healthy vision therefore can determine a child's learning ability. Hence, it becomes pertinent that children develop safe eye care habits especially during the formative years (between 0-12 years).

Several eye problems and diseases are preventable, provided early detection and timely interventions are possible for remedial action. School going children, as pointed out by the World Health Organization (WHO), are prone to a range of eye diseases that include conjunctivitis, trachoma, congenital cataract, and Vitamin A deficiencies. This may lead to permanent vision loss if timely detection and early access to eye-health services is not assured.

One of the most important ways in which eye care of students can be maintained and eye health can be ensured is to have the teachers as the front-line defence. Students spend maximum time in schools and interact with their teachers in close proximity and confined environment of the classrooms. Hence, teachers have a greater opportunity and chance to identify the first signs of vision related problems that the children are struggling with.

To understand how teachers can become watchful and have the right knowledge about the first level of scrutiny and intervention, Tech Mahindra Foundation has conducted this research to understand the current knowledge base, awareness level and perception of teachers regarding eye health of children.

To empower teachers to be the catalyst in spreading awareness about Eye Health, the study has found that it is important to create guidance and manuals for the teachers and train them to understand the initial signs of eye health problems that students experience. This can help teachers develop their knowledge and understanding regarding how eye issues manifest in classrooms. It was also found that often the understanding of the problem is very impressionistic and not driven by science. This may create the risk of perpetuating myths around eye health that can be counter productive. Hence, Teacher training and community awareness programmes may include information on the factors that affect the eye health of the students, and its manifestation.

This research has helped to identify the way forward to strengthen and improve the eye healthcare for students. Tech Mahindra Foundation recognises the importance of empowering teachers as catalysts. Thus, the findings of this study can help to chart the trajectory to build the next phase of action to improve knowledge and practice of eye health care for protecting children and preventing any lifelong disabilities.

Rakesh

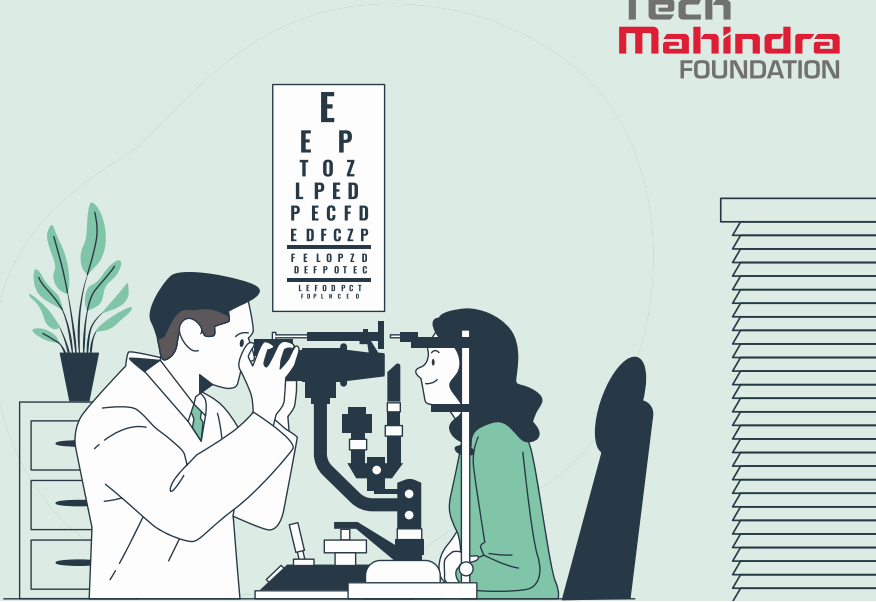
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Disclaimer: This report is based on the data collected by Tech Mahindra Foundation from government school teachers in Delhi, and from data available in secondary literature as open access. The data has subsequently been reviewed by the research team at Tech Mahindra Foundation. All surveys and recommendations made in this report are made in good faith and based on the information available to the research team at the time. The information in this report is believed to be true and every attempt has been made to ensure the reliability and validity of the data. However, no representation or warranty is given (expressed or implied) as to its accuracy or correctness.

*The percentages in the graphs of figures are more than 100% in some of the cases since the respondents have chosen multiple options.

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ABBREVIATION LIST

ABC: Avoidable Childhood Blindness

AIIMS: All India Institute of Medical Sciences

AMD: Age-related Macular Degeneration

KAP: Knowledge, Attitude, Practice

MHRD: Ministry of Human Resource Development

NGO: Non Governmental Organisation

NPCB: National Program for Control of Blindness

PRAGYATA: Plan-Review-Arrange-Guide-Yak (talk)-Assign-Track-Appreciate

PTR: Pupil-Teacher Ratio

RE: Refractive Error

ROP: Retinopathy of Prematurity

RTE: The Right of Children to Free and Compulsory Education

SHS: Second hand smoke

UNICEF: United Nations Children's Fund

NCRB: National Crime Records Bureau

VAD: Vitamin A Deficiency

WHO: World Health Organisation

Abstract

Eye health ensures the extent to which one can perceive the world and receive information. Studies show that 80% of what is perceived comes through sight. Healthy eyes in children are linked to educational achievement, quality of life, and overall socio-emotional wellbeing. Ensuring safe and quality eye health comes from healthy practices and seeking timely eye care to help reduce eye problems or visual impairment. World Health Organization states that globally half the cases of blindness could have been prevented with early intervention. Therefore, understanding early warning signs and symptoms of eye problem among students becomes crucial. Students spend maximum of their time in classroom settings with their teachers. This compact learning environment can help teachers become important sources who observe changes in sight and eye health among their students and play a significant role in promotion of eye health and in prevention of more serious diseases. Therefore, this study has investigated the how the teaching community can play a more effective role in detection of vision related impairment and problems at the early age of children. Hence, it has understood and analysed the perception, awareness, knowledge of primary school teachers on student's eye health. A primary assessment has been conducted with government school teachers of Delhi to identify perceptions, challenges, and solutions to eye health and related problems. The key results show that while there is a gap in the knowledge and awareness levels of the respondents in the case of eye health, teachers however still have some basic level of awareness and knowledge. This can be understood in the background of the fact that close to 100% have not received prior training in understanding eye health. More than 60% teachers have correctly identified activities that are essential for taking care of eye health. These activities include taking small breaks during online activities (75.5%), avoiding mobile/internet surfing 40 minutes prior bedtime (~67%), among others. More than 70% teachers correctly identified carrots, green leafy vegetables, nuts, fish as healthy food items for eyes. However, while a greater number of teachers recognise conjunctivitis (~71%), night blindness (44.5%) and refractive error (33.1%) as a common eye disease that can affect children, smaller percentages recognise cataract (26.2%) and trachoma (14.4%) as diseases affecting children. "Too much screen time" is rated as the highest contributing factor towards eye health issues in children by the teachers, and the lowest rated factor is hereditary/genetics. Close to 50% of teachers are not aware and/or observant about the status of eye health of their students while a little over one-fifth (22%) are aware. Nearly 30% of teachers are not aware of how to balance online and offline activities - including what is mentioned in the PRAGYATA guidelines.

Keywords: Children, eye health, low vision, screen time, COVID-19, pandemic, exposure, adolescent, teachers, technology, teacher training.

1. Introduction

Eyes are our essential sensory organs. We perceive and receive 80% of information from our surroundings and environment through visual stimulation. In addition to the other sensory perceptions through smell, hear or taste, eyes protect us from the dangers.

Eye related problems may not always be serious in nature. Several eye problems including diseases are preventable. But this requires early detection along with intervention for timely remedial action. Otherwise, small eye problems may worsen to develop into serious and irreversible symptoms, even leading to visual impairment. Taking steps to prevent visual impairment and childhood blindness can deliver lifelong benefits and secure overall mental and physical health and wellbeing of students. This may strengthen their education, future development and opportunities.

Global data available from the World Health Organization (WHO), last updated in February 2021 shows that an estimated 19 million children are vision-impaired or are blind. School-going children are prone to a range of eye diseases that include conjunctivitis, trachoma, congenital cataract, and Vitamin A deficiencies. This may lead to permanent vision loss if timely detection and early access to eye-health services are not done^[1].

The elementary stage of education or the formative years of a student's life are most crucial for vision development (between 0-12 years). Healthy vision has strong bearing on child's learning ability. Children with Myopia have trouble reading the notes on the class-board or comprehending the presentation materials shared in the class, it can also lead to underperformance in various sports activities. Children with Hyperopia will have trouble reading textbooks or conducting different tasks within a short visual range. School-age children are most vulnerable to uncorrected refractive errors. If left unchecked, it may affect learning capabilities and educational potential^[2].

Studies have shown that 80% of the knowledge acquired by the child in school happens through the information that is visually presented and imparted, making vision a primary learning tool^[3]. Given the amount of time students spend in schools and engage in classrooms, teachers have a greater opportunity and chance to detect and identify the first signs of vision related problems that the children are struggling with.

Teachers are therefore the frontline protection for a large population of school going children. School health programmes need to recognise this to create a pool of vigilant teachers and do capacity building with knowledge for the first level of scrutiny and intervention. This can play a significant role in promotion of eye health and in prevention of more serious diseases. The objective of these eye health programs can be three folds-

1. Teachers of primary section can help to build awareness and knowledge around eye health issues,
2. Help with early detection and early warning, and
3. Enable the schools to strengthen the provision of improved eye healthcare services for the students.

This can contribute towards spreading awareness among students, parents as well as their home communities. It is also possible to inform the school curriculum to incorporate eye health in the overall agenda of health and wellbeing.

This research has investigated various dimensions of how teachers can be catalysts to eye health awareness and interventions in schools and facilitate building of knowledge, awareness with ensuring safe and healthy eye health practices among children and their communities.

1.1. Eye Health importance for Children and Education

WHO explains childhood eye health related issues as a group of diseases and conditions that occur during childhood or early adolescence which if left undetected without timely treatment, may result in severe visual impairment including blindness.



Common conditions that occur among children can be indicated as follows, along with treatments

BLOCKED TEAR DUCTS

Some babies may be born with this condition preventing tears from draining normally (excessive tearing, swollen pool of tears mucous like discharge from eyes).

Majority of cases resolve without any treatment – gentle massage of the tear duct can help relieve blockage, antibiotic drops. Some cases may require surgical probing.

AMBLYOPIA (Lazy Eye)

Reduced vision because normal vision did not develop during childhood. This is commonly noticed in babies & adolescents. Major cause often attributed to misaligned or poor focusing of eyes.

Applying an eye patch over the dominant eye. Other treatments may include glasses, surgery to address misalignment.

ASTIGMATISM

Distorted or blurred vision due to an irregular shaped cornea.

Wearing eye glasses or contact lenses may correct mild to moderate astigmatism.

CONJUNCTIVITIS (Lazy Eye)

Child's eye appears red, itchy, teary or may have a sticky discharge. This occurs due to allergies or infection.

Depending upon its severity, it can be often controlled at home. Otherwise, doctor may prescribe antibiotic eye drops or ointment. Frequent hand and eye washing may prevent the condition from spreading among those who come in contact of the person infected.

CATARACT (Cloudy eyes)

The lens of the eyes appears as "cloudy".

Majority of children require surgery to remove cataract. While cataract is prevalent among adults, children can also be affected either due to an injury or as a birth problem.

STYE

A lump that is red and sore at the edge of the eye lid. Caused by bacterial infection.

Application of warm and moist compress, ointment, or antibiotic drops.

MYOPIA

(Near-sightedness)

Difficulty in seeing objects at a farther range. This condition is rare in babies but common in school going children.

Use of glasses to correct blurred distance vision. This condition may not be outgrown amongst children. Contact lenses can be another option once they become adults.

CHALAZION

Painless lump in the eye lid due to swollen oil gland. If infected, makes the entire eyelid swollen and painful.

Application of warm and moist compress around the area, or eye drops can help treat the area. Some cases may require minor surgery.

HYPEROPIA (Farsightedness)

Difficulty in seeing objects at a close range. A small degree of far sightedness is normal in babies and children since eyes aren't developed fully.

If the condition becomes severe, it also makes the eyes cross. Severe conditions require corrective glasses.

GLAUCOMA

A condition because of built-up pressure in the eyes. If remains untreated, it damages the optic nerve leading to vision loss. Paediatric glaucoma can usually be diagnosed within the first year of a child's life.

Childhood glaucoma usually requires surgery. Early detection is important.

STRABISMUS

(Crossed Eyes)

Common in babies where eyes don't align with each other (they point at different directions at the same time). One of the eye lids may point upwards, downwards, in or out.

The cause of the misalignment often indicates the treatment. Common treatments include eyeglasses, eye patches, or surgery.

BLEPHARITIS

(Swollen eye lids)

Inflamed oily glands of the eyelids. Leading to swollen eyelids and flaky scales (dandruff-like) forming on eyelashes.

Application of warm compress, cleaning of eyelids with diluted baby shampoo. Antibiotics may be required in case of infection.

PTOSIS

(Droopy Eyelid)

Weakness of muscle that supports opening of eyelid. This leads to eyelids appearing "droopy" and resulting in blocked vision.

Mild cases may require application of cold compress. Severe cases can lead to reduced vision impairment (amblyopia) with requirement of eyelid surgery.

PSEUDOSTRABISMUS

One or both eyes may appear misaligned but are straight. Hence, they only appear as crossed eyes. May occur due to broad flat nasal bridge, with eyelids having small folds at the inner corner of the eyelids.

This condition itself will cause no harm. However, one should get them monitored regularly to determine whether the child has Strabismus or not. If latter remains undetected, it may lead to permanent vision loss.

COLOUR VISION DEFICIENCY

(Colour blindness)

Most common kind is when children have trouble differentiating between red and between green and yellow. Symptoms are majorly noticed when children learn colour names.

There aren't any known cures for this condition. There are contact lenses and glasses with colour filters to aid vision. Colour blindness otherwise does not interfere with other vision capabilities. It may however be dangerous when the adult later takes to driving or other activities that require distinguishing between colours.

Source: Childhood Eye Disease Conditions (2020, American Academy of Ophthalmology), Status of Child Eye Health in India (2020, ibis)

The severity of eye health related issues majorly depends upon the socio-economic conditions, availability of primary healthcare and eye health services. Hence, it may vary across regions (Gilbert et al., 2006).

Therefore, knowledge and understanding of different eye diseases that affect children can help the child and their guardians be on alert if they observe any symptoms. A break-down of diseases in terms of severity can also help understand diseases that can be controlled with early detection and diseases that may require lifelong management. Such information to parents and guardians of children can help in sensitisation as well.

1.2. Magnitude of Eye health related issues across the globe

According to the global statistics of WHO^[4], 2.2 billion individuals suffer from eye related issues. If we break down this figure according to different eye health conditions of individuals, we get the following– individuals with near vision impairment from presbyopia (1.8 billion), cataract (65.2 million), macular degeneration due to age (10.4 million), distance vision impairment including moderate to severe conditions, or unaddressed refractive error leading to blindness (123.7 million), diabetic retinopathy (3 million), glaucoma (6.9 million), trachoma (2 million), and other causes (41.3 million).

The Global Burden of Disease study^[5] observed that South Asia hosts the maximum number of individuals with blindness (11.7 million). This becomes 32.5% of people who are blind across the world. South Asia also hosts 61.2 million people who have moderate to severe eye health related issues.

Among the South Asian countries, India alone is home to one fifth of the global population percentage with adults forming the maximum cohort suffering from eye related problems. This becomes an important point given that maximum eye related issues including blindness is preventable and curable with early detection and care.

A 2011 policy brief of Sightsavers^[6] explains that around the globe 1-2% of preschool children suffer from strabismus. This, if not detected early, can lead to unilateral vision loss. Another eye problem that can affect children is Cataract and early detection can result in surgical management resulting in improved visual functions. Other eye diseases prevalent in school going children include bacterial and viral conjunctivitis (often occurs during widespread epidemics), allergic conjunctivitis (may become severe with persistent symptoms and visual impairment), lid infection, and cysts.

Tirkey & Adlakha (2018)^[7] conducted a study with 1,300 private primary school children of Vindhya region in Central India. The objective of the study was to analyse the prevalence of eye diseases in primary school children. The results showed that nearly half the children (41.38%) had refractive error, with Myopia (43.68%) being the most common spherical refractive error^[i]. 18.5% had allergic conjunctivitis, 14.4 per cent had corneal opacity^[ii] and 8.4% suffered from a squint. Other disorders found in children included – glaucoma (5.6%), colour blindness (3.6%), ptosis (4.9%) and styte (2.9%).

1.3. Teachers as catalysts for eye health awareness

Communities can play a vital role when it comes to promoting and maintaining eye health. One such cohort that can play an important role is the teacher community. Teachers are a crucial part and point of contact for children. Teachers, especially primary teachers spend maximum of their time with adolescent students, and this creates an environment where the teacher understands the student's eye health in terms of their reading/visual/observational abilities from an early age.

They can be made part of health programmes that include non-medical professionals who can be trained to become first level interventionists. This kind of intervention can be useful in identifying cases of eye health issues, becoming advocates of promoting safe and hygienic practices and ensuring safety and well-being of children.

Many countries in the developing as well as developed world have school health programmes that contribute to eye health promotion, prevention, early detection, and treatment. These programmes majorly focus on teachers and students to equip them with knowledge and awareness of eye health and related practices so as to play a crucial role in improving the eye health of their families and subsequent communities.

Habiba et al., (2017)^[8] in their paper 'Knowledge and practices of teachers associated with eye health of primary school children in Rawalpindi, Pakistan' discuss the importance of school eye health programmes and cite a success story from London where the decline in the Trachoma diseases could be attributed to children taking back and sharing eye health messages with their parents and hence, spearheading awareness.

Terminologies explained

ⁱSpherical refractive error happens if the optical power of the eye is too small or too large for the light to focus on the retina.

ⁱⁱCorneal opacity is scarring of the cornea.

Case Study: How training teachers as a part of school eye health programme can improve awareness and detection of eye health related issues in children

Pakistan Urban Paediatric Eye Care Programme (PUPEC): Sightsavers, Pakistan

Sightsavers, Pakistan conducted a five-year project (2011-2015) on eye health of children in the slum areas of five urban cities (Karachi, Rawalpindi, Lahore, Multan and Faisalabad) in the country.

The aim of the project was to -

1. Identify children with low vision or who are blind within these 5 projects cities.
2. Provide necessary eye care services (surgeries, spectacles, low vision devices) to the identified children.
3. Improve and increase awareness of eye health in schools and communities
4. Develop human resources to strengthen eye health systems;
Establish programme management systems that are effective and efficient for implementation.

This programme is one of the largest eye health screening programmes conducted in the urban areas of Pakistan. PUPEC found that prior to this intervention, none of the project areas had any vision screening programme for school children, especially in government schools. Due to which large number of school children were not even aware that they had refractive errors. The parents weren't aware of the implications of vision impairment, or the eye care services they could avail for their children.

Addressing these unmet needs of the children - PUPEC project met 47% of overall needs of uncorrected refractive errors among the slum children. It also contributed towards reduction in the need of surgery for childhood cataract cases. The project found a positive outcome in children who were provided with spectacles in terms of class performance and child confidence (especially among children who had refractive errors and addressed it through spectacle wear).

Teacher training in identifying eye health problems among children - PUPEC project developed the capability of teachers in identifying eye related problems among students, conduct initial screening and provide with primary eye care and provided the teachers with additional reference material. This approach helped in reaching out to many school children and in retention of vision screening skills by teachers.

The project trained 26,163 teachers and 64.7% of all children screened by teachers showed to have vision problems.

Source: Awan, H. (2016). Pakistan Urban Paediatric Eye Care Project (PUPEC) – End Term Project Evaluation. Sightsavers. Available from: 75060_PUPEC_2016_End_term_Evaluation.pdf (sightsavers.org)

Another example can be taken from a baseline study conducted in Timor-Leste^[9] in South-east Asia. The baseline study of student's KAP (knowledge, attitude, and practice) about eye health was done by providing resource materials to students regarding basic eye health problems, practices, and solutions. The results of the study showed that eye-health awareness creation interventions can be successful and should be made part of regular school curriculum with increased engagement of teachers. One study highlight is that a teacher created a song with students using key eye health information and this was further recorded and broadcasted on national radio for greater outreach for awareness generation regarding eye health.

Therefore, primary school teachers' knowledge, awareness and perception regarding student's eye health can be leveraged to influence the provision of better eye health care practices among their students. This will also help spread awareness among children, their parents, and the communities they all relate to.

2. Eye Health and India

India has 28.6% of population as children below the age of 15 years^[10] and this becomes a considerable segment in the overall health status of the population of a particular area. This paediatric group, i.e., the age group between 0-15, when suffer early onset of eye related problems can experience lower level of cognitive, social, and emotional development with lifelong repercussions as compared to their normally sighted peers. India is also home to approximately 1/5th of this population with high proportion of visually challenged individuals in the South Asian region.

2.1. Impact of Eye Health issues among Children in India

Out of the total population of India, Cataract is found in approximately 74% of adults and from the 2,80,000 to 3,20,000 visually impaired children, childhood cataract is found in nearly 14% of the cases. Cataract is avoidable, and a treatable condition. However, previous research from India by Titiyal JS, et al^[11] indicates that approximately half of the children who go to the school for blind are diagnosed from potentially preventable and or/treatable conditions, including cataract as one of the leading causes.

If we compare cataract conditions in adults to cataract in children – the treatment for the former is effective for visual rehabilitation at any age. This may not be the case when visually significant cataract occurs in infancy or early childhood as this must be treated as early as possible with long-term management. Therefore, a representative study by Sheeladevi et al^[12] indicates that late surgery for childhood cataract remains a major challenge in India and this requires addressing to achieve full visual potential for every child with cataract.



Sightsavers, 2007 reports ^[13] that an estimate of almost half of the world’s population suffering from micronutrient deficiency may be found in India. For instance, worldwide approximately 20-40 million children have mild Vitamin A deficiency (VAD), and half of them reside in India. VAD has resulted in blindness amongst an estimate of 60,000 children in India, each year.

According to LV Prasad Eye Hospital, every year approximately 7,000 to 9,000 cases of childhood cataract are detected ^[14]. Singh et al (2017) share that along with cataract, childhood blindness is the second largest contributor to blindness in the population. Approximately it can be said that about 280,000 children are blind ^[15]. However, according to India’s Vision 2020 – 50% of all childhood blindness in India is preventable or treatable ^[16]. Wadhvani et al (2020) ^[17] argue in their research, which is a systematic review of the prevalence of and causes of childhood blindness in India –improvements are required on timely neonatal eye care facilities, pediatric surgical services and proper refraction strategies to reduce the percentage of children with childhood blindness.

Refractive errors (RE) are another major problem that affects children, with Myopia being a prevalent issue affecting children across the world, including India.

“Childhood blindness is the second largest contributor to blindness in the population.”
- Singh et al. (2017)

There are some significant surveys conducted across India that will help to understand the severity of the situation. The survey findings as highlighted below will help understand the severity of eye health problems in school going children in India.

- Singh et al. (2017) conducted another study with urban and rural school going children in west Uttar Pradesh. This study includes 4,838 children in the age group of 5 to 15 years. It was found that 28.65% of urban children and 30.05% of rural children had prevalence of Ocular Morbidity^[iii].

Terminologies explained -

ⁱⁱⁱOcular morbidity is a spectrum of eye diseases that are either significant to the individual (the individual is concerned enough about the condition to seek care) or to professionals (an eye health professional determines that the individual would benefit from advice, further review or treatment).

- V Kemmanu et al. (2018) conducted a study in the Tumkur district of Karnataka and found 6.54% of children with Ocular Morbidity. Refractive errors (RE)^[iv] were identified to be the major contributor of ocular problems in both the studies conducted in Uttar Pradesh and Karnataka.
- R Saxena et al. (2017) conducted a longitudinal study to understand the incidence and progression of Myopia and associated factors in the urban school children of Delhi. It found that incidences of Myopia are higher compared to what statistics convey. A statistically significant higher incidence is seen amongst the younger age groups.
- Another survey conducted in Gurgaon, Haryana by Sing, K. N., James, M. R., Yadav, A., Kumar, R., Asthana, S., & Labani, S. (2019) showed that on an average, 21.1% of children had a prevalence of myopia. These students are aged between 5 to 15 years and belong to two private schools in Gurugram, Haryana. An interesting insight of the study was that a higher prevalence was found in boys (25%) as compared to girls (19%). Contributing factors to this was seen to be due to gender inequity during school enrolment, and socioeconomic conditions.

Regular eye healthcare with early detection can result in successful detection and possible prevention of eye-related problems. India has made strides in creating social infrastructure to achieve the same, however it is still insufficient.

Terminologies explained

ⁱⁱⁱ Ocular morbidity is a spectrum of eye diseases that are either significant to the individual (the individual is concerned enough about the condition to seek care) or to professionals (an eye health professional determines that the individual would benefit from advice, further review or treatment).

^{iv}Refractive Error is an eye where the eye is unable to clearly focus and see images.

2.2. Eye Healthcare Services in India

As mentioned in the previous section, over the years the healthcare infrastructure has improved in India, however there is still a long way to go to achieve optimum care facilities.

2.2.1 Infrastructure of Eye Healthcare services in India

In countries like Indonesia, Bhutan, Myanmar and Maldives, the public sector is the predominant healthcare provider. Countries like Sri Lanka and Thailand have the private sector as its predominant provider of healthcare. However, a mix of public and private sectors as healthcare provider is found in India, Bangladesh and Nepal.

The healthcare sector in India has grown over the years, however, there remain disparities in terms of accessibility to quality healthcare services. A 2016 Optometry in India report by India Vision Institute^[18] highlights the key challenges of the vision health sector of India. According to the report, rural population has almost no access to qualified medical care and contrastingly individuals belonging to the upper economic strata receive affordable standardized services by the growing corporate chain of hospitals. This was supported by data available from 2010 that showed approximately 66% of surgeries happened at urban facilities with 31% of the population.

The report further indicates that maximum of the trained vision care specialists reside in tier I and tier II cities that further adds to the accessibility challenges. This statement is supported by a 2005 McKinsey report^[19] that highlights that rural people have higher incidence of refractive blindness due to lack of accessibility to vision care resulting from prohibitive travel time and costs attached to repairing eyeglasses.

More recent reports from India indicate a rise in non-governmental organisations (NGOs) as eyecare providers (Murthy & Vasisht, 2013). India and Nepal found that more than 60% of cataract surgeries were done by the NGO sector – those account for a third of all ophthalmologists. This tells us that there is merit in increasing the output of the system for more desirable result and efficiency.

2.2.2. Human Resource availability for Eye Healthcare in India

Bansal (2015)^[20] talks about the deficit of eye care in India and how it is contributing to cases of blindness. In this report he highlights that there are approximately 12,000 ophthalmologists in India that roughly comes down to a ratio of 1 ophthalmologist for every 90,000 people. This is below the recommended ratio provided by WHO i.e., 1 ophthalmologist per 20,000 population^[21].

Somasekhar (2017) reports^[22] that India has about 45,000 optometrists, as against the required 125,000 as per the country's population leading to scarcity of initial screening of eyes among children to do first level intervention, if any. This highlights the serious shortage of human resources for eyecare in India. Dhingra, B., & Dutta, A, K (2018) mention that quality eye care with equitable distribution remains elusive in most parts of India with suboptimal availability of trained human resources.

With unavailability of adequate eyecare infrastructure and lack of human resources, the occurrence and prevalence of eye care and related issues increases. Along with this, the lack of awareness about eye health and related practices tells us the importance of advocacy about eye health. To the best of our knowledge, the following studies can be referred to bring out the knowledge and awareness gaps existing in the Indian communities regarding children's eye health –

- Dandona et al. (2001)^[23] conducted a quantitative study in Hyderabad and the findings showed lack of awareness within the general population regarding glaucoma (2.4%), night blindness (55.8%), diabetic retinopathy (28.8%). This becomes a cause of concern, especially poor knowledge about night blindness in children as VAD is common among children and night blindness is one of the first signs of Vitamin A deficiency. This deficiency is also linked with higher mortality rate of children.
- Nirmalan et al. (2004) conducted a study in South India to understand different misconceptions regarding eye health in the community. One of the misconceptions identified was that one cannot treat Strabismus (crossed eyes). Some respondents also considered Strabismus as a sign of good luck. This is a red flag because Strabismus is treatable, and if its left untreated it may lead to permanent loss of vision in the eye that isn't connected to the brain. Another observation was that parents in the sample cohort did not consider periodic eye check-up as important. Some preferred going to traditional healers for primary level services for eye problems.
- Vaseem et al. (2015) conducted a study in Indore where 54% of the respondents, i.e., more than half the respondents did not understand why eye check-up for children below 5 years is important.

2.3. How teachers can bridge the gap of lack of human resources and promote eye health awareness

Teachers can help play a key role in promoting eye health awareness among their students. This can further have a trickle-down effect where students can take back information and circulate it among their family members, and subsequently the chain of information can spread through the different communities. Teachers can also intervene and help identify early warning signs and symptoms of eye health related issues among students and refer them to medical services. This may also help ease the burden of the medical eye-care personnel.

India can benefit from comprehensive eye care models that include the contribution of not only trained medical practitioners, but also community level stakeholders. One such model can be seen through WHO's VISION-2020-The Right to Sight programme. This lists the control of childhood blindness as one of its top priorities. India has incorporated WHO's initiative with the National Program for Control of Blindness (NPCB). Together they aim to eliminate avoidable childhood blindness (ABC) by 2020. To contribute to this mission, teachers have a high potential of being the first point of contact in the identification of suspected cases amongst students. This is also a major initiative under NPCB to set up comprehensive school screening programmes.

It is important to have innovative community-based strategies, one such being the training of teachers to understand student eye health. Identifying non-medical stakeholders from the community help bridge the gap that comes from the healthcare infrastructure and improve knowledge, awareness and perception of the community regarding eye health.

For this purpose, teachers can be one important point of contact when it comes to maintaining and intervening to promote eye health among children.

Saxena et al. (2015) conducted a study^[24] in Delhi with 10,000 school going children across different schools of Delhi. The study found that schools where non eye care personnel like teachers were trained to identify visual impairments or blindness showed good results. This also reduced the work of the eye care providers and promoted efficiency^[25]. The objective of the study was to do a comparative analysis of referrals between teachers and eyecare workers for subnormal vision for school students (aged 1-9 years) and establish a cut off for identification of subnormal vision among school going children. Results showed that teachers correctly referred students with sub-optimal vision with a 93.3% specificity rate with 6.7% false positives.

This brings our focus to the fact that to identify the status of a student's eye health need not be a skill that is reserved for healthcare professionals. This knowledge can also be imparted to other professionals as well – especially teachers who interact with students more frequently in an environment of continuous learning.

2.3.1. Teachers as Eye Health advocates - Other advantages

Teachers can not only help in easing the burden of dearth of human resource availability for eye care, but they are also a cost-effective option^[26], compared with trained health worker or an optometrist as alternatives. Teachers can also effectively motivate parents and children for regular eye check-up visits and ensure the use of spectacles and other safe eye care habits. Positive encouragement along with acceptance on behalf of the teacher Positive encouragement and acceptance by the teacher can help reduce any possible ostracising or ridicule faced by children for wearing glasses or showing other visible symptoms of eye problems in school.

Hence, a sense of sensitivity can also be instilled among students. However, it is important to provide regular training and refresher courses to teachers to enhance their knowledge and understanding of eye health and related issues, along with maintaining motivational levels and for teachers to not consider this as an additional workload.



3. Children and the Digital World

The American Academy of Ophthalmology (2018) said there is an increase in strain and dryness of the eyes of children because of increase in screen time. Common problems that occur in children due to this include headaches, blurry vision. Electronic devices have high-energy, short wavelength, blue and violet light emanating from it. This may affect vision and may also lead to premature aging of the eyes. Increased exposure to blue light can result in eye strain and discomfort, leading to serious conditions such as Age-related Macular Degeneration (AMD) that can cause blindness.

Dubey et al. (2018) conducted an assessment^[27] on among adolescents of urban resettlement colonies of Delhi. The results showed that 68% of adolescents use screen-based media for more than 2h/day (apart from sleeping, spent maximum of their time engaged with media, which on average came out to be 7h/day), which is higher than the recommended screen time by American Academy of Paediatrics.

The American Academy of Paediatrics recommends that screen time (i.e., the time spent as sedentary behaviour that involves screen-based media, watching television, using computers and smartphones, or playing video games) should not be more than 2h/day for age groups above 2 years. This percentage is higher than the data found in previous studies conducted in India and in other countries according to a multicentre study done by LeBlanc et al^[28].



SCREEN TIME GUIDELINES BY AGE

As recommended by World Health Organization (WHO)

Source: Eye Promise, 2020.

Available from: <https://www.eyepromise.com/blog/screen-time-chart/>

Under 18 months old

No recommended screen time - can video chat with relatives and family under the supervision of a guardian.

Infants - 18 months to 24

Little to no screen time

- A critical development stage and hence, proactive measures towards physical and creative interactions and activities.
- If at all screen time is required, then limit it to <1 hour.

Preschooler - 3-5 years of age

Recommended up to 1 hour per day

- Plan TV time in advance. Discourage the use of screen-based media as a 'distraction'.
- Encourage dependence on print-based media such as books, toys, games that may help children engage with on-screen characters off screen.

Elementary School - 6-10 years of age

Recommended up to 1.5 hours a day

- Demarcate consistent time limits on screen-based media use and the type of media.
- Develop tech-skills by balancing creative and laid-back time.
- Ensure media usage doesn't overlap with adequate sleep, physical activities and other essential behavioural development.

Middle School – 11-13 years of age

Recommended up to 2 hours per day

- Children are better placed to understand the concept of balance. Parents may take a judgement call on how to fit screen time with other activities.
- If children are found to be addicted to a certain video game/tv show, parents are requested to have an open conversation to understand and explain harmful effects to children.

With the outbreak of COVID-19 pandemic, there has been a further increase in screen time due to a shift to remote learning models. Data tell us that approximately 32 crore learners halted their moves to schools/colleges. The national lockdown and COVID-19 safety measures pre-empted all educational activities in India. The impact has served as a catalyst for the sector to adapt to alternative modes for continued learning during the pandemic. The approach, hence, has been to digitise education and reach learners in an online mode. While this has opened new opportunities such as strengthening their technological knowledge and infrastructure, it has also translated into more screen time for the students.

A survey conducted by Times of India in July 2020^[29] sought to capture responses of school students to understand what the impact of this increased screen time and sitting before devices has been on their health. Common complaints include pain and swelling in the eyes, headaches, eye dryness and irritation and bad reading postures. These complaints are supported by paediatric ophthalmologists as well. Students who excessively keep gadgets in close range to the eyes can affect their eye muscles leading to blurring of vision. Suggestions for alternatives by medical professionals have been to use desktops to reduce prolonged reading on small screens (such as mobile phones) from a close range. However, not all students have the luxury to have access to bigger screens for online learning.

3.2. 'PRAGYATA' Guidelines on Digital Education

Ministry of Human Resource Development (MHRD) in 2020 announced guidelines for online classes amidst the COVID-19 pandemic. The guidelines have been created with the objective of enhancing the quality of online education and by ensuring students receive maximum benefit from it.

There are eight steps highlighted in the PRAGYATA guidelines that include: Plan-Review-Arrange-Guide-Yak (talk)-Assign-Track-Appreciate. These emphasise on the planning of the online classes and implementation of digital education. The HRD Ministry also suggests a cap on screen time while conducting online classes for the students^[30] -

- Pre-primary students should have online classes for at-most 30 minutes a day.
- Students from class 1st to class 8th should not have more than two online sessions of up to 45 minutes each in one day.
- Students of class 9th to class 12th should have up to four sessions for at-most 45 minutes each per day.

PRAGYATA guidelines also mention tips for parents and students on how to manage physical and mental wellbeing during online classes, and with increase of screen time and internet use.

PRAGYATA Guidelines for Parents and Students

Source: PRAGYATA Guidelines for Digital Education. Available from:
https://www.education.gov.in/sites/upload_files/mhrd/files/pragyata-guidelines_0.pdf



Physical, Mental Wellbeing

- Frequent interaction with students to check on their mental and physical wellbeing. **Be aware of any signs of anxiety, stress, anger, or any discomfort during online classes.**
- Check on any secretive behaviour of the child during online activities (deleting search history, using encryption software, quickly changing display screen when parent enters. **Have open discussion regarding internet usage and responsible online behaviour.**
- **Combining online time with offline activities** (games, physical activities, creative activities, etc).
- Do not force children to sit for longer durations in front of screens.

Safety Measures

- **Keep digital devices (TV, laptop), in common areas.** This can aid in restricting screen time and keep a check on online behaviour.
- **Identify digital rules** in consultation with children (screen-free areas in home, internet safety rules, duration of watching TV, surfing the web, etc.)
- **Discussion about responsible online behaviour** (not to post harmful messages online, not to post photos or videos of others without permission, etc).
- If parents see the necessity then may use **parental controls in devices and enable safe search in browsers.**
- **Educate children and oneself with cyber security measures.** Parents may refer to cyber security measures published by CBSE (http://cbseacademic.nic.in/web_material/Manuals/Cyber_Safety_Manual.pdf).



Balance Online and Offline Activities

- **Create and maintain schedules** for sleep, food, internet usage for learning and usage for socialising and other activities.
- Include offline reading of books, and other physical and creative activities alongside online classes.
- Take notes during offline classes and do an offline review of them.
- **Keep restrictions** on surfing and **regulate screen time** for scrolling/reading information on different issue. **Secondary students should try and not exceed more than 2 hours.**
- **Take small breaks** during online activities (stand up and move, quick indoor walk, stretches and deep breathing, catching up with family members).
- Avoid using the mobile or internet 40 minutes prior to going to bed.

Safety and Ethical Protocols

- Prior permission from parents before sharing any personal information on the internet.
- Be aware of cyber bullying and don't indulge in the same.
- Ensure responsible internet behaviour.

4. About the Research Study

4.1. Rationale of the Study

Given the fact that most visual impairments are avoidable and treatable, it becomes even more important to identify and intervene early. If it goes unchecked, it may severely dampen the child's learning abilities. Low vision can result in low motivation, limited social interaction and reduced learning abilities. This can undermine mental health and create disabilities for life that otherwise are avoidable with preventive intervention.

Teachers observe the student's learning patterns more closely – a child may hold the book too close to their face that may suggest a sign of a vision problem; a child may easily confuse themselves as they find it hard to pick up on visual cues and this occurs frequently; a child may struggle to understand body language due to an underlying visual health concern that may have adverse effect on the child's social life^[31].

Teachers may not always come with the training or understanding of identifying children who may have a visual impairment. This becomes more pertinent in that context to equip teachers with the knowledge to help identify such students at an early stage and connect them with the most immediate eye health services. The first step to this is to understand what is the existing perception that teachers have with respect to the children's eye health and how can we build upon that knowledge to adapt it to a skill set for identification. This becomes important because data shows that 50% of all childhood blindness in India is preventable or treatable^[32].

4.2. Research Question

What is the perception, the level of knowledge, and awareness of primary school teachers regarding student's eye health? Through this research question, current understanding of the teachers, the implications and preparedness of addressing student's eye health is assessed.

This study also analysed the preparedness of teachers to understand student's eye health and correct eye health practices with increase in screen time as new models of online learning becomes the new normal. This helped exploring the impact of longer-term screen time on eye health and the remedial measures that will be required.

4.3. Objective(s) of the study

Tech Mahindra Foundation leveraged its experience in in-service teacher capacity building programs. The Foundation works with 12,000 teachers as part of its flagship in-house teacher capacity building programme that helps build a cadre of innovative and motivated school teachers who can create a more conducive and interactive learning environment in schools. The Foundation believes in creating happier and safer classrooms. Hence, it is important to identify all change agents that may contribute to the cause. Keeping this in mind, this survey has been conducted to understand how the teaching community can play a key role in creating safer classrooms for all students. This research paper would help us build on the existing opportunity by further empowering these teachers with the ability to identify and take the crucial preventive steps to avoid childhood blindness and other visual disabilities.

Hence, through this study, we investigated:

- The current perception, knowledge, and awareness levels of primary school teachers regarding the eye health of students.
- How the increase in screen time is affecting eye health of students with education being adapted to the online mode.
- How does the current knowledge, perception and understanding influence the teacher's approach to eye health problems amongst the children in their class.

5. Tools and Methodology

This research is conducted in Delhi by the Research, Monitoring & Evaluation unit of Tech Mahindra Foundation. We chose Delhi because at present, there are not many studies conducted to understand community awareness of eye health of children. Maximum studies from the limited pool are done in South India. Delhi gave us an adequate representation of government school teachers belonging to different socio-demographic data.

The sample cohort included government primary school teachers. Approximately 7% of the sample of teachers is considered for the purpose of this study. Purposive random sampling technique was used to select different government schools. This sampling technique is chosen based on prior research permissions received from gatekeepers from specific areas. Simple random technique is used to identify primary school teachers. All pre-school and primary level (up to grade 5) are invited to participate in the study.

5.1. Preparation of Questionnaire

The questionnaire was prepared as an online survey form as all schools remained closed due to the COVID-19 pandemic. The survey form included questions that aimed to understand the perception, knowledge and understanding of teachers. The questionnaire was then checked for content validity by public health professionals. In total, there were 21 items (perception 5, knowledge 8, awareness, 8). The items of questions sought to understand the respondent's understanding of common eye diseases among children; safe eye health practices; symptoms to observe in classrooms (e.g., reading ability, watery eyes, squinting, participation in activities, academic performance); prevention methods.

The online survey was translated in Hindi. The respondents were given a choice to answer either the English or the Hindi survey. The survey was piloted with ~5% of the sample size. The revised questionnaire was shared with the respondents in a digital format as a mixed questionnaire.

5.2. Ethical Approval

Ethical approval was granted by the Research and Ethics Review Committee of Tech Mahindra Foundation. Relevant gatekeepers were approached to seek their approval to conduct a research study in their respective communities. Informed written consent form was obtained from all participants.

5.3. Data Collection

The data collection was conducted by the core research team. All survey forms were collected and coded to ensure anonymity of the respondents. Data were stored in password protected files only accessible to the core research team. Data were analysed using MS Excel and MAXQDA 11.

6. Analysis Process

Since the survey format was mixed in nature, for the subjective questions - common themes were identified and coded to describe the content.

The survey included variables such as age group (20-26, 27-41, 42-56, 57-75), gender, level of education (undergraduate, post graduate, professional courses), whether respondents ever had an eye disease, whether they have had any prior training, and if their relatives had an eye related problem.

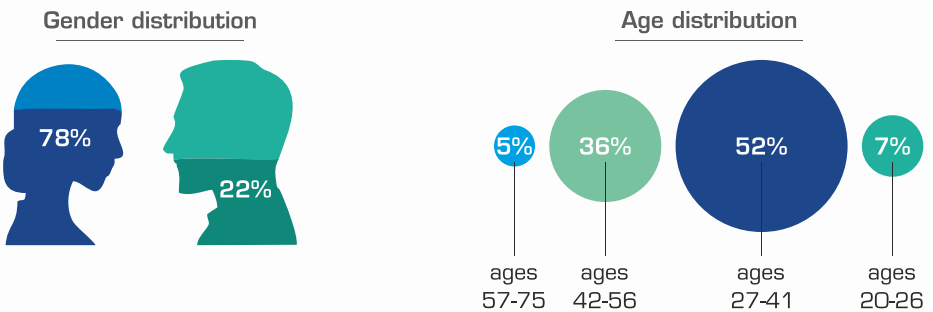
Individual questions were cross analysed based on gender, age, among respondents who suffer from eye related problems compared with those who've not had an eye related issue; those who have received prior training with those who haven't.

7. Key Findings

7.1. Demographic distribution of respondents - Gender and Age

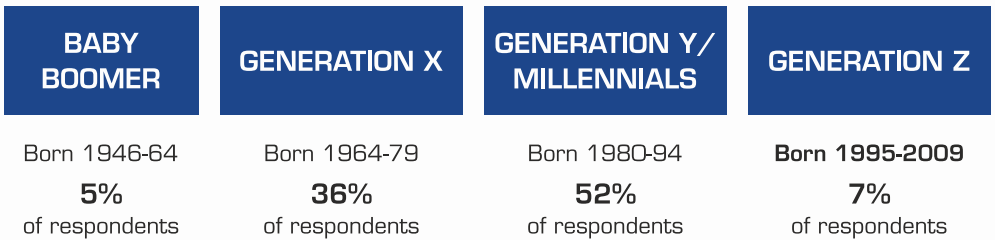
A total of 1,358 teachers participated in the study (78% females, and 22% males). The overall participation rate of teachers was 92 % (1,358 out of 1,477 teachers). Of the teachers, maximum teachers i.e., more than half the respondents (52%) belonged to the age group of 27-41 years, 36% belonged to the age group of 42-56 years, 7% to the age group of 20-26 years and the smallest percentage (5%) fell in the age group of 57-75 years (refer to figure 1).

Figure 1: Demographic distribution of respondents



The study analysed the teachers across different generations to understand whether there is any difference in their perception and approach to eye health and related habits. The generations identified are based on the characterisation given by McCrindle^[33]. According to this, the maximum respondents i.e., 52% of teachers belong to the 'Generation Y' or the 'Millennial' generation. 36% belong to 'Generation X', 7% belong to 'Generation Z', and 5% belong to the generation of 'Baby Boomer' (refer to fig 2).

Figure 2: Mapping respondents according to generations

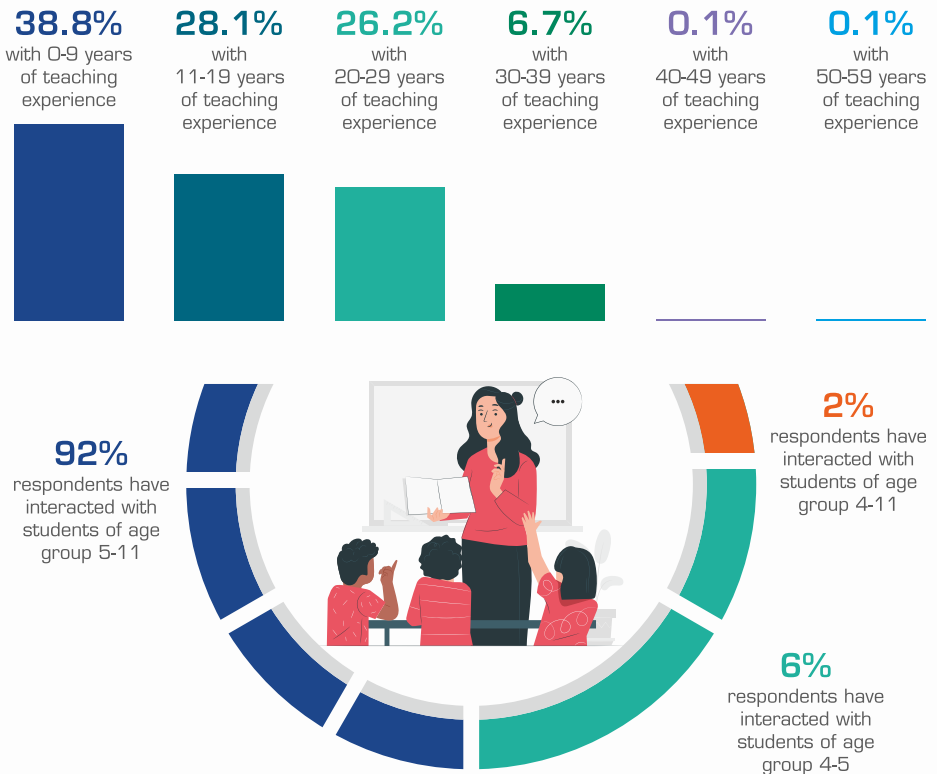


7.2. Years of Teaching Experience and the age-group of students the teachers have interacted with

Of all the teachers, maximum i.e., 38.8% have less than 10 years of teaching experience (≥ 0 years to $<$ than 10 years), followed by 28.1% with experience between 11 years - 19 years, 26.2% have teaching experience between 20 years- 29 years, 6.7% have an experience between 30 years – 39 years, and the rest 0.2% have a minimum teaching experience of 40 years and maximum of 59 years.

Among this cohort, every 9 out of 10 teachers (92%) have taught and interacted with students in the age group of 5-11 years. While 6% have interacted and taught students between 4-5 years of age, a smaller percentage of 2% have interacted with students across 4-11 years of age.

Figure 3: Years of teaching experience and teacher-student interactions



7.3. Teacher's history of eye condition related experiences

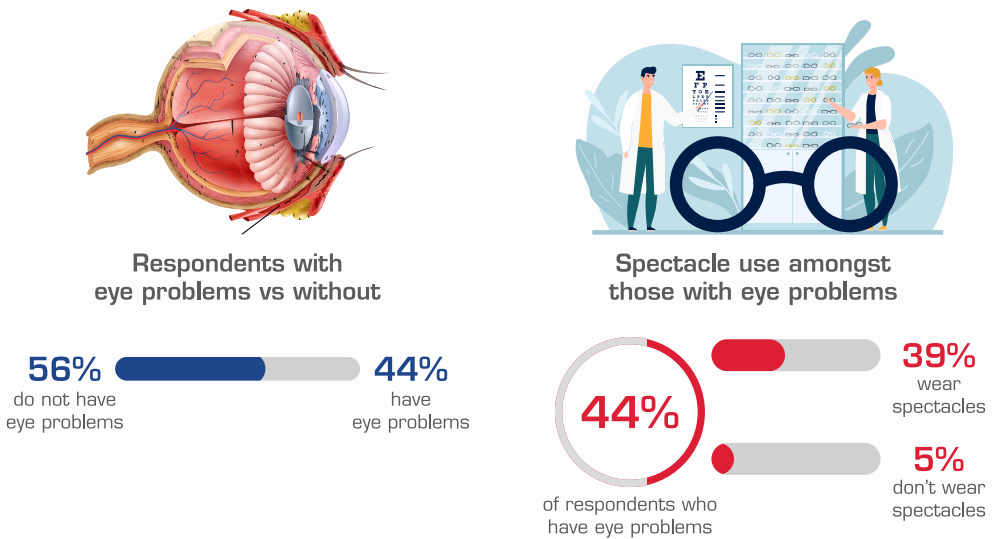
Teachers were asked whether they have any history of eye related problems, if they go for regular eye check-ups, their experience of knowing/living with people who have eye related problems and if the teachers have received any prior training in eye health and related practices.

(a) Relationship between Eye problems and Spectacle use among respondents

More than half the respondents (n=1029), i.e., 56% said that they do not suffer from any eye related problem, and 44% said that they have eye related problems (refer to figure 4).

Spectacle use amongst the respondents with eye related issues - Out of the 44% who have eye problems, 38% wear spectacles and 5% do not (refer to figure 4).

Figure 4: Relationship between eye problems and spectacle use among respondents



Hence, one of the dominant ways of addressing eye problem among respondents is through spectacle wear (as shown in figure 4).

This data is also consistent with the finding that the most common eye related problem that the Indian population faces is in the form of RE. RE is commonly addressed through spectacle usage. An article published by Arvind Panagariya in The Economic Times (last updated in 2019)^[34] analyses the importance of a mission like 'eyeglasses to all' in India. The article tells us that 550 million people use spectacles to correct refractive error, which is the most common eye problem in India. This reduces the ability of the eyes from focusing on objects clearly and resulting in conditions of hyperopia, presbyopia, astigmatism, and myopia.

(b) Relationship between regular eye check-ups and eye related problems among respondents -

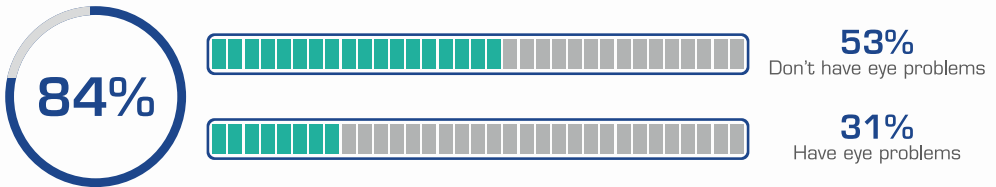
Of the total respondents (n=1358), maximum percentage of teachers i.e., 84% said that they have undergone eye exam(s) in the past and 16% said that they have never taken an eye exam (refer to figure 5).

Figure 5: Percentages of respondents who have had an eye exam before



Of all the teachers who have had an eye examination before (n=1136), 31% have said that they suffer from an eye related problem as compared to more than half the respondents (53%) who said that they do not have any eye problem (refer to figure 6).

Figure 6: Respondents who have had eye exam before and suffer from eye problems

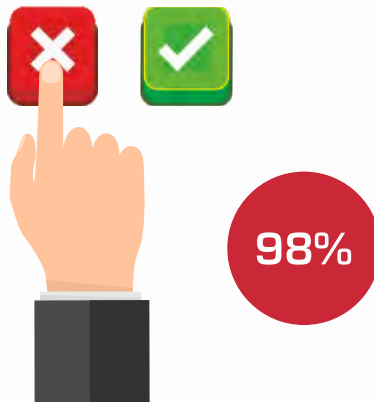


7.4. Past Training Experience

Respondents were asked whether they have taken any eye health related training in the past. The aim of asking this item of question was to understand whether previous training can have an influence on the respondents' baseline knowledge and understanding of eye health.

Out of all respondents (n=1358), almost all said that they have no past training in eye health or related domains (98%) [refer to figure 7].

Figure 7: Have you taken any training in eye health before?



Almost 100% respondents have not received any prior training, either through their schools or through any other platform.

7.5. Perception of respondents regarding eye health and related practices –

The items in this section analyse the perception of respondents regarding different eye health related practices. The question items either had respondents to choose from binary responses of Yes or No, or statements which were presented with Five-point Likert scale rating from 1 to 5, with 1 having the ‘least probability’ of a situation occurring and 5 having the ‘highest probability’.

a) Respondents’ perception of reasons contributing to development of eye related problems among children

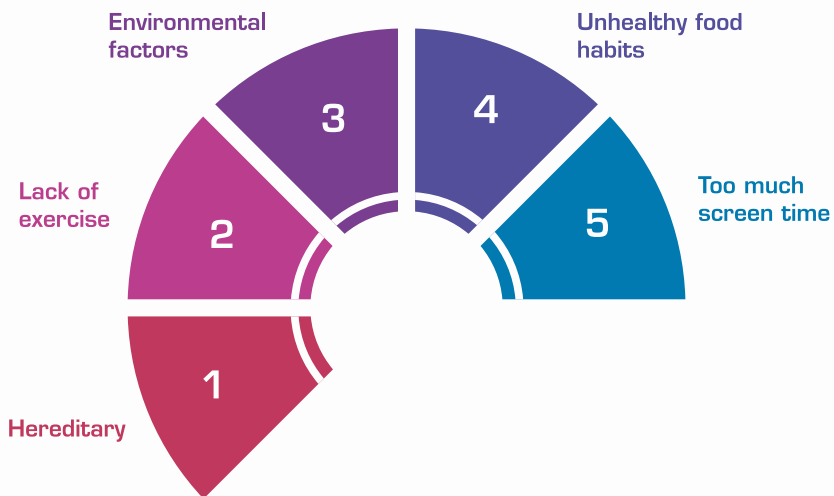
Respondents were provided with different factors that may contribute to the development of eye related issues among children. The respondents rated each of the factors against a 5-point scale Likert Scale with 1 being the “least probability” of a factor contributing, and 5 being the ‘highest probability’ of contributing to eye related issues among children.

The data received from the Likert-ranking has been analysed by identifying the ‘mode’, or the *most frequent response* under each factor.

i. Overall perception of respondents -

Respondents rated ‘too much screen time’ as the highest contributing factor among children in developing eye health problems, followed by unhealthy food habits, environmental factors, lack of exercise, and the least contributing factor was identified as ‘hereditary’ (refer to figure 8).

Figure 8: Overall perception of factors that contribute to developing eye health in children



While there is no conclusive research that clearly “ranks” risk factors, we analyse this item by looking at how different risk factors may put a child at a “higher risk” than the rest. Higher risk is defined as the probability of one factor becoming dominant in predisposing children towards eye related problems. The analysis has been further explained in the section 8 - Discussions and Interpretation.

ii. Generation wise analysis -

The study also cross tabulated the perception of different generations with what factors they perceive can contribute the most to the least to children’s eye health. The objective of this analysis was to understand whether there are differences in perception based on the age and generation the respondents belong to.

Figure 9: Perception of risk factors to eye health problems in children - Generation wise Analysis

Gen Z (1995-2009)

(Sample cohort: Age 20-26)



Gen Y/Millennial (1980-94)

(Sample cohort: Age 27-41)



Gen X (1964-94)

(Sample cohort: Age 42-56)



Baby Boomer (1946-64)

(Sample cohort: Age 57-75)



Figure 9 tells us that across generations, “too much screen time” has been rated at 5 - “highest probability” of contributing to eye problems in children. The least contributing factor across generations is seen to be ‘Hereditary’.

There is also a similarity of perception between Gen Z and Gen X. Both generations have said that screen time is the highest contributor towards eye problems in children, and rated rest of the factors at 3 (a neutral approach).

Millennial perception shows that the highest risk factor is screen time, followed by unhealthy food habits, environmental factors and lack of exercise and the least contributing factor as hereditary.

iii. Gender-wise analysis -

Another cross-tabulation analysis had gender as a variable component. The objective of this analysis is to understand perception differences between different genders. The two main genders identified by respondents are “females” and “males”.

7.6. Observation of teachers regarding eye problems across different school grades

Item of questions under this section aimed to understand whether teachers currently observe/look out for eye related symptoms among their students, and what is their current understanding of reasons behind student eye problems.

Figure 10: Overall Perception of risk factors to eye health problems in children - Gender wise Analysis

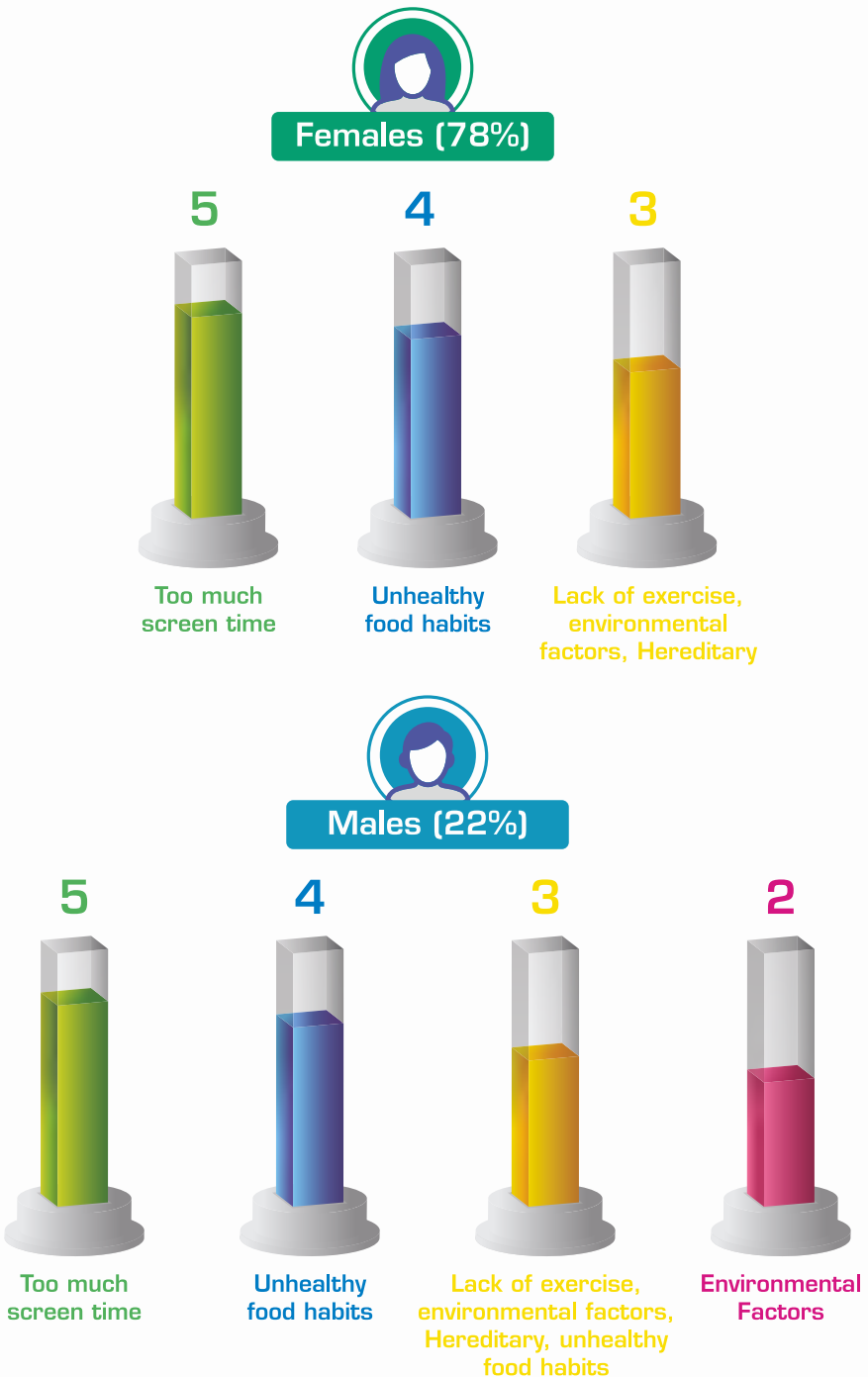


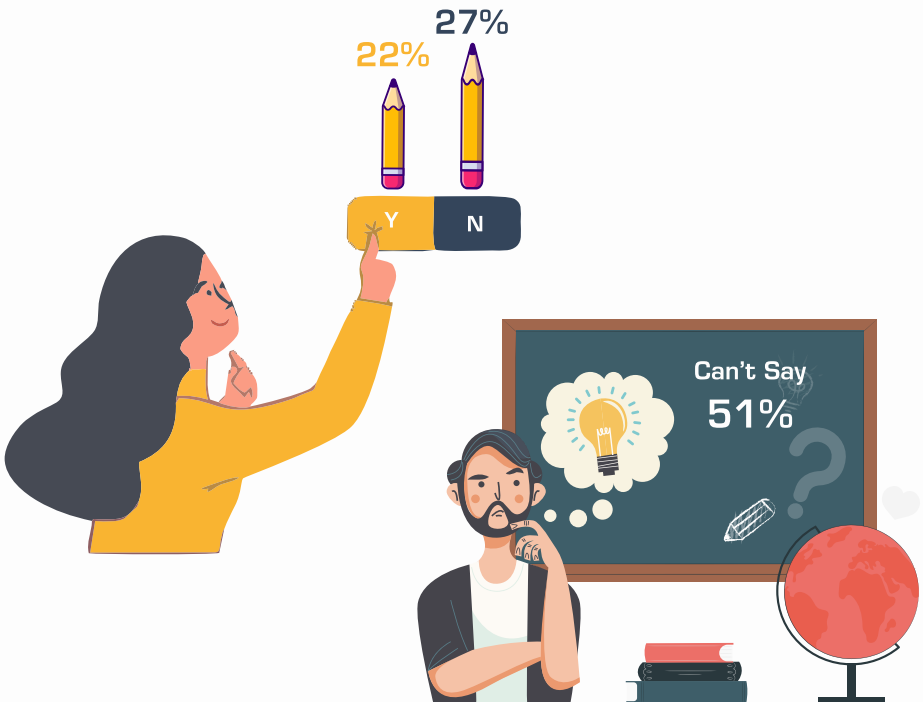
Figure 10 gives us a clear picture that both males and females believe “too much screen time” to be the highest contributing factor to child’s eye health issues. An interesting observation comes when we see the ‘4th ranking’ results – while female respondents said unhealthy food habits may be ranked at fourth, males did not rank any of the factors for the 4th position. Contrastingly, males have ranked unhealthy food habits at the 3rd position.

Another observation comes from the ranking of both genders for the 2nd place. While female respondents have not ranked any factor at the 2nd place, majority of male respondents have ranked ‘environmental factors’ at the 2nd place.

a) Whether teachers have observed eye related problems in students across different school grades

Teachers were asked if they have observed any eye related problems in students belonging to different school grades.

Figure 11: If teachers have noticed eye problems across different school grades

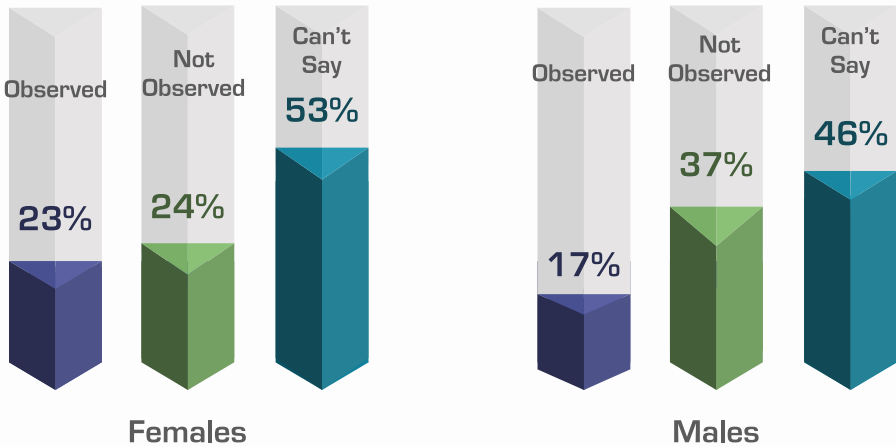


According to figure 11, almost half the teachers (51%) responded that they are not sure whether they have observed any eye problems in students. Little over one-fifth of teachers said that they have observed (22%) and 27% have said they haven't. This gives us an important observation. Close to 50% of teachers are not aware and/or observant about the status of eye health of their students.

b) Gender-wise analysis of whether teachers have observed any eye related issues in students across different grades

The data points were cross tabulated against the 'gender' variable to identify any differences between male and female teacher respondents.

Figure 12: Gender wise analysis of whether teachers have observed eye related problems among students across different grades



When we analyse the responses from male and female teachers, we find the following differences-

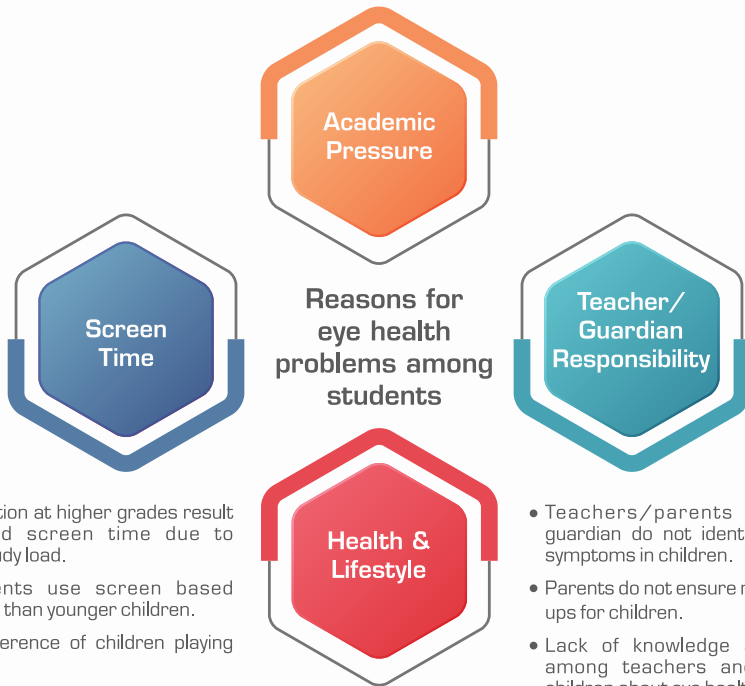
- i. Difference between female teachers who have observed vs who haven't – the percentage difference isn't very high (23%, and 24% respectively). However, more than half the female teachers have said that they are not sure.
- ii. There is a stark percentage difference between male teachers who have said yes i.e., less than one-fifth of respondents (17%) vs those who said they haven't i.e., over one third of respondents (37%). Over two-fifths of male teachers have responded that they are not sure.

c) Reasons for eye problems across different school grades - Respondents' perception

Respondents were asked to share different reasons according to them that may be contributing to eye health problems in children across different grades. The responses were coded based on different themes to understand different perceptions. Following are the themes that emerged -

Figure 13: Reasons for eye health problems in students according to respondents

Increase in syllabus for students as they go to higher grades, may lead to increase in eye exhaustion and problems.



- Online education at higher grades result in increased screen time due to increased study load.
- Elder students use screen based devices more than younger children.
- Parents preference of children playing indoors.
- Higher income groups may find children with more screen time.

- Teachers/parents or the child's guardian do not identify early warning symptoms in children.
- Parents do not ensure regular eye check ups for children.
- Lack of knowledge and awareness among teachers and guardians of children about eye health problems.

- Lack of proper rest and bad posture.
- Improper dietary habits.
- Lack of knowledge regarding eye health.
- Lack of exercises.
- Lower income groups may find children with lack of nutrition and improper diet.

Figure 13 gives us a picture of the different reasons cited by teacher respondents. Certain reasons shared by respondents such as increase in screen time, effects of online education, lack of knowledge and understanding of parents and teachers, can be supported by secondary literature and evidence. However, we also found that teachers have also cited 'income groups' as a determining factor that may be determining the eye health of the child. This section is further discussed under Section 8 of this paper.

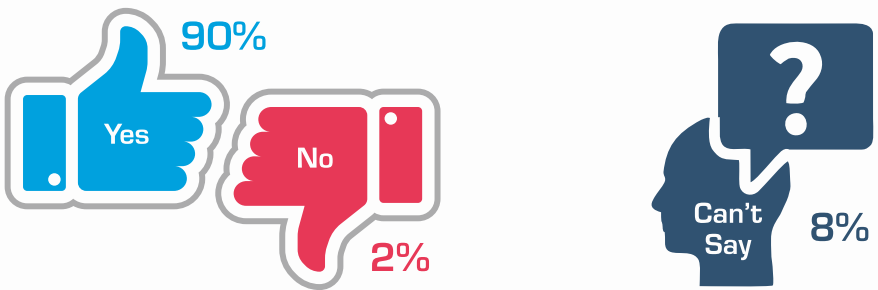
7.7. Awareness about eye hygiene and related practices

This item of questioning involved asking respondents their perception regarding maintaining eye hygiene and whether they are aware of certain hygienic practices to maintain healthy eye health.

a) Do respondents believe in knowing about eye hygiene and related practices?

Respondents were asked if it is important to be aware about eye hygiene and related practices.

Figure 14: Do respondents believe in knowing about eye hygiene and related practices?



According to figure 14, majority of respondents (90%) believe that it is important to know about eye hygiene and related practices, 8% (105 respondents) said that they can't say and 2% (35 respondents) said that they don't feel it is important to know.

While the percentage may be on the lower side, it is still important to highlight that certain proportion of the sample still either don't believe in taking care of eyes or they are unsure about it. If people are not aware of the importance of taking care of eye health, it may contribute to underlined risk factors associated to eye problems or lead to eye issues among children. If we are talking about identifying catalysts such as teachers to spread knowledge, awareness and identifying symptoms in children – it is important to also ensure that teachers themselves are aware, understand the importance, and implement safe eye health practices.

b) Safe eye health practices according to respondents

Those who said it is important to know about eye hygiene and practices were further asked to elaborate on such practices according to their current knowledge and perception that can be done in schools.

Figure 15: Safe eye health practices to include in schools according to respondents

HOW CAN SCHOOLS ENSURE SAFE EYE HEALTH

Teacher's Perspective

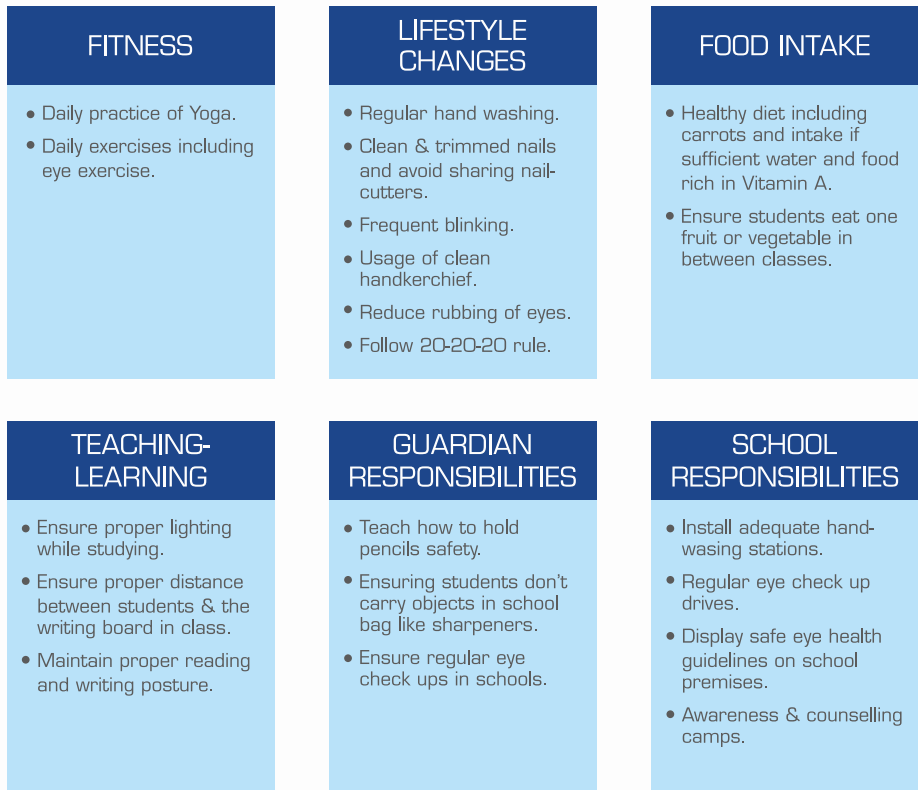


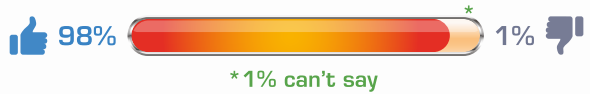
Figure 15 gives us a map of all safe eye health practices that respondents believe can be included in schools to ensure safe eye health among children.

7.8. Responses on perception statements

This item of questioning involved sharing certain statements regarding eye health and practices in a yes/or no/or can't say format. The respondents chose the most appropriate response according to their knowledge and perception. The inferences of the below responses are discussed in detail in Section 8 of this paper.



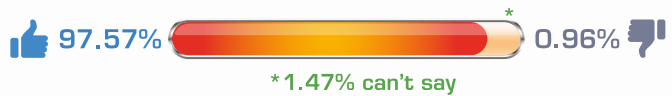
“Sitting close to the TV or increased screen time can hurt the eyes”



Maximum respondents i.e., close to 100% believe that sitting close to the TV or increased screen time can hurt the eyes.



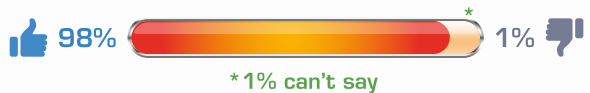
“Reading in dim light leads to reduced vision”



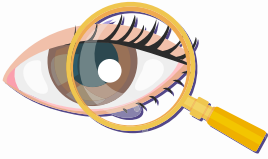
Majority of respondents (97.57%) believe that reading in dim light leads to reduced vision.



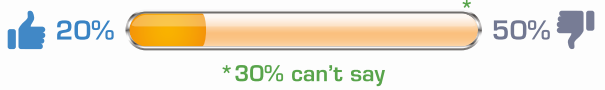
“Vitamin A is an important nutrient to maintain eye health”



Almost all respondents (98%) believe that Vitamin A is an important nutrient to maintain eye health.



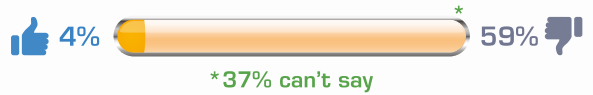
“It is true that there is no harm in blowing off objects from other people’s eyes”



The response to this statement shows significant percentage differences. Half the respondents believe that it is harmful to blow off objects from other people’s eyes. Whereas 20% of respondents believe it is not harmful. However, 30% say they can’t say.



“We cannot prevent any blindness”

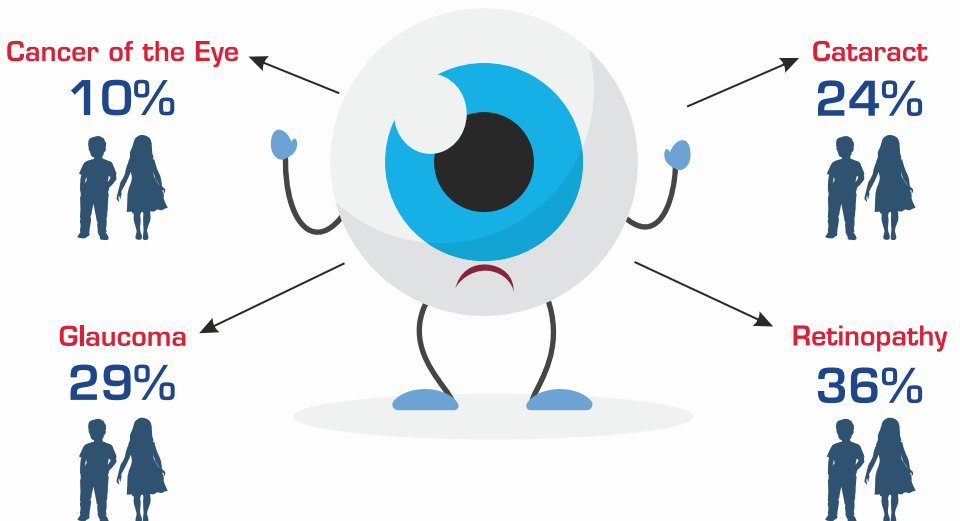


More than half the respondents believe that blindness may be prevented (59%).

7.9. Eye Diseases in Children

This item of questioning presented different eye health diseases and asked respondents to identify which diseases occur among children.

Figure 16: What eye diseases occur in children according to respondents



The overall picture (figure 16) tells us that maximum percentage of respondents i.e., 36% chose 'Retinopathy' amongst all options, followed by Glaucoma at 29%, then Cataract at 24% and the least percentage went to Cancer of the Eye, at 10%. Hence, Retinopathy in children is the most popular eye health disease that respondents are familiar with, and Cancer of the eye in children is the least known condition among respondents.

7.10. Awareness of respondents regarding eye-health of students and related practices –

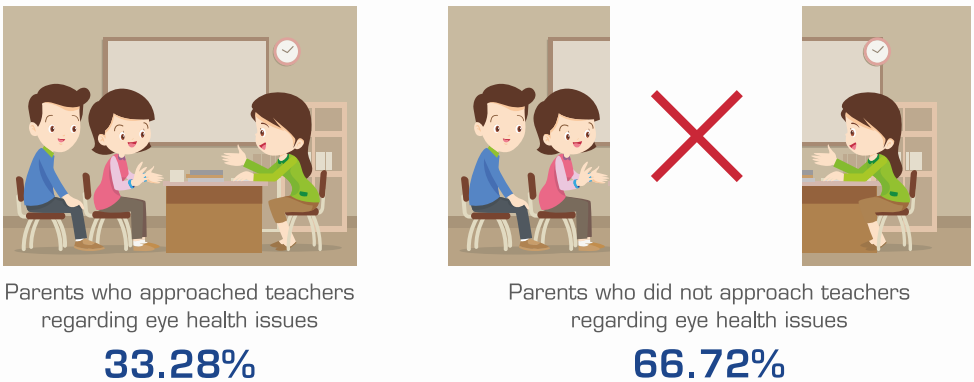
This item of questioning focused on understanding the current awareness levels of teacher respondents about eye-health and practices and their level of communication regarding possible eye health related issues with students'

a) Parents approaching teachers regarding eye problems of their children-

This study also analysed the parent-teacher interaction when it comes to discussing eye health of their children/students along with how parents handle their child's eye-health, including the action they take after noticing it.

The teacher respondents were asked if parents had approached them regarding their child's eye-health (figure 17).

Figure 17: Parents approaching teachers for their child's eye-health



According to figure 17, 1 out of every 3 parent(s) (33.28%) has approached the respondent teachers regarding eye problems noticed in their children whereas a majority of 66.72% parents have not approached the teachers regarding the eye health issues of their child. The reasons for less reported cases could be due to the negligence of parents, or lack of awareness about eye-health issues. Or not sure about going to teachers for the issue/ no health check-up at the schools etc.

b) Parents approaching teachers regarding eye problems of their children - Gender Wise Analysis

A gender wise analysis was also done to understand the approachability of parents to teachers (as shown in figure 18).

Figure 18: Parents Approaching Female Teachers Vs Male Teachers for their Child's Eye-Health

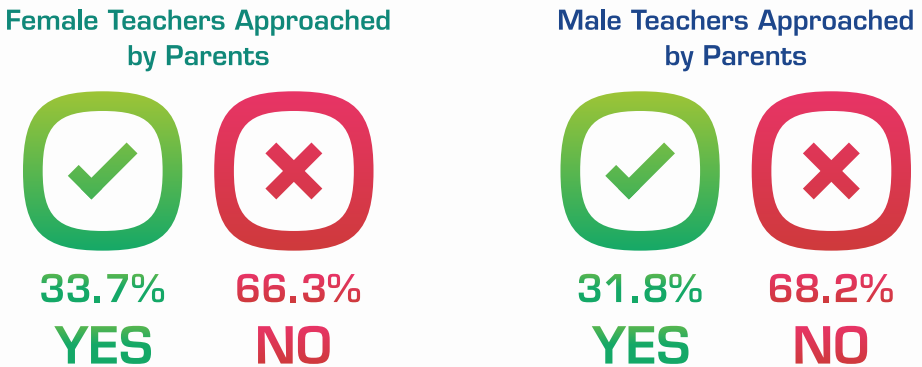
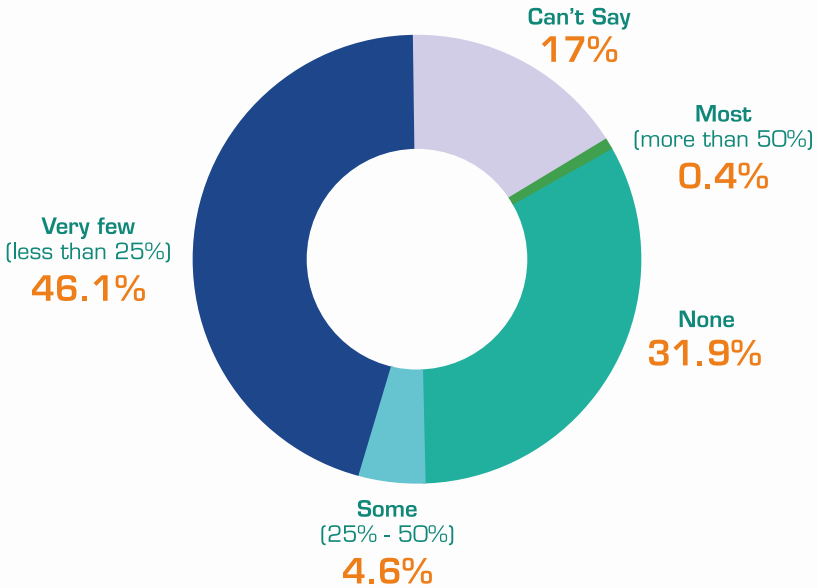


Figure 18 shows that 33.7% of the total female respondents (n=1053) were approached by parents to report the eye-health issues of their child whereas 31.8% of the total male respondents (n=305) were approached by parents to report the eye-health issues of their child. While this is not a considerable difference, a comparatively higher percentage of parents have been found to approach female teachers as compared to male teachers.

b) Whether teachers have observed eye problems in students in their classrooms

Respondents were asked about the percentage of students who have eye related problems in their classrooms. The percentages were described in the following manner - 'None' i.e., teachers have not observed any student with eye related problems, 'very few' i.e., if teachers have observed eye related problems in less than 25% of students, 'Some' i.e., teachers have observed eye problems in more than 25% but less than 50% of students and 'Most' i.e., teachers have observed eye problems in more than 50% of students.

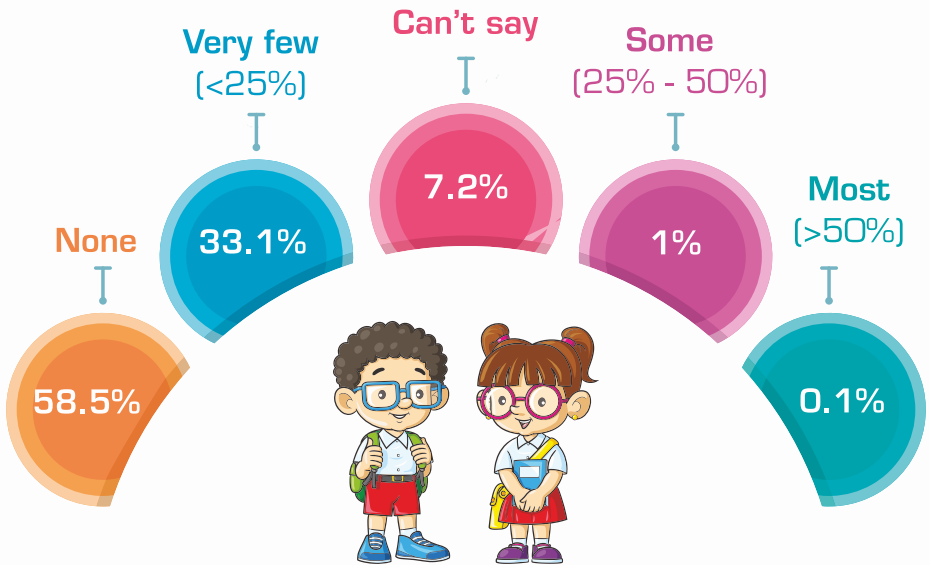
Figure 19: Percentage of students with eye problems in classrooms



According to Figure 19, an exceedingly small percentage of teachers, i.e., 0.37% reported to have noticed that most of their students (more than 50%) with eye related problems, about 50% respondents have noticed less than 50% students having eye problems, whereas 31.9% of respondents have not noticed any child having eye problems in their class. A concerning percentage of 17% teachers are not aware about the existing eye problems in students of their respective classes.

To understand how many students wear eye glasses as a corrective measure to address their current eye problems, the study also analysed the percentage of students who wear eyeglasses in the respondents' classrooms (refer to figure 20).

Figure 20: Percentage of children wearing eye-glasses in classrooms of teachers



According to figure 20, approximately one out of 100 teachers have reported having over 25% students wearing eye glasses in their class (1%). Nearly 6 out of 10 teachers have reported having no student wearing eye glasses in their class (58.5%). Around 7 out of 100 teachers (7.2%) are not aware about the number of students wearing eye glasses in their class.

The study also cross tabulated teachers who themselves wear eye glasses with respect to them reporting cases of students in their classrooms with eye related problems. This was done in order to find out if the teachers wearing eye-glasses, who already have undergone the process of eye-health check-up and hence being more aware of eye-health issues, influence the number of eye-health issue cases being identified and reported in schools. The findings are shown in figure 21.

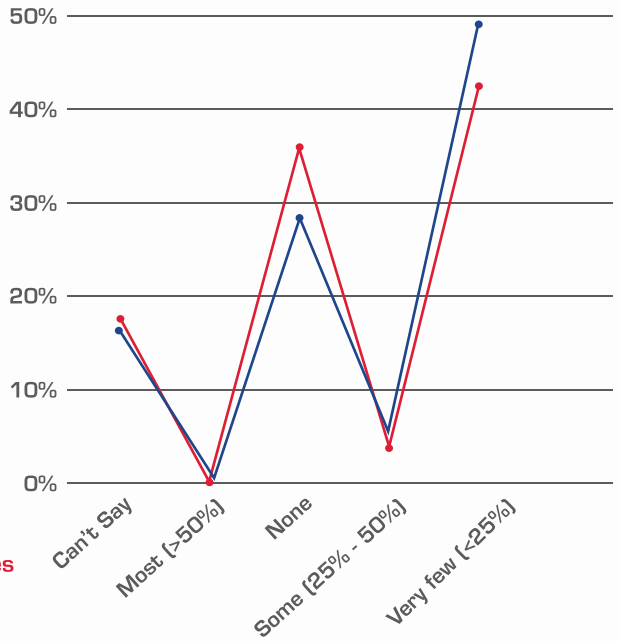
Figure 21: Eye-health issue cases in children reported by teachers who wear eye-glasses and those who do not wear eye glasses

Reported cases of children with eye problems with respect to respondents wearing eye-glasses and not wearing eyeglasses.

Codes:

Teachers Wearing Eye-Glasses

Teachers not Wearing Eye-Glasses



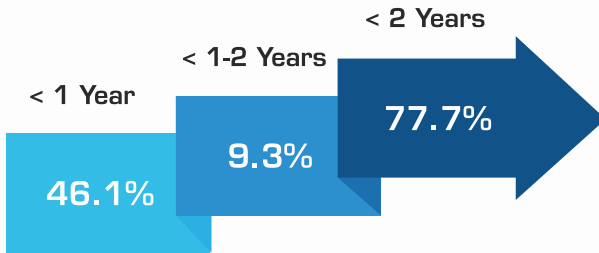
Eye problems were mostly reported by teacher respondents wearing spectacles. The study reflected that 5.26% of respondents who wear spectacles have noticed some (25% - 50%) of students with eye-problems as compared to 3.94% of respondents who do not wear spectacles. 49.24% respondents wearing spectacles have noticed less than 50% students having eye problems as compared to 42.52% of respondents not wearing spectacles.

28.35% respondents wearing spectacles have not noticed any child having eye problems in their class as compared to 35.91% of respondents not wearing spectacles. 16.46% respondents wearing spectacles are not aware of the existing eye problems in students of their respective classes as compared to 17.64% of total respondents not wearing spectacles. Very few respondents who wear eye glasses have reported to have noticed more than 50% children in their class with eye related problems.

Further analysis showed that respondents who have been wearing spectacles for over two years have identified a greater number of students having eye related issues (figure 22).

Figure 22: Reported cases of children with eye problems with respect to the duration of eye-glasses worn by teachers

REPORTED CASES OF CHILDREN WITH EYE PROBLEMS WITH RESPECT TO THE DURATION OF EYE-GLASSES WORN BY RESPONDENTS



On comparing the number of cases reported by respondents wearing spectacles, the study found that respondents wearing spectacles for more than 2 years have identified maximum number of students (77.32%) with eye problems. Respondents wearing spectacles for 1-2 years have identified 9.3% of total cases of students with eye problems. Teachers wearing spectacles for less than a year have identified 13.4% of total cases of students with eye problems.



c) What kind of eye related symptoms and issues have teachers observed in their students?

This item of questioning involved asking respondents the kind of eye related problems and symptoms they have observed in their students. Based on some of the common eye-related issues observed in school children, the study also provided the following list to respondents and asked them to provide their information about students of their respective classes.



Watery eyes



Redness in eyes



Squinting



Constant rubbing of eyes



Frequent headaches



Seeing double



Itching, burning, heavy discharge in eyes



Holding reading material close to the face



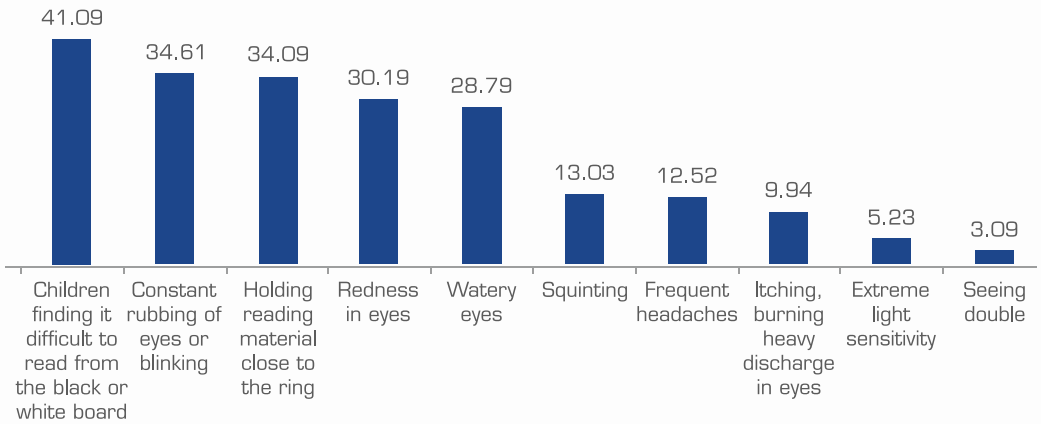
Children finding it difficult to read from the black or white board



Extreme light sensitivity

The respondents were also asked to add any other eye-related issues in students that they may have observed.

Figure 23: Types of eye-related issues and symptoms observed in children by teachers (in %age)



According to figure 23, 4 out of 10 students with eye have difficulty reading from the chalkboard. Nearly 34 percent students were found to have issues such as constant rubbing of eyes or blinking and holding reading writing material close to their face. The other major eye-related issues are occurrence of redness in eyes (30.19%) and watery eyes (28.79%) in students. Nearly 1 out of 10 students are reported facing eye-related issues such as squinting, frequent headaches, itching and burning of eyes. Extreme light sensitivity (5.23%), seeing double (3.09%) and dryness of eyes have been rarely reported by respondents.

d) Measures taken by teachers on identifying eye-related issues in students

The respondents were asked if they had taken any measures after detecting the eye-related issues in students. If yes, then what kind of measures did they take.

Measures taken by respondents regarding students' eye-health issues in descending order of their percentage are presented in figure 24.

Figure 24: Measures taken by respondents regarding students' eye-health issues

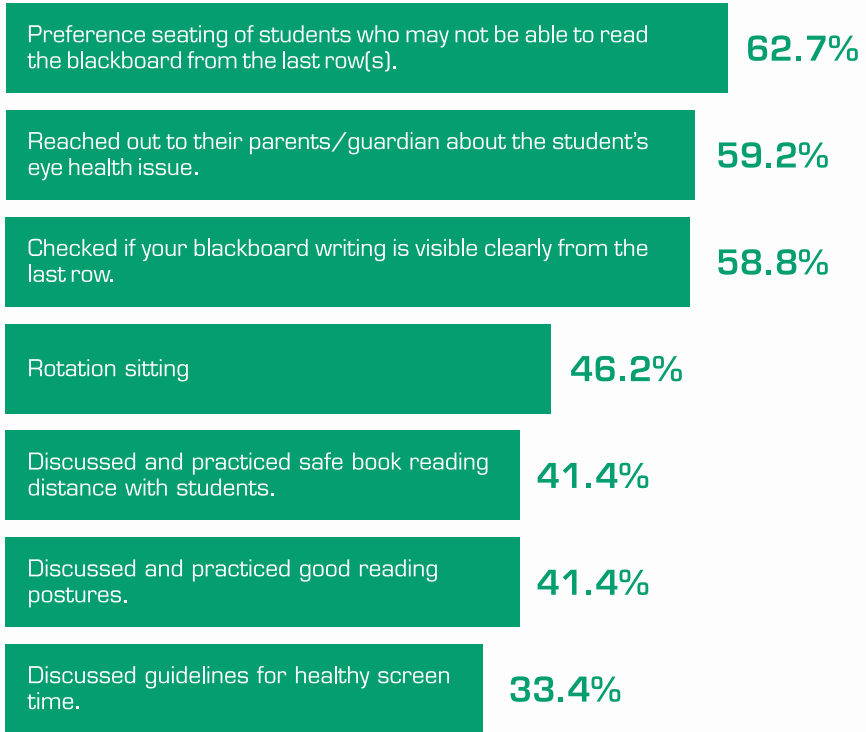


Figure 24 reflects that majority of respondents (over 50%) took the following measures.

- Preference seating of students who may not be able to read the blackboard from the last row(s) (62.7%),
- Reach out to their parents/guardian about the student's eye health issue (59.2%).
- Checked if your blackboard writing is visible clearly from the last row (58.8%).

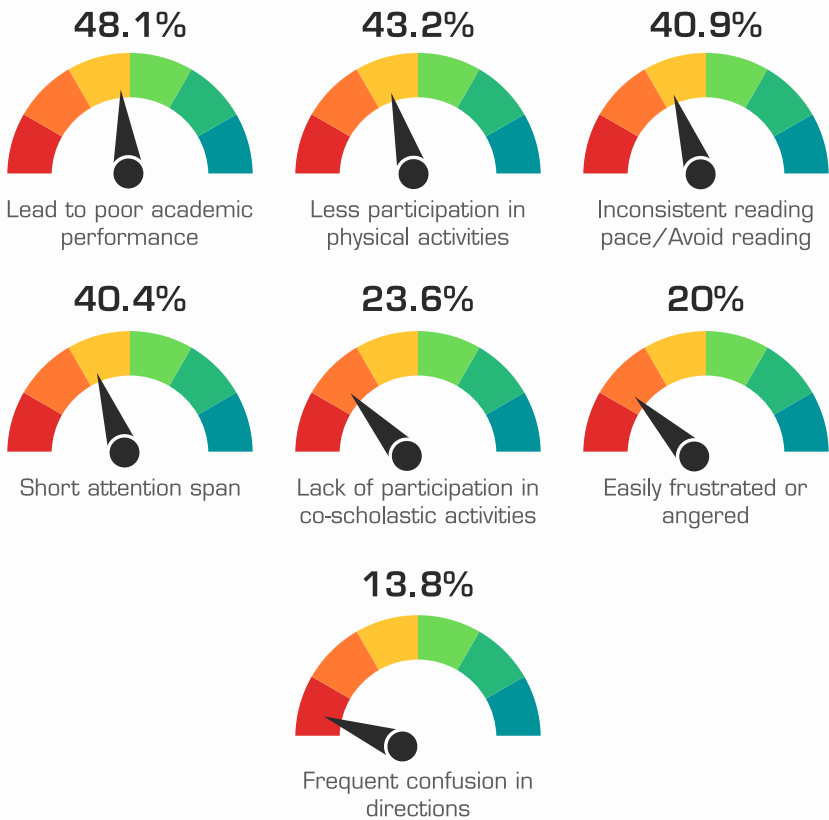
46.2% respondents took 'rotation sitting' as a measure to respond to students' eye health issues. Nearly 2 out of every 5 respondents (41%) discussed and practised safe book reading distance and good reading postures with students.

Other measures that were taken by the respondents were regular eye check-up, washing eyes with clean, cold water, providing offline assignments instead of online assignments, social distancing, ensuring provision of healthy diet in school, informing school authorities and seeking better infrastructure.

e) Socio-academic related issues faced by children who have eye related problems

Eye-health issues lead to many other issues in students which hampers their holistic development. Respondents were asked to mention the major issues faced by students due to eye-health issues.

Figure 25: Daily issues children face when suffering from eye-related diseases



According to the figure 25, nearly half the respondents believe that poor academic performance of child is the biggest issue that students face, 43.23% respondents consider inactive/less participation in games or physical activities as compared to others as the second major issue. Around 40% respondents believe that the next major issues are inconsistent reading pace/Avoid reading and reduced attention span of students.

Other issues mentioned by the respondents are lack of participation in co-scholastic activities (23.64%), easily frustrated or angered (20.03%), frequent confusion in directions (often confuses their left or right) (13.84%), holding reading material close to face.

f) Awareness regarding reading postures

The respondents were asked whether they were aware of the correct reading posture and the minimum distance of keeping a book while reading. The respondents who were aware of it, were further asked to choose the correct reading posture out of the four different reading postures.

Figure 26: Teachers' knowledge regarding the correct reading posture

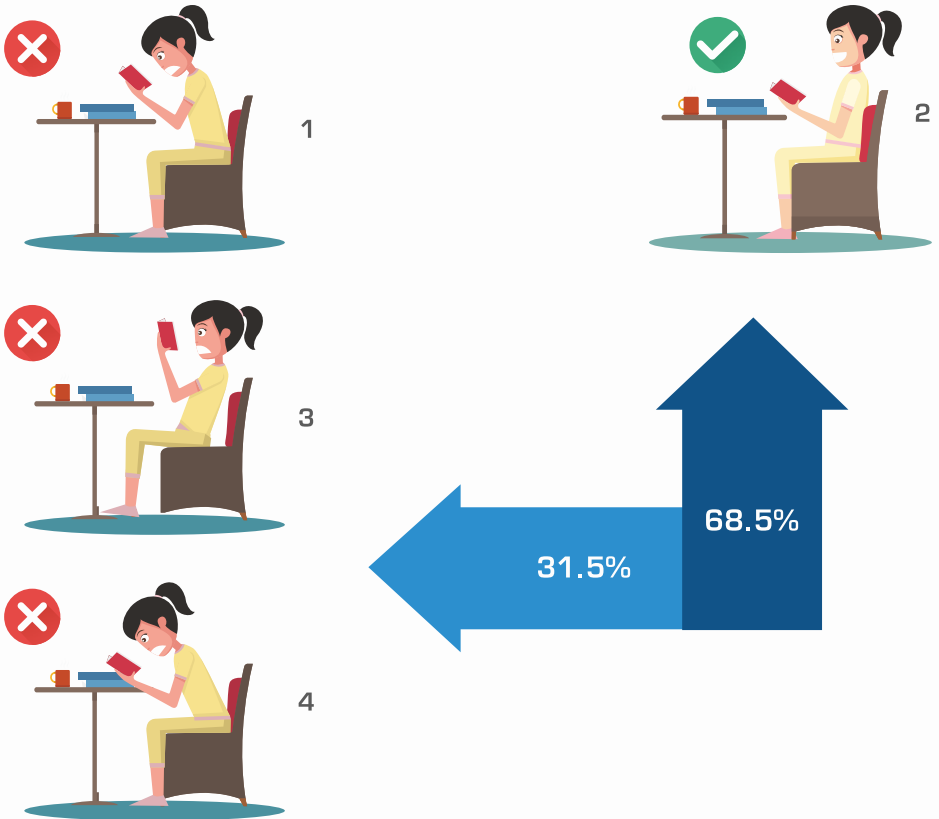
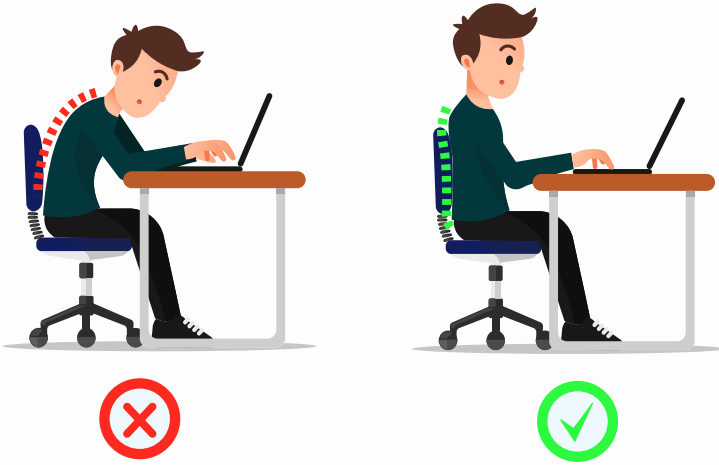


Figure 26 shows that nearly 7 in 10 respondents are aware of the correct reading posture (posture 2).

From figure 26, it is encouraging to see that maximum respondents (68.5%) are aware of the correct reading posture. The PRAGYATA guidelines mentions that the postures and practices a person adopts throughout the day while using digital devices can have a significant impact on one's health and well-being. Staying in the same posture for prolonged periods is undesirable. Besides, prolonged exposure to digital devices can have negative impacts on other aspects of health and wellbeing also.

The best posture while working on laptop recommended in the guidelines is shown below-

Figure 27: Best posture while working on laptop recommended in PRAGYATA guidelines

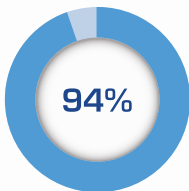


g) Nutritional understanding of teachers regarding eye health

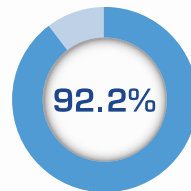
Figure 28: Percentage of teachers choosing healthy food items for eye health

Nutrition plays a crucial role in the eye health of a child. The awareness in respondents about food items that contribute to healthy eyesight is desired. They were asked to choose the food items that can help maintain and/or improve eye health.

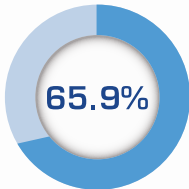
Carrots



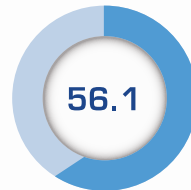
Green Leafy Vegetables



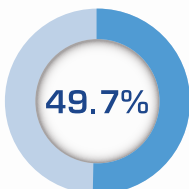
Nuts



Fish



Legumes



Eggs

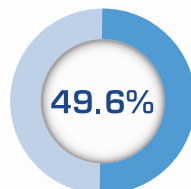
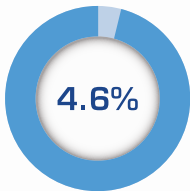
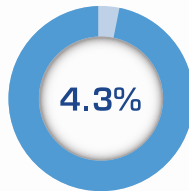
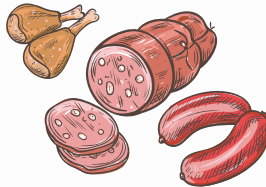


Figure 29: Percentage of teachers choosing food items unhealthy for the eye

Saturated Fats



Fatty Meat



White Bread

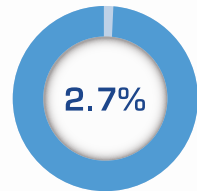
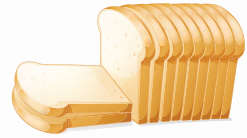


Figure 28 reveals that nearly 9 out of every 10 (94%) respondents consider carrots and green leafy vegetables to be healthy food items for eyes, nearly 6 out of 10 respondents consider fish and nuts to be healthy food items for eyes, whereas nearly 5 out of 10 respondents consider eggs and legumes to be healthy food items for eyes. Saturated fats, fatty meat and white bread have been least considered as healthy food items for eyes.

The data reflects that there is clarity among respondents over the unhealthy food items that can cause negative impact on eyesight, but many respondents are not aware that fish, eggs, legumes and nuts are healthy food items for good eye health.

Figure 29 shows that nearly 10% respondents have given incorrect responses and are unaware that food items such as saturated fats, fatty meat and white bread are unhealthy for eyes.

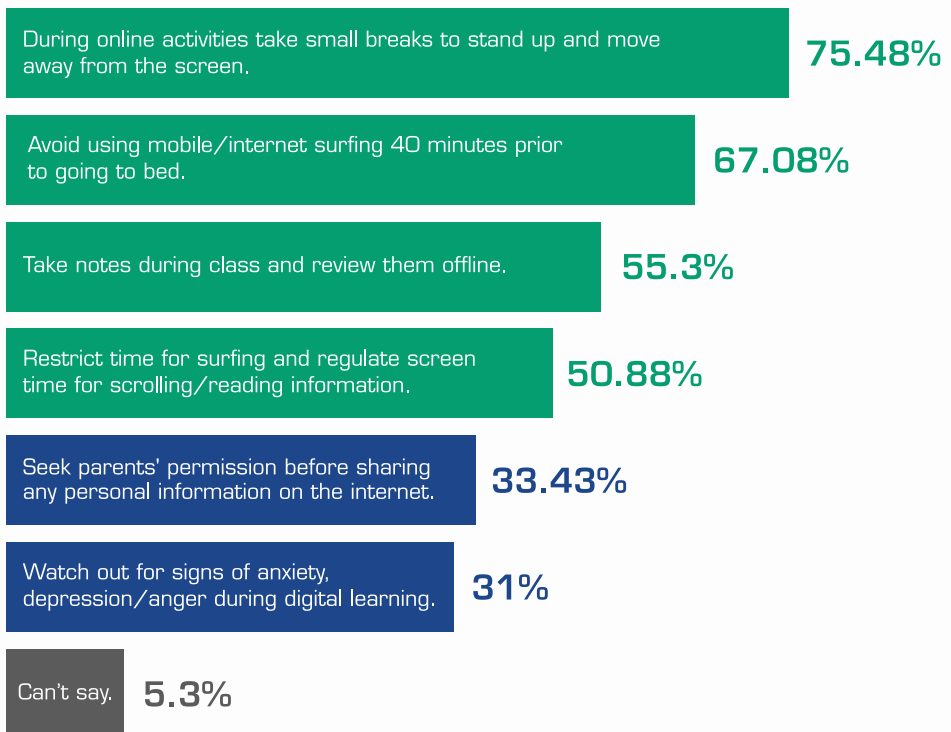
h) Balancing online and offline activities – What do teachers think?

During the COVID-19 pandemic, schooling has majorly shifted to online mode or distance learning. In this situation, the understanding of balancing online and offline activities becomes important. Based on this concern, the education ministry of India has released PRAGAYATA guidelines which has focused on various ways in which teaching-learning can be made effective when students are at home. In these guidelines there is a detailed mention about the modes of teaching-learning, the ideal screen time to which the students should be exposed during online classes, the ways in which a students can stay healthy during online teaching-learning etc.

Distinguishing between activities with respect to their purpose is crucial for a respondent in order to guide their students towards overall well-being. Hence, to understand the awareness of the respondents about the activities helpful in taking care of the eye health of students which have been mentioned in PRAGYATA Guidelines, they were asked to choose the activities that would be helpful in taking care of the eye health of students during the pandemic. They were given a choice of choosing multiple activities.

The responses received have been shown below in figure 30.

Figure 30: Activities helpful in taking care of the eye health of students



Note- Green-Correct responses; Blue-incorrect responses, Grey - Can't Say

According to figure 30, nearly 70% respondents have chosen the correct activities for taking care of eye-health. 75.5% respondents believe that taking small breaks during online activities to stand up and move away from the screen will be helpful in taking care of the eye health of students. Nearly 67% respondents chose avoiding the use of mobile/internet surfing 40 minutes prior to going to bed, 55.3% respondents considered taking notes during online class and reviewing them offline', whereas 50.9% respondents considered restricting time for surfing and regulating screen time for scrolling/reading information as an effective activity for taking care of eye health.

Nearly 30% respondents have marked incorrect responses as activities helpful in taking care of the eye health of students. 33.4% respondents chose 'seek parents' permission before sharing any personal information on the internet', whereas 31% chose 'watch out for signs of anxiety, depression /anger during digital learning' to be effective in taking care of eye health. These activities will help students in being cyber safe and taking care of their mental well-being respectively.

7.11. Awareness and knowledge about common eye diseases among teachers

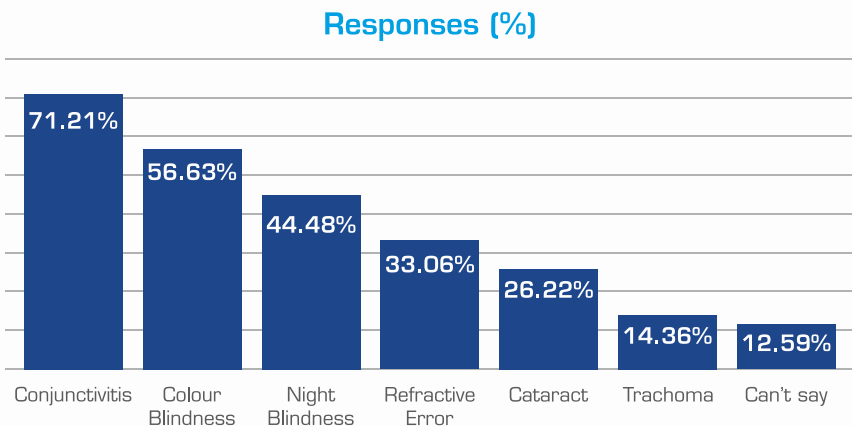
The item of questioning in this section aims to understand the current awareness and knowledge of respondents regarding common eye diseases observed in school going children. Having heard of the highlighted common eye diseases amongst children will be defined as "awareness" and having some understanding of the eye disease will be defined as "knowledge".

a) What common eye diseases can affect the children?

This item of questioning involved asking respondents the common eye diseases that can affect the holistic development of children.

The responses received are shown below in figure 31-

Figure 31: Common eye diseases that can affect children



According to the above figure 31, nearly 7 out of every 10 respondents chose conjunctivitis as a common eye disease that can affect children. The other common eye diseases in children that have been marked by the respondents in decreasing order of their percentages are night blindness (44.5%), refractive error (33.1%), cataract (26.2%) and trachoma (14.4%).

It can be seen clearly that majority of respondents consider eye diseases conjunctivitis, colour blindness and night blindness as eye diseases or conditions to affect a child’s holistic development. Very few respondents consider trachoma as an eye disease that can affect a child’s eye health and overall development. Only 1 out of 3 respondents know that refractive error is a common visual defect that can affect children.

A considerable percentage of respondents (12.6%) have marked ‘can’t say’ and are unaware of the common eye diseases that can affect the holistic development of children.

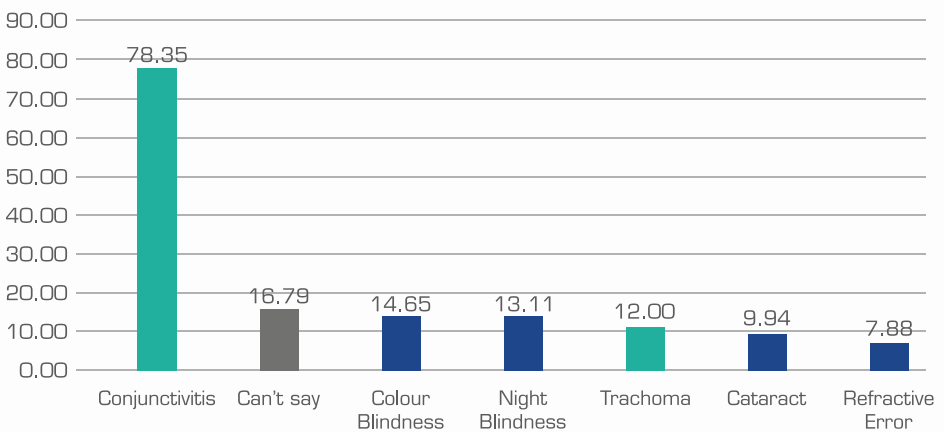
b) Awareness in teachers about contagious eye diseases that can affect a child’s eyesight

Awareness about contagious diseases can help children prevent from being infected with eye diseases. To understand the respondents’ awareness about contagious diseases, they were asked to mark the contagious eye diseases from the list- conjunctivitis, trachoma, refractive error, night blindness, cataract and colour blindness. They were provided a choice to select multiple options as their answer.

The responses received are shown below-

Figure 32: What are contagious eye diseases according to teachers?

Responses (%)



Note- Green-Correct responses; Blue-incorrect responses, Grey - Can't say

From the list of eye diseases given to the respondents, conjunctivitis and trachoma are contagious, whereas the other diseases are non-contagious.

It is evident from the data in figure 32 that more correct responses have been received from respondents as compared to incorrect responses. Over three-fourth of the total number of respondents (78.35%) are aware of conjunctivitis as a contagious disease and its symptoms, but a very few (12%) know that trachoma is also a contagious disease. 7.8% respondents marked refractive error as a contagious disease, 9.9% respondents marked cataract, 13.1% respondents marked night blindness whereas 14.6% respondents marked colour blindness as contagious diseases.

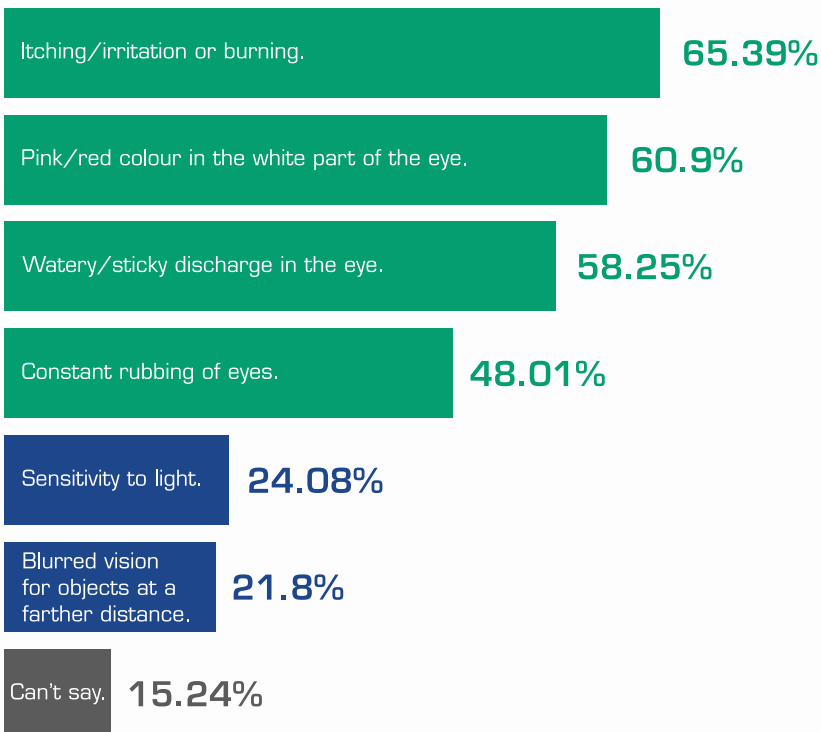
This averages out to 11.4% respondents marking incorrect responses. Nearly 17% respondents cannot distinguish between contagious and non-contagious eye diseases.

c) Awareness in teachers about symptoms of conjunctivitis

A list of symptoms of conjunctivitis was provided to the respondents and they were asked to identify the correct symptoms for conjunctivitis.

The responses received are shown below-

Figure 33: Teachers identifying the symptoms of conjunctivitis



Note- Green-Correct responses; Blue-incorrect responses, Grey - Can't say

The symptoms of conjunctivitis are- pink/or red colour in the white part of the eye, itching/irritation or burning, constant rubbing of eye and watery/sticky discharge in the eye, and hence will be considered as correct responses. Sensitivity to light and blurred vision are not symptoms of conjunctivitis, and hence will be considered as incorrect responses.

Figure 33 shows that more correct responses have been received from respondents as compared to incorrect responses.

As correct responses, 60.9% respondents chose 'Pink/or red colour in the white part of the eye' as a symptom of conjunctivitis. 65.4% respondents chose 'Itching/irritation or burning of eyes', 48.01% respondents chose 'Constant rubbing of eye' and 58.25% respondents chose 'Watery/sticky discharge in the eye' as a symptom of conjunctivitis.

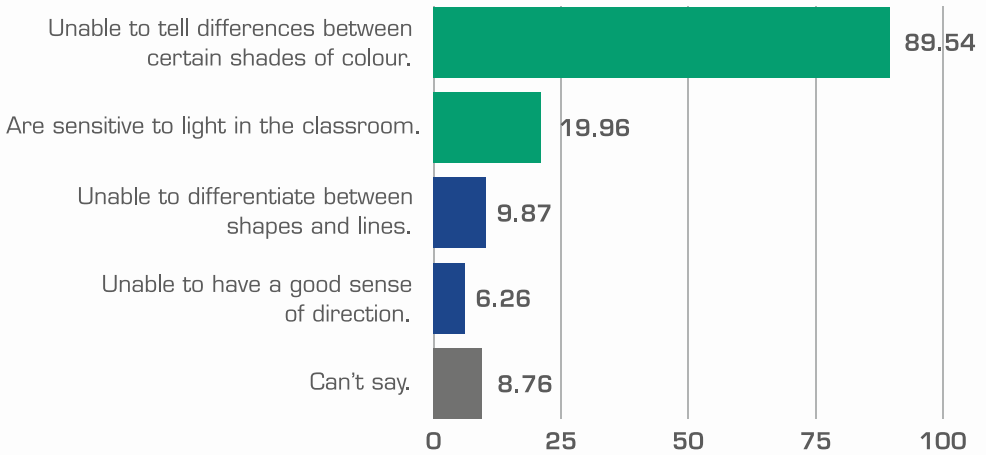
Over 20% respondents have chosen incorrect symptoms of conjunctivitis as their answers. 24.1% respondents chose 'Sensitivity to light' as a symptom of conjunctivitis whereas 21.8% respondents chose 'Blurred vision for objects at a farther distance' as a symptom of conjunctivitis.

15% respondents have marked 'can't say' as their response, and are not aware about the symptoms of conjunctivitis.

d) Awareness in teachers about the symptoms in children suffering from colour blindness

To understand the awareness in respondents about the symptoms in children suffering from colour blindness, they were provided a list of options and were asked to choose the correct options. They were asked to choose multiple answers if they exist and to mention any other symptom, they have noticed in colour blind children. The following figure 34 represents the data received from respondents regarding their awareness about symptoms of colour blindness.

Figure 34: Awareness in teachers about the symptoms in children suffering from colour blindness



Note- Green-Correct responses; Blue-incorrect responses, Grey - Can't say

The correct and incorrect responses for the symptoms of colour blindness are given below-

Correct symptoms -

- 'Unable to tell differences between certain shades of colour'- identified by 9 out of every 10 respondents (89.54%).
- 'Sensitivity to light'- identified by 2 out of every 10 respondents (19.96%).

The incorrect symptoms -

- 'Unable to differentiate between shapes and lines'- identified by 1 out of every 10 respondents (9.87%).
- 'Unable to have a good sense of direction'- identified by 6.26% of respondents.

Nearly 9 out of every 10 respondents (89.54%) identified 'Unable to tell differences between certain shades of colour' as a symptom of colour blindness. 2 out of every 10 respondents (2%) identified 'Sensitivity to light' as a symptom of colour blindness.

This shows that a majority of respondents (80%) are not aware that sensitivity to light is a symptom of colour blindness.

Nearly 1 out of every 10 respondents identified 'Unable to differentiate between shapes and lines' as a symptom of colour blindness whereas nearly 6 out of every 100 respondents identified 'Unable to have a good sense of direction' as a symptom of colour blindness.

An average of about 8% of respondents are not aware of the correct symptoms of colour blindness. 8.76% respondents could not identify any symptom from the list provided.

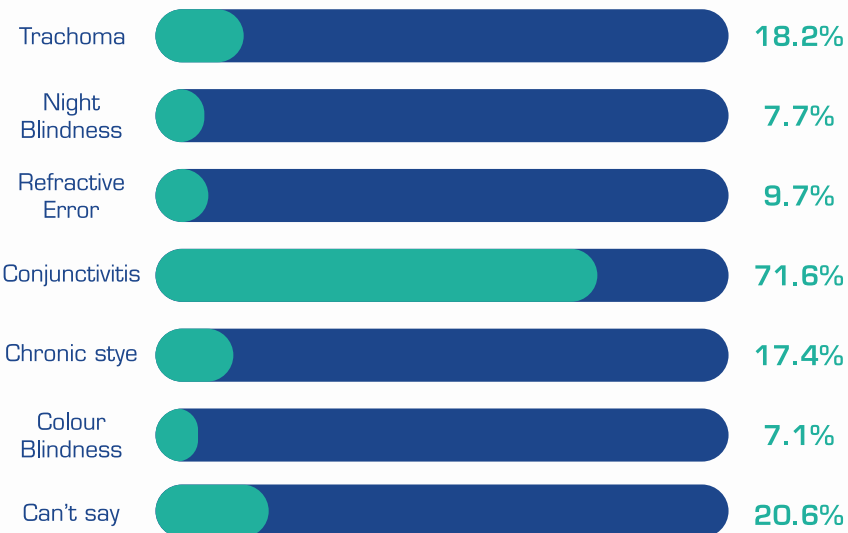
No additional symptoms have been reported by the respondents regarding colour blindness.

e) Awareness in respondents about the diseases that can develop due to poor sanitation and hygiene

To understand the awareness in respondents about the eye diseases that can develop due to poor sanitation and hygiene, they were provided a list of options and asked to identify all the correct diseases.

The responses received from the respondents are shown in figure 35-

Figure 35: Awareness in teachers about the diseases that can develop due to poor sanitation and hygiene



Diseases that can develop due to poor sanitation and hygiene are:

- Conjunctivitis – identified by 7 out of every 10 respondents (71.6%)
- Nearly 2 out of every 10 respondents (Trachoma-18.2%; Chronic styel- 17.4%) are aware that trachoma and chronic styel are also caused as a result of poor sanitation and hygiene.

Diseases that do not develop due to poor sanitation and hygiene -

- 7.7% respondents chose 'Night blindness', 9.7% respondents chose 'Refractive error' and 7.1% respondents chose 'colour blindness' as an eye disease caused due to poor sanitation and hygiene.

20.6% respondents have marked 'can't say' as their response and are not aware of the eye diseases that are caused due to poor sanitation and hygiene.

8. Key Observations - A Summary

A. Maximum teachers who identified as having eye related issues are diagnosed with refractive error and use eyeglasses to address the issue.

Out of 44% of teachers, 39% have an experience in which they have been diagnosed with a refractive error, that require corrective glasses. Their own experience may help to sensitise them, build their knowledge and awareness about symptoms among their students. Direct first-hand observation and experience helps in better understanding of the process and makes it relevant. This can be leveraged to increase knowledge, awareness, and early diagnosis among children.

A 2019 Jarma Wellness report titled "Enhancing the Effectiveness and Impact of Schools: Insights from School Health Screening Program"^[35], found that approximately 25.5% of school going children aged between 2-17 years had abnormal vision. The report analysed a sample of more than 1,76,240 school children of 40 K-12 schools and 300 pre-primary centres across socioeconomic backgrounds in different cities of India (including Ludhiana, Jaipur, Mathura, Kolkata, Mumbai, Bangalore, Chennai, Mangalore).

The survey states that nearly half the children in senior secondary section (50%) wear glasses and yet have uncorrected hyperopia/myopia. Therefore, one in every 2 children may need glasses to address these uncorrected concerns.

B. Majority of teachers have undergone eye examinations, but 1 out of every 6th person has reported no history of an eye examination.

A usual perception regarding eye check-ups is that it is required only if one is facing an eye related problem, or it is needed to check the power of glasses. In some cases, if an eye problem has already been established and checked for, people may not want to go for regular check-ups to check for progress. It is important to make all aware that eye examinations include a lot more details like it checks for a person's visual function for both proximal and distance vision. The basic acuity screening also helps understand if and when a person may need to start wearing glasses for the first time, and also whether symptoms are worsening or not.

Hence, a regular eye check-up can help to identify any early warning signs and enable early/immediate intervention. It is important to get regular eye check-ups, even if one is not already wearing glasses/or have any eye related problem.

While it is encouraging to find that majority of teacher respondents go for regular eye check-ups, we still find that every 6th person has reported no history of eye check-ups. This may be a cause of concern for the following reasons -

- i. Many of the ocular symptoms and conditions if not identified at an early stage can lead to irreversible or make cure difficult at a later stage. Regular eye check-ups can help in this matter.
- ii. Regular check-ups can also help understand whether symptoms are worsening over time.
- iii. 'Sense of habit' – Adults who themselves go for regular eye check-ups may be more aware about the importance of this practice. This understanding and knowledge can be imparted to the community and to children. Teachers who get routine check-ups can extend this knowledge to their students and their parents. With the increase in screen time amongst children during the COVID-19 pandemic has made regular check-ups more pertinent than ever before. According to American Optometric Association, 61 percent of children amongst those who have never had an eye exam were found to be suffering from eye problems^[36].

The 2019 Jarma Wellness study also identified that even though 1 in every 3 children wear spectacles the persistent problem of facing vision related problems was due to lack of regular screening after the initial evaluation. Another 2019 study^[37] by Signify that was conducted with 1,000 Indians and 300 ophthalmologists across 10 Indian cities revealed that even though 68% of Indian parents prioritised eye health of children, only 46% got their children's eyes tested regularly.

C. Close to 100% of respondents have had no training experience in eye health.

Teachers can become focal points when spreading awareness and helping in early identification of eye health related problems among children. With the knowledge on safe and healthy eye health practices, they can also help create visually stimulating environment and pedagogy for students and prevent eye health problem, as also reinstated in a 2020 study^[38] titled 'Learning Is Visual: Why Teachers Need to Know about Vision' by Gunvor Birkeland Wilhelmsen and Marion Felder. The study analyses the importance of vision development, impairment, intervention, screening and how teachers can play a vital role in all these areas.

D. "Too much screen time" identified by respondents as the highest probable factor and "genetics" as the least probable factor contributing to eye health problems in children.

Too much screen time, Hereditary/Genetic factors, Unhealthy lifestyle, and Environmental components are all important factors that may contribute to deteriorating eye health among children. However, certain environmental factors and practices can increase the vulnerability of children and put them at risk of developing eye related problems and diseases.

It is important to identify such factors and understand how they contribute towards eye health so that they can be limited, and one can determine the frequency with which children should get their eyes checked.

Genetics - A major factor that may alone put a child at risk of developing eye related problems is 'Genetics'. Guardians (including teachers, parents) can be more proactive - especially in identified cases where either or both parents already have an eye problem.

Diseases that may arise due to genetics include diseases that are a leading cause of blindness among infants and children according to a Cleveland Clinic report^[39]. This discusses the role of genetics in putting children at risk of eye health diseases. According to the report, eye problems such as strabismus (cross-eyes), amblyopia (lazy eye), colour blindness, refractive errors like myopia (nearsightedness), hyperopia (farsightedness) and astigmatism can commonly occur in children due to genetics.

Another 2019 article titled 'Is poor eyesight all down to your genes?' published by Optimax^[40] discusses how genes may predispose individual's eye problems. The article states that if both parents have Myopia, then 1 out of 3 chances that the child will develop the condition, if one parent has Myopia, the chances are 1 in 5 and if neither of the parents have Myopia, the chances for their child developing the condition comes further down to 1 in 40. Hyperopia is also considered that is most likely present in due to hereditary factors^[41].

Eye diseases like Glaucoma, which is one of the main causes of blindness is far more likely to be inherited than to occur randomly according to Glaucoma Research Foundation. The Foundation states, "*family history increases risk to glaucoma four to nine times...*"(The Glaucoma Foundation, 2019).

Hereditary factors are also something that may not necessarily be “in the hands of a child” as it occurs biologically. Hence, if people are aware how important hereditary and genes are when it comes to eye health, suitable corrective measures can be taken by altering lifestyle and health choices followed by early intervention.

Figure 8 in section 7 of the paper shows respondents rating ‘Hereditary’ as the least probable factor in contributing to eye problems in children. This brings out the importance of spreading awareness about the role of genetics in making children vulnerable to eye related issues. The awareness can help ensure that the child gets frequent eye check-ups and develops safe and healthy habits of eye care with limited exposure to other factors like unhealthy habits, lack of exercise, and too much screen time.

Unhealthy Lifestyle and Environmental factors - It is encouraging to see respondents ranking ‘unhealthy Food habits’ and “environmental factors” high. These two may be comparatively more high-risk factors that in many cases independently may also have an impact on the eye health of children.

However, respondents have ranked “lack of exercises” comparatively lower – it may be inferred that respondents’ recognise that while exercises are important, it needs to happen in combination with other factors such as healthy food habits. Guardians also need to ensure the consistency of eye health exercises for children residing in areas with unfavourable environmental factors.

i. Unhealthy lifestyle: Eating habits - Good nutritional intake promotes eye health and often helps in keeping eye health related symptoms in check. One may be able to avoid serious eye problems if their diet includes food rich in antioxidants such as Vitamin A, C, E; omega-3 fatty acids, zinc, beta-carotene, lutein, and zeaxanthin^[42].

Carrots have commonly been cited as a great food source in maintaining eye health. According to a 2014 Sightsavers report titled ‘Vitamin A deficiency and avoidable blindness’, the reason why carrot and other Vitamin A rich food is essential for maintaining eye health is because it helps body in replacing skin cells daily, supports different surface tissues in functioning and assists the conjunctiva to produce mucous that protects eyes against infection. It also supports eyes when trying to focus with poor lighting and provides protection against corneal ulcers that lead to avoidable blindness. A 2018 study^[43] analysing the impact of Vitamin A deficiency on the eye health of children in India quotes that India has 52,500 cases of children per year of blindness due to VAD.

Research suggests that processed foods and high-fat diets may lead to increasing risks of developing eye related problems – one such being age-related macular degeneration (AMD)^[iv]. While AMD commonly occurs in people who are 55 and older, it is still important to follow a healthy diet pattern from a young age so that negative effects do not show at a later stage in life.

Regular intake of “junk” or processed food may lead to other long-term health problems such as obesity, diabetes, heart diseases, high blood pressure, which also pose high risks in individuals in developing eye related problems.

^{iv}AMD or age-related macular degeneration is a disease affecting the central vision of the eye. It can blur the central vision that is required for activities such as reading or driving. “Age-related” means that it often happens in older people. “Macular” means it affects a part of your eye called the macula. (National Eye institute, 2020).

ii. **Environmental Factors** – Factors such as toxic gasses, pollutants, bacteria, smoking, temperature variations and ultraviolet rays can have severe impacts on the eyes - such as the cornea and conjunctiva. This results in eye problems such as conjunctivitis, cataract, glaucoma, and dry eyes^[44].

Dr. Rajesh Sinha, an Ophthalmologist from All India Institute of Medical Sciences (AIIMS) shared with Indo-Asian News Service (IANS)^[45] that pollution can have major impact on eyes because unlike mouth and nose-eyes aren't as easy to cover, making them vulnerable to air pollution. Experts have also noted that compared to elderly, children and individuals aged between 20-30 years are at greater risk of eye related problems caused by pollution.

According to a 2021 article published in The Indian Express^[46] analysing cases of dry eyes with air pollution - people who live in polluted cities in India (such as in Delhi, Mumbai, Kolkata, Chennai) have higher susceptibility of being diagnosed with dry eyes as compared to those who reside in relatively lesser polluted areas.

There also exists a direct correlation between eye diseases and related conditions with exposure to tobacco smoke among children- such as prevalence of strabismus. Second hand smoke (SHS) may also lead to choroidal thinning^[vi] among children as young as 6 years, as per a 2019 cross sectional study conducted in Honk Kong which used retinal and choroidal imaging to measure choroidal thickness in children exposed SHS at home versus those without any exposure. It found that the choroidal thickness was 6-8 micrometres thinner as compared to those from the non-exposed group. In conclusion the study says that with an increase in exposure to one second hand smoker per day, choroids in children reduced by almost 0.5 micrometres. This data is alarming because when compared to exposure rates of children to SHS in India, available data tells us that in Indian cities like Mumbai, 6.5% students are exposed to SHS at home and 39.9% to SHS outside their homes^[47].

iii. **Unhealthy Lifestyle: Lack of Exercises** - Regular exercises including vision exercises can help in maintaining and improving eyesight. These include moving eyes up and down, frequently blinking of eyes, rolling of eyes, among others. However, exercises alone may not help in improving and maintaining eye health. This should be included along with healthy lifestyle and regular eye check-ups.

^{vi}'Choroid' is a tissue that creates a thin layer between the sclera (white outer layer of the eye) and the retina (the inner layer of nerve tissue at the back of the eye). When the thickness starts decreasing it may severely impact visual acuity.

Too much screen time - Another positive sign observed from respondents was their view that “too much screen time” may be a factor that can be of high risk. However, it is more important to understand the combination of a healthy lifestyle (exercises, diet, environmental factors) with combatting the effect of too much screen time. This becomes pertinent especially during the COVID-19 pandemic where the near future includes increase in online classes.

Increase in screen time can lead to eye fatigue, blurry vision, and dry eyes. The COVID-19 pandemic also resulted in a shift to online schooling that further contributes to the increase in screen time among children. The reasons why the above issues come up is because staring at screens for longer durations can make the muscles around the eyes tired, leading to headaches, lack of concentration or double vision. One also tends to blink lesser while staring at the screen and this results in eyes becoming dry or irritated.

However, as studies suggest, increase in screen time may not lead to severe eye disease or retina damage^[48, 49]. It is still important to note that while there may not be long term severe effects, this can only be true if guardians are ensuring that children are indulging in exercises, eye care and frequent check-ups. Otherwise, if no intervention or maintenance is taken care of- children may develop issues resulting from the long-term effects of dry eyes, or myopia, amongst others.

Guardians should take remedial measures to ensure that children are practicing eye exercises – such as ensuring kids blink more often while staring at the screen and otherwise, follow the 20-20-20 rule (take a 20-second break every 20 minutes and view objects that is 20 feet away), etc.

E. According to respondents - lower economic status may lead to lack of nutrition among students. But students from higher income group may experience increased screen time that can affect the eye health.

While respondents cited different reasons such as increase in screen time, effects of online education, lack of knowledge and understanding of parents and teachers, as reasons for eye health issues in students, some teachers have also cited ‘income groups’ as a factor that may be determining the eye health of the student.

10 respondents shared that lower income groups may have children with lack of nutrition, or malnutrition that may lead to eye health problems, and 8 respondents shared that high income groups may have children with issues mostly dependant on increased screen time, resulting in eye problems. 2 respondents made clear comparisons between high and low-income groups with former having issues related to use of screen-based devices and latter having issues related to access to nutrition and healthy diet.

When we talk about nutrition – it is important that children eat a well-balanced diet for proper nourishment and for keeping diseases (including eye health problems and diseases) at bay. When there is insufficient intake of nutrients, vitamins, proteins, absorption of energy, minerals and micronutrients, it can lead to deficiencies and hence, undernutrition. Undernutrition may stunt intellect, reduce productivity, and may make children susceptible to childhood infections and lifelong health related issues.

Another important term that is used while talking about nutrition is ‘Malnutrition’. Malnutrition, as explained by United Nations Children’s Fund (UNICEF), India is – *“...a broad term that refers to all forms of poor nutrition. Simply put, malnutrition includes both undernutrition and over nutrition...”* (UNICEF, 2019). *Malnutrition doesn’t always mean lack of eating food intake. It means that the food consumed is not providing balanced nutrition that the body requires to maintain health. Hence, this covers two broad spectrums – i) ‘Undernutrition’ that includes stunting, wasting, underweight, and ii) overweight, obesity, and age-related diseases* (WHO, 2021).

Hence, the perception that teacher respondents expressed about nutritional deficiencies only affecting children belonging to lower income groups can be flagged as a myth. This is supported by UNICEF 2019 that tells us that malnutrition can affect children across socio-economic groups in India.

Another important aspect contribution to malnutrition across socio-economic groups include consumption of junk food. Sanand, (2019)^[50] shares statistics of junk food consumption by school going children in India. According to which every 9 out of 10 school going children (93%) consume packaged food more than once a week, 56 per cent consume food high in sweet content such as ice creams and chocolates more than once a week and 59% children (between ages 14-17 years) drink packaged beverages atleast once a week. Therefore, excessive consumption of high salt, sweet, fat etc can worsen nutritional deficiencies and health in children making them susceptible to diseases and eye health problems.

It is important to be aware about eating patterns among children and understand this not only as a relative function of belonging to certain income groups.

F. Across generations “too much screen time” has been identified as the highest probability factor that may contribute to eye problems in children. Schools and Parents can ensure including physical activities (sports, exercises, and other activities) and healthy diet in the child’s daily activities to combat any issues arising from the increased screen time.

This study finds that across all generations, “too much screen time” has been identified as the highest probability factor that may be affecting the eye health of children. It may be inferred that across generations, respondents are cognizant that children are leading a sedentary lifestyle resulting in an increase in screen time.

Therefore, it becomes important to ensure children are involved in physical activities (exercise, sports, yoga, among others). Schools can ensure this by making their curriculum more robust that provides opportunities and exposure to students to improve their competence and confidence in physical fitness.

The generation-wise analysis may be understood by giving background reference of why generation perceptions may be influenced based on their exposure to the use of technology.

Across all the generations, Gen Z is the most dependant on technology and the internet. While both Gen Z and Millennials are heavily connected to it, Gen Z can be considered more digitally affluent and “tech savvy” as this generation grew up with internet and technology, while Millennials watched the internet develop and newer technology come into the market. It may be deciphered that the connection to the use of internet and the increased technology dependence is something that Millennials may have not gone through from a young age, which may not be the case for Gen Z.

A 2020 Isobar-Ipsos #MeetTheZ Survey^[51] analyses the generation priorities when it comes to shopping, spending habits and use of technology. According to the study, atleast 55% of Gen Z responded that their “lives run on technology” and that on an average, they spend 8 hours online every day.

Individuals belonging to generation ‘Baby Boomer’ and Gen X fall at the lower end of being technologically dependant. These generations grew up with cable televisions and enjoyed conventional sources of entertainment. Their schooling and work did not include smart classes or technologically aided devises. Gen Z and Millennials have often guided the older generations when it comes to using/or adopting the internet and technology.

Hence, even though younger generations may have more exposure to the internet and technology as compared to the older generations, the research sought to understand how this translates into having knowledge about safe eye health practices.

Another observation that comes across is the similarity of perception between Gen Z and Gen X. Both generations have said that screen time is the highest contributor towards eye problems in children, and rated rest of the factors at 3 (a neutral approach). One inference could be that most parents of Gen Z are the ones belonging to Gen X and hence, one may decipher that similarity may also stem from the knowledge imparted from parents to their offspring.

Gen Z, often categorised as the ‘touch screen’ generation, have a unique experience of growing up amidst the rapid evolution of personal technology. This has contributed to their preferences and consumption and increased their familiarity and dependence on technology (S Hill., (n.d.)). One may decipher that due to this increased engagement with the interface, the probability of developing problems from screen time or seeing peers develop may be higher and therefore consider exposure to screen time has a high-risk factor affecting eye health.

Millennial perception shows that the highest risk factor is screen time, followed by unhealthy food habits, environmental factors and lack of exercise and the least contributing factor as hereditary. Millennials are the generation who grew up while internet was growing and saw technology develop and reach its more advanced forms of touch screen devices, laptops, etc.

Another interesting comparison is that most parents of Millennials belong to the generation of Baby boomer – a time when there was barely any technological advancement and primary mode of entertainment/communication were traditional sources with increased consumption of books, writing with paper-pen methods. A confluence of the learnings from their parents and personal exposure of Millennials towards two different worlds - technological advancement and when technology was developing – may also contribute to their understanding of how along with screen exposure, diet, exercise and environmental factors can also play major role in putting the eye health of children at risk.

Other social factors such as preference of technology over other means and a move towards a more sedentary lifestyle may also influence the perception of respondents in identifying “screen time” as having a higher probability in contributing to eye health issues.

G. Female respondents identify unhealthy food habits as a higher probability factor contributing to eye health of students, as compared to male respondents.

An interesting observation comes when we see the ‘4th ranking’ results when cross tabulated with the gender variable. Ranking was done against a Likert scale with “5” being of highest probability and “1” being of lowest probability. While female respondents said unhealthy food habits may be ranked at fourth, males have ranked unhealthy food habits at the 3rd position.

One inference for these perception differences may come from the status que of majority Indian women being responsible for the household’s diet and nutrition. This is supported by Chakraborty, 2019^[52] who explains that predominantly Indian societies find women overseeing /in-charge of the household pantry, the food consumed by the family members including the diet and nutrition. It may be concluded that women may understand the importance of food when it comes to maintenance of health and eye health, however there is no conclusive data to determine whether women possess “better” knowledge regarding diet and nutrition as compared to men.

H. Teachers can play an important role in early intervention and awareness generation regarding eye health and related practices. To become important focal points and catalysts to create awareness and do early intervention, it is important that they themselves are aware, and understand the importance, of implementing safe eye health practices.

The following findings of the study can be seen encouraging from this perspective-

- **Majority of respondents believe it is important to be aware about eye hygiene and related practices.**

90% of respondents believe that it is important to know about eye hygiene and related practices, however, 8% (105 respondents) said that they can't say and 3% (36 respondents) said that they don't feel it is important to know.

While the percentage of teacher respondents who are unsure or have said they don't feel it is important may be on the lower side, it is still important to highlight that certain proportion of the sample still either do not believe in taking care of eyes or they are unsure about it. If people are not aware of the importance of taking care of eye health, it may contribute to underlined risk factors associated to eye problems or lead to eye issues among children.

- **Majority of respondents recognise Vitamin-A as an important nutrient to maintain eye health.**

A positive sign to see majority of respondents recognise Vitamin A as an important nutritional component in maintaining healthy eye sight. According to American Optometric Association^[53], Vitamin A supports healthy functioning of ocular surface and is also important for formation of the photoreceptor rhodopsin.

This is a photo pigment found in red cells of the retina and is important especially when eyes focus on objects at night. Hence, night blindness is often a common symptom of Vitamin A deficiency. Other benefits of Vitamin A include reduced risk of developing vision loss, macular degeneration, eye inflammation and other eye health issues.

- **Majority of teachers believe that blindness is preventable.**

It is encouraging to find that the majority of respondents believe blindness is preventable. Blindness can be preventable through a combination of education, awareness and access to primary eye care. According to operation eyesight universal, 90% of blindness can be prevented or cured^[viii]. However, one must ensure a healthy diet, proper addressal of symptoms and early intervention. This can be achieved through increase in knowledge and awareness regarding eye health.

The following findings can serve as areas where teachers may need more support in terms of training and building their knowledge and awareness regarding eye health -

^{viii} Operation Eyesight Universal

- **The current study finds that nearly half the respondents are not aware and/or observant of eye related issues and symptoms in their students.**

Nearly 50% of teachers are not aware and/or observant about the status of eye health of their students. This highlights the lack of knowledge, skills and ability. Indian school system cannot afford that 50% teachers miss about the glaring eye issues in the schools.

Kuldeep Dole, an MBBS ophthalmologist shares with IANSlife^[54] that students in India are highly susceptible to eye problems such as eye allergies, worsening of eye sight, myopic vision – supported by the fact that 23-30% of students on an average in India are affected with Myopia. Children may also not always be aware that they may be suffering from an eye health issue, as explained by Hubert Sagnieres, CEO of Essilor – *“the brain compensates for the loss of sight for some years, and the mind gets used to it. But beyond a point, the brain cannot handle it..”* (John & Phadnis, 2013).

- **More than 95% of respondents believe that reading in dim light may reduce vision capabilities.**

Maximum respondents have said that reading in dim light results in reduced vision. While reading in dim light may lead to eye strain, as also supported by studies such as Science line, Harvard Health that caution against eye strain when reading in dim light but reading in dm light will not decline in vision^[55,56]. This is also supported by Essilor USA^[57] according to which reading in dim light will not cause decline in vision/or permanent damage.

- **Half the respondents are either not sure or believe that there is no harm in blowing off objects from other people’s eyes.**

It is important to note that the safest way of removing foreign objects such as debris from eyes is by splashing clean water. Attempts to blow objects from eyes may increase the risk of contamination by saliva^[58].

Foreign objects may enter the eyes of children while they are occupied with activities such as playing, cycling, or even while indoors. If the object comes in contact with the surface of the eyes, it may hurt the cornea leading to a “corneal abrasion” or “corneal erosion”. This is not always visible. Corneal abrasions mostly feel like “something has gone in your eyes” even after the object has been removed. These abrasions usually heal within few hours or a day or two. In some cases, they may lead to complications, and it is advised to seek a doctor’s advice. The automatic response of the eye is to try to flush away through blinking or by watering. However, if it persists, it is advised to clean the area by splashing water and not by rubbing eyes or blowing into the eye.

- Respondents are comparatively more aware of Retinopathy, Glaucoma and Cataract as eye diseases that may occur in children, but least aware of Cancer of the Eye.

Cancer of the eye - Retinoblastoma (Rb) is an eye cancer that can occur at any age, but commonly affects children during early childhood. This type of cancer affects the retina of the eye. However, it rarely spreads to the rest of the body. The causes for this cancer can be due to a genetic mutation or in a foetus during pregnancy. Studies^[59] show that approximately 40% of Rb patients have the hereditary form of disease and about 60% have the non-hereditary form.

In majority of cases, this condition is identified during routine checks with a paediatric ophthalmologist or oncologist. Hence, another reason why regular eye check-ups are important. Other symptoms may include white (leukocoria) or red pupil in place of the normal black, misalignment of eyes (strabismus) looking towards the ear or nose, painful or reddened eye, different coloured irises, or an enlarged pupil.

According to a 2014 report by Centre for Sight^[60], the highest number of children who are affected by Rb live in India – with at least 5,000 cases of Rb around the world, India records a third (over 1,500) every year. We see that the respondents of this study are least aware about Rb in children. This is consistent with secondary literature that tells us that awareness about Rb is lesser amidst the population. This disease can be life threatening, but if the condition is diagnosed early then it is completely curable. This reinstates the importance of having the knowledge and awareness about this condition in children.

Cataract - Cataract is another eye condition that is commonly believed to affect the elder population. However, cataract also affects children and is called paediatric cataract. Cataracts are caused due to cloudy patches in the lens of the eye. Paediatric cataract is experienced as blurry vision that can impact childhood development and may lead to loss of vision. This can either be congenital or acquired.

Khokar et al (n.d.) tell us that paediatric cataract is the leading cause of blindness during childhood. They also emphasise on the importance of early identification and appropriate management to reduce the risks of severity. In India, paediatric cataract is found in 15 out of every 10,000 births in India and in 14% of the cases the reason for childhood blindness^[61].

Glaucoma - Glaucoma is another eye disease that affects children. It can be of the following types - congenital (present at birth), infantile (onset between ages 1-24 months), and juvenile (onset after age of 3). While Glaucoma may not be a common disease, however certain predisposed factors in children may put them in the high-risk bracket. These factors include hereditary, or if a child has had cataract surgery, among other. Symptoms may include excessive tearing, sensitivity to light and a large, cloudy cornea (the normally clear front surface of the eye) which can cause the iris (coloured part of the eye) to appear dull.

Senthil et al 2019 tell us that one in 3,300 live births in India have the prevalence of primary congenital glaucoma and this accounts for 4.2% of all childhood blindness in India. Childhood glaucoma is not a condition that can be cured. However, it is important to do an early intervention for better management of the disease. This can ensure long-term successful outcome.

Retinopathy - Retinopathy of Prematurity, or ROP (Retinopathy in premature infants), diabetic retinopathy are some common conditions that may occur in children. Both ROP and Diabetic Retinopathy are preventable causes of childhood visual impairment. This can be ensured with timely diagnosis and a healthy lifestyle.

- **Majority of eye problem related symptoms observed by teachers in their students are the ones that can be easily observed.**

Difficulty reading from the chalkboard, constant rubbing of eyes or blinking and holding reading writing material close to their face are the common symptoms that teachers have identified as having observed in their students. The other major eye-related issues are occurrence of redness in eyes (30.19%) and watery eyes (28.79%) in students. Nearly 1 out of 10 students are reported facing eye-related issues such as squinting, frequent headaches, itching and burning of eyes. Extreme light sensitivity (5.23%), seeing double (3.09%) and dryness of eyes have been rarely reported by teachers.

All these symptoms are something that can be easily observed and spotted. There is a possibility of more students suffering from frequent headaches, itching and burning of eyes, but as they aren't easily observable, it may not be conveyed by the student, or the teachers may not be registering it.

- **Nearly 30% of teachers were not aware of how to balance online and offline activities - including what is mentioned in the PRAGYATA guidelines.**

With the shift to online schooling during the COVID-19 pandemic, it is important to understand the healthy balance of online and offline activities for students. If there is not any healthy balance, it can lead to eye strain, eye fatigue, among other eye related issues due to the increased screen time.

The findings showed that nearly 30% of teachers were not aware of how to balance online and offline activities (including what is mentioned in the PRAGYATA guidelines. According to one article titled 'Effect of Online Classes on Children's Physical Health' by Narayana Health, *"Increasing eyesight problems with frequent headaches are attributed to prolonged screen time. In addition, increasing anxiety and depression due to home confinement along with sleep disorders are also on the rise."*

Therefore, there may be a negative impact of online classes on child's eye-health. Hence it is very crucial for teachers to be updated with the knowledge about the activities that are helpful for a child's eye-health.

- **Choosing preference seating for students who are not able to read the board from the back, reaching out to parents/guardians and checking whether their blackboard writing is visible from the last row are the most common measures taken by respondents in addressing eye health issues.**

It is crucial for a teacher to take relevant measures after identifying eye-related issues in students, as it will ensure early diagnosis and treatment so that the student is prevented from a permanent loss of vision due to negligence.

Reaching out to parents regarding their ward's eye health issues is a welcoming measure and can help in preventing vision impairment in children. The other measures taken by respondents as a response to child's eye health issues such as ensuring child's better visibility of the blackboard too is a good measure.

However, other measures such as safe book reading distance and better reading posture are equally crucial and need to be taken care of in order to prevent visual impairment in children.

- **Among all the common eye diseases, respondents on an average have shown greater awareness of common eye diseases such as conjunctivitis and colour blindness in children, however lesser knowledge on identifying symptoms of these diseases.**

While teachers are most aware about Conjunctivitis and its symptoms, there is a lack of clarity about other commonly occurring eye diseases in children such as trachoma, chronic stye, refractive error and colour blindness.

Conjunctivitis - Conjunctivitis is an eye-disease in which a child's eye appears red, itchy, teary or may have a sticky discharge. This occurs due to allergies or infection. Depending upon its severity, it can be often controlled at home. Otherwise, doctor may prescribe antibiotic eye drops or ointment. Frequent hand and eye washing may prevent the condition from spreading among those who come in contact of the person infected.

Awareness about this disease in teachers can help them guide students to maintain proper hygiene and keep their eyes healthy. When we break down this awareness and compare the results of teacher's awareness regarding conjunctivitis and awareness regarding its symptoms - results show that 45.9% respondents who did not identify the correct symptoms. The study also identified 15% who were not aware about any symptom. This, when compared to the earlier finding where more than half the teachers were aware of conjunctivitis being a common eye disease in children, shows a gap in awareness regarding the disease and awareness regarding its symptoms.

Colour blindness - When compared to teacher's awareness about colour-blindness being a common eye disease in children, more than half the respondents were aware of it. However, there is a gap between the teacher's awareness and knowledge of symptoms for this eye disease. Majority of teachers identified only one out of the two correct symptoms i.e., a colour-blind individual is unable to differentiate between certain shades of colour. While only 19.96% identified sensitivity to light as another symptom.

According to an article titled 'Living with Colour Vision Deficiency' published by the website 'Colour Blind Awareness' mentions that colour blind people face many difficulties in everyday life which normally sighted people just aren't aware of. For example, they can face problems even in the simplest of activities including choosing and preparing food, gardening, sport, driving a car and selecting which clothes to wear. Colour blind people also cannot pick up a change in someone's mood by a change in colour of their face or cannot notice cases of sunburns. Colour blindness can affect a child's access to education, exam grades and career choice.

Careful attention and observation in the classroom, awareness about eye-related diseases and early diagnosis of the problem by teachers can create a huge impact in preventing eye-health related diseases in students at an early stage.

I. Parents can also take proactive measures and build healthy communication with their child's teachers to address issues on eye health and practices.

This study has already established the fact that teachers can effectively understand children's eye health as they interact with students in an environment of learning for long durations. Hence, they can effectively observe any changes in their vision. Parents can develop open communications with their child's teachers to understand these issues in order to address any symptoms or conditions at the right time.

- **About two third of parents have not approached the teachers regarding the eye health issues of their children while 1 of every 3 parent has.**

It has been found that parents are mostly unaware of the fact that their child can be suffering from eye-related issues. Velibanti et al, 2018^[62] in their paper titled 'Knowledge and practices of parents about child eye health care in the public sector in Swaziland' show that majority of parents in Swaziland, Africa are not aware of their child's eye-health issues. The article states that out of 173 participants, 104 (60.1%) parents reported that they have never taken their children for an eye test and 69 (31.7%) felt that their children's vision was fine. Ninety-seven (53.1%) parents indicated having no knowledge about child eye conditions and no significant association was found between level of education and knowledge of eye conditions affecting children.

J. Teachers also identified important measures than schools can include in their infrastructure and practice to promote safe eye health practices in schools.

- **The 20/20/20 rule:** This rule was popularised by Dr. Jeff Anshell, a vision ergonomics specialist. This rule explains to look at something 20 feet away every 20 minutes for 20 seconds. Following this rule can help prevent eye strain as it helps in breaking the pattern of continuously looking at the same source. This rule becomes more important in the context of online schools. While American Academy of Ophthalmology explains that staring at screens may not lead to serious eye problems immediately, the increased exposure may result in eye strain and subsequent eye problems.

Humans on an average blink 15 times each minute, however this number decreases to a half or third of that while staring at screens^[63]. Hence, according to Advanced eye care and aesthetics, taking frequent breaks from screens and looking at other objects can help reduce eye strain symptoms. The 20/20/20 rule may prove to be beneficial in this.

Other practices to reduce eye strain and working eye muscles as explained by respondents include viewing the tip of pencil from one arm distance and moving it left and right without blinking the eyes.

- **Building a habit of regular hand washing** - Respondents have also highlighted the importance of washing hands regularly, with 7 respondents specifying the importance of washing it especially after meals in school. In this regard suggestion has come to install adequate hand washing systems in schools to ensure there is no transfer of germs to eyes.
- **Maintaining healthy pupil-teacher ratio** - Respondents also shared the importance of maintain a healthy pupil-teacher ratio in class that can support teachers in not only observing students, but also ensuring all students have a healthy and clear distance of the black/white board. One can refer to guidelines given by National Educational Policies such as the Right of Children to Free and Compulsory Education, (RTE) Act of 2009. According to RTE^[64], the pupil-teacher ratio (PTR) for school level should be maintained at 30:1 and for primary and upper primary it should be 35:1.

Therefore, ensuring children have healthy eyes and indulge in safe eye health practices is important for their continued growth in all aspects of human development. This study has highlighted the role teachers can play in addressing eye health issues and promoting knowledge and awareness of eye health and related practices among their students and in the rest of the community.

9. Recommendations

The analysis has shown that there is a strong potential and opportunity in involving the teaching community as the front-line defence for detection of eye problems among students. Teachers come in close proximity to the students with daily interaction and are more strategically placed to make keen observations. If made aware and are also skilled to be interventionists in the classrooms, they can observe several vision related changes closely and problems that may remain undetected at home and otherwise. This study has shown that there is varied perception and understanding of the eye related problems among teachers – about its causes and diverse manifestations.

It is necessary therefore to chart a pathway for the schools to have a system and a strategy in place to involve teachers more directly to detect eye health problems and contribute towards improvement.

1. Teacher can be the change agent/catalyst in spreading awareness about Eye

Health: Teachers can play the lead role in establishing eye care as a focal point within the health care system in the schools by being the front-line connect with the students. It is possible to leverage the knowledge and experience of teachers as they themselves are adult seekers of eye health care and understand the dimensions of the problem. This is an opportunity to build a cadre of teachers in schools who can play a deliberate role to address refractive errors among students and other conditions that if go unnoticed can become severe in nature.

It is possible to create guidance and manuals for the teachers and train them to understand the initial signs of eye health problems or vision related problems that students experience. This can help teachers develop their knowledge and understanding regarding how eye issues manifest in classrooms. This proactive move can be very helpful in early diagnosis and treatment.

2. Role of Schools in creating aware cadre of teachers for detection of eye health problems in students:

Even if schools have a healthcare system to do screening of students on the basis of several parameters periodically, eye health requires a more regular classroom-based approach rather than only clinical examination-based approach. Schools can adopt a more deliberate strategy and programme to train the teachers to make them more aware of their role when they are teaching in the classrooms.

Moreover, the schools can design more planned physical activities and nutrition programmes that have bearing on eye health. The schools can also connect more directly with the parents and home environment to sensitise about the home-based practices and diet that can be initiated for the basic protection and preventive action.

3. Knowledge building related to eye health among teachers and community should sensitise about the science-based health-facts Vs. Myths: This survey has exposed that often the understanding of the problem is very impressionistic and not driven by science. This creates the risk of perpetuating myths around eye health that can be counter productive. For instance, there is a risk of underplaying the risk of genetics and overestimating the role of environmental factors or looking at socio-economic background of the student to understand the role of nutrition vs gadgets and how it is affecting the student. The understanding of the relative significance and the effect of environmental factors require deeper understanding in anticipating the changes in eye health. Teachers training and community awareness programmes can include information on the factors that affect the eye health of the students, and its manifestation.

4. Need data driven national and state level programme on eye health of children and integration of school network with this initiative: Schools can develop their individual strategy for involving teachers as the front-line cadre to detect eye problems among children. It can also make students aware of the corrective and mitigation steps. The governments at the national and state level also can frame policies and guidelines and ensure implementation that all schools are adopting these strategies.

A central database on eye health among issues among children - by type of problems, age, causes, trend and development analysis and mitigation statistics can be maintained. This will help to indicate the scale of the problem and the nature of the problem so that a national response system can be created through a student-oriented health strategy. Medical fraternity and experts can be involved in this initiative to provide the professional and scientific support to shape an appropriate programme. Standardised manuals can be prepared for the teachers. It can also include the advice on the preventive and mitigation strategies.

Bibliography

- ¹UNESCO. (2013). Monitoring and Evaluation Guidance for School Health Programs Thematic Indicators, Supporting FRESH (Focusing Resources on Effective School Health). Available from: <http://www.unesco.org/new/health-education>
- ² Grover, A.K., & Arora, S. (2012). Eye Screening in Children: Its Relevance and Implications. Available from: <http://medind.nic.in/jav/t12/i4/javt12i4p221.pdf>
- ³Visual Impairments. (n.d.). Available from: <http://www.projectidealonline.org/v/visual-impairments/>
- ⁴Business Standard. (2019). 2.2 billion people around the world suffer from eye conditions, visual impairment: WHO. Available from: https://www.business-standard.com/article/pti-stories/2-2-billion-people-around-the-world-suffer-from-eye-conditions-visual-impairment-who-119100900016_1.html
- ⁵Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, Keeffe J, Kempen JH, Leasher J, Limburg H, Naidoo K, Pesudovs K, Resnikoff S, Silvester A, Stevens GA, Tahhan N, Wong TY, Taylor HR, Vision Loss Expert Group. Lancet Glob Health. 2017 Sep; 5(9):e888-e897.
- ⁶Sightsavers. (2011). Eye health in children. Available from: <https://www.sightsavers.org/wp-content/uploads/2017/09/Sightsavers-policy-brief-eye-health-in-children-1.pdf>
- ⁷Tirkey, R.E., Adlakha, N. (2018). Epidemiological Study of Eye Diseases in Primary School Children in Private Schools in Vindhya Region. DJO [serial online] [cited 2021 Jun 13];29:64-67. Available from: <https://www.djo.org.in/articles/29/1/Epidemiological-Study-of-Eye-Diseases-in-Primary-School-Children-in-Private-Schools-in-Vindhya-Region.html>
- ⁸Habiba, U., Ormsby, G.M., Butt, Z.A., Afghani, T., Asif, M. (2017). Knowledge and practices of teachers associated with eye health of primary school children in Rawalpindi, Pakistan. Taiwan J Ophthalmol. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5525601/#ref5>
- ⁹Hobday, Karen & Ramke, Jacqueline & du Toit, Rènée & Pereira, Sara. (2014). Healthy Eyes in Schools: An evaluation of a school and community-based intervention to promote eye health in rural Timor-Leste. Health Education Journal. 74. 10.1177/0017896914540896
- ¹⁰India Fact Sheet. National Family Health Survey-4 2015-16, Ministry of Health and Family Welfare
- ¹¹Titiyal JS, et al. Causes and temporal trends of blindness and severe visual impairment in children in schools for the blind in North India. Br J Ophthalmol. 2003;87:941-5
- ¹²Sheeladevi, S, Lawrenson, JG, Fielder, AR & Suttle, CM Global prevalence of childhood cataract: a systematic review. Eye. 2016. <https://doi.org/10.1038/eye.2016.156>.
- ¹³Sightsavers. (2007). Eye care in India – A situation Analysis. Available from: https://www.sightsaversindia.in/wp-content/uploads/2019/03/16482_Eyecare-in-India-A-Situation-Analysis.pdf
- ¹⁴Garai, K. (2019). Cataract among kids is quite common in India. Deccan Chronicle. Available from: <https://www.deccanchronicle.com/nation/current-affairs/280619/cataract-among-kids-is-quite-common-in-india.html>
- ¹⁵Saxena, R., Vashist, P., Singh, D., Tandon, R. (2015). Preventing childhood blindness: Synergy between ophthalmology and community medicine. Available from: <http://www.ijcm.org.in/article.asp?issn=0970-0218;year=2015;volume=40;issue=3;page=149;epage=151;aulast=Saxena>

¹⁶Childhood Blindness. (n.d). Available from: http://v2020eresource.org/content/files/Childhood_Blindness_final.pdf

¹⁷Wadhvani, M., Vashist, P., Singh, S.S., Gupta, V., Gupta N., Saxena, R. (2020). Prevalence and causes of childhood blindness in India: A systematic review. *Indian J Ophthalmol*. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7003592/>

¹⁸Optometry in India Report. (2016). India Vision Institute. Available from: https://www.indiavisioninstitute.org/resources-files/17300ptometry%20in%20India%20report_February%202016.pdf

¹⁹McKinsey & Company. (2005). Innovation blowback: Disruptive management practices from Asia. Available from: <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/innovation-blowback-disruptive-management-practices-from-asia>

²⁰Bansal, P. (2015). Eye care deficit makes India the blind capital of the world. Available from: <https://health.economictimes.indiatimes.com/health-files/eye-care-deficit-makes-india-the-blind-capital-of-the-world/944#:~:text=To%20add%20to%20the%20challenge,recognized%20as%20an%20adequate%20ratio>

²¹Healio Ophthalmology. (2000). Access to eye care, uptake of services are issues in India. Available from: <https://www.healio.com/news/ophthalmology/20120225/access-to-eye-care-uptake-of-services-are-issues-in-india>

²²Somasekhar, M. (2017). India faces shortage of eye specialists. *Hindu BusinessLine*. Available from: <https://www.thehindubusinessline.com/news/variety/india-faces-shortage-of-eye-specialists/article9712661.ece>

²⁴Rohit Saxena, P.V., Radhika Tandon, et al. (2015). Accuracy of visual assessment by school teachers in school eye screening program in Delhi. *Indian Journal of Community Medicine*, 40: p. 38-42.

²⁶Saxena, R. Vashist, P., Tandon, R., Pandey, R, M., Bhadwaj, A., Menon, M. (2015). Accuracy of Visual Assessment by School Teachers in School Eye Screening Program in Delhi. *Indian Journal of Community Medicine*. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4317979/>

²⁷Dubey, M., Nongkynrih, B., Gupta, S.K., Kalaivani, M., Goswami, A.K., Salve, H.K. (2018). Screen-based media use and screen time assessment among adolescents residing in an Urban Resettlement Colony in New Delhi, India. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6293917/>

²⁸LeBlanc AG, Katzmarzyk PT, Barreira TV, Broyles ST, Chaput JP, Church TS, Fogelholm M, Harrington DM, Hu G, Kuriyan R, Kurpad A, Lambert EV, Maher C, Maia J, Matsudo V, Olds T, Onywera V, Sarmiento OL, Standage M, Tudor-Locke C, Zhao P, Tremblay MS, ISCOLE Research Group. *PLoS One*. 2015; 10(6):e0129622.

²⁹Jena, Pravat. (2020). Impact of Pandemic COVID-19 on Education in India. *International Journal of Current Research*. 12. 12582-12586. 10.24941/ijcr.39209.07.2020. Available from: https://www.researchgate.net/publication/342123463_Impact_of_Pandemic_COVID-19_on_Education_in_India

³⁰PRAGYATA Guidelines. Available from: <http://ddnews.gov.in/national/pragyata-guidelines-digital-education-announced-hrd-ministry>

³¹Bishop, V. E., & Benavides, R. C. (1996). *Preschool Children with Visual Impairments*. Available from: <https://www.tsbvi.edu/curriculum-a-publications/3/1069-preschool-children-with-visual-impairments-by-virginia-bishop>

³²Childhood Blindness. (n.d). Available from: http://v2020eresource.org/content/files/Childhood_Blindness_final.pdf

³³Fell, A. (2021). Generations defined: 50 years of change over 5 generations. *McCrinkle*. Available from: <https://mccrinkle.com.au/insights/blog/generations-defined-50-years-change-5-generations-resource/>

³⁴ Panagariya, P. (2019). The Economic Times. Available from: <https://economictimes.indiatimes.com/news/economy/policy/view-why-india-needs-an-eye-glasses-to-all-mission/articleshow/70423557.cms?from=mdr>

³⁵ The Indian Express. (2019). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4317979/>

³⁶ American Optometric Association. (Last updated on website in 2020). School-Aged Vision: 6 to 18 Years of Age. Available from: <https://www.aoa.org/healthy-eyes/eye-health-for-life/school-aged-vision?sso=y>

³⁷ IANS. (2019). Only 46% Indian kids get regular eye tests. Hindustan Times. Available from: <https://www.hindustantimes.com/more-lifestyle/only-46-indian-kids-get-regular-eye-tests/story-eJUXSeMXo4LXuqVIHHzSzH.html>

³⁸ Wilhelmson, G. B., Felder, M. (2020). Learning Is Visual: Why Teachers Need to Know about Vision. Available from: <https://www.intechopen.com/books/education-at-the-intersection-of-globalization-and-technology/learning-is-visual-why-teachers-need-to-know-about-vision>

³⁹ Cleveland Clinic. (n.d.). Available from: <https://my.clevelandclinic.org/health/diseases/17130-eye-disease-inherited-genetic>

⁴⁰ Green, K. (2019). Optimax. Available from: <https://www.optimax.co.uk/blog/poor-eyesight-genetic-inherited/>

⁴¹ Khetrpal, A. (2020). Signs and Risks of Eye Diseases. News Medical Life Sciences. Available from: <https://www.news-medical.net/health/Signs-and-Risk-Factors-for-Eye-Disease.aspx>

⁴² Butler, N. (2020). 7 Best Foods for Healthy Eyes. Healthline. Available from: <https://www.healthline.com/health/eye-health/best-foods-for-eyes>

⁴³ Shaikh, S., Mahalanabis, D. (2018). "Prevalence of Vitamin A Deficiency is a Greater Concern in Children in India". Nutrition and Food Science. Available from: <https://juniperpublishers.com/nfsij/pdf/NFSIJ.MS.ID.555655.pdf>

⁴⁴ Shubhnica, P. (2013). Ophthalmology effect of environment on eyes: A Review. Indian Journal of Clinical Practice. 24:4.

⁴⁵ IANS. (2018). Air Pollution Could be Bad for Your Eyes Too: Doctors. TWC India. Available from: <https://weather.com/en-IN/india/health/news/2018-11-29-air-pollution-eye-health-doctors>

⁴⁶ The Indian Express. (2021). "Beware of dry eyes". Available from: <https://www.newindianexpress.com/cities/chennai/2021/apr/15/beware-of-dry-eyes-2290035.html>

⁴⁷ Determinants of exposure to second-hand smoke at home and outside the home among students aged 11-17 years: results from the Mumbai Student Tobacco Survey 2010.

⁴⁸ UAB Medicine News. (last update on website in 2021). Eye Health in Digital Age: Does Too Much Screen Time Hurt Your Vision?. UAB Medicine. Available from: <https://www.uabmedicine.org/-/eye-health-in-the-digital-age-does-too-much-screen-time-hurt-your-vision->

⁴⁹ Harvard Health Publishing. (2011). Safeguarding your Sight. Harvard Medical School. Available from: <https://www.health.harvard.edu/healthbeat/safeguarding-your-sight>

⁵⁰ Sanand, S.R. (2019). Junk food becoming menace in India! Data points to dangerous increase in consumption. Financial Times. Available from: <https://www.financialexpress.com/lifestyle/junk-food-becoming-menace-in-india-data-points-to-dangerous-increase-in-consumption/1679596/>

⁵¹ Business Insider. (2020). Available from: <https://www.businessinsider.in/advertising/ad-agencies/news/indian-gen-z-spends-an-average-of-8-hours-per-day-online-isobar-ipsos-meetthez-survey/articleshow/74833473.cms>

⁵²Chakraborty, S. (2019). India Suffers Because Women Eat The Last And The Least. Outlook Poshan 2.0. Available from: <https://poshan.outlookindia.com/story/poshan-news-the-game-changer/333941>

⁵³American Optometric Association. (2020). Vitamin A Beneficial for Eyes, just not for preventing Myopia. American Optometric Association. Available from: <https://www.aoa.org/news/clinical-eye-care/health-and-wellness/vitamin-a-good-for-the-eyes?sso=y>

⁵⁴IANS. (2019). Only 46% Indian kids get regular eye tests: Survey. INDIA TV. Available from: <https://www.indiatvnews.com/news/india/only-46-percent-indian-kids-get-regular-eye-tests-surve-565445>

⁴⁹UNICEF, India. <https://www.unicef.org/india/what-we-do/nutrition>

⁵⁰WHO. 2021. <https://www.who.int/news-room/q-a-detail/malnutrition>

⁵⁵Harvard Health. 2011. Safeguarding your sight. Available from: <https://www.health.harvard.edu/healthbeat/safeguarding-your-sight#:~:text=Myth%3A%20Reading%20in%20dim%20light,your%20eyes%20out%20more%20quickly.>

⁵⁶Peck, M.E. (2007). Does reading in the dark hurt your eyes? Available from: <https://scienceline.org/2007/10/ask-peck-darkeyesmyopia/>

⁵⁷Essilor. (n.d.). IS READING IN THE DARK BAD FOR YOUR EYES? Available from: <https://www.essilorusa.com/newsroom/is-reading-in-the-dark-bad-for-your-eyes>

⁵⁸Can you Safely blow Debris from your eyes? (2015). American Academy of Ophthalmology. Available from: <https://www.aao.org/eye-health/ask-ophthalmologist-q/is-it-safe-to-blow-debris-out-of-someones-eye>

⁵⁹Leahey, A.M. (n.d). Retinoblastoma (Eye Cancer in Children). Children's Hospital in Philadelphia. Available from: <https://www.chop.edu/conditions-diseases/retinoblastoma>

⁶⁰Rashid. (2014). India has highest number of Retinoblastoma effected children: CFS. Centre for Sight. Available from: <https://www.centreforsight.net/blog/india-highest-number-retinoblastoma-effected-children-cfs/>

⁶¹Garai, K. (2019). Cataract Among Kids is Quite Common in India. Deccan chronicle Available from: <https://www.deccanchronicle.com/nation/current-affairs/280619/cataract-among-kids-is-quite-common-in-india.html>

⁶²Sukati, V. N., Moodley, V. R., Mashige, K.P. (2018). Knowledge and practices of parents about child eye health care in the public sector in Swaziland. African Journal of Primary Health Care & Family Medicine. Available form: <https://phcfm.org/index.php/PHCFM/article/view/1808>

⁶³Prevent Eye Strain with the 20-20 Rule. (last updated in 2021). Advanced eye care & aesthetics. Available form: <https://advancedeyecaremd.net/20-20-20-tipstopreventeyestrain/>

⁶⁴Right to Education. (last updated in 2021). Available form: [https://righttoeducation.in/index.php#:~:text=\(a\)%20to%20\(d\),one%20classroom%20for%20every%20teacher](https://righttoeducation.in/index.php#:~:text=(a)%20to%20(d),one%20classroom%20for%20every%20teacher)

Annexure

Annexure 1 - Semi structured survey questionnaire for primary school teachers

Semi-structured interview protocol: Teacher's perspective on student's eye health. This interview guide is for the primary school teachers. The objective of this questionnaire is to understand the perception, knowledge, and awareness that teachers have regarding the eye health of students. This will help to build the capacity of the teaching community to play a more effective role in detection of vision related impairment and problems among students for early intervention and prevention.

This survey is voluntary in nature. We leave the decision to participate in the survey completely on teacher's discretion. Participants personal information and responses will be kept confidential and anonymous. It is important to get participant's responses for all the questions for a comprehensive understanding. The survey usually takes 20 minutes to complete. Thank you for your active participation!

Topic guide -

I. Questions related to socio-demographic characteristics-

S. No.	Questions	Responses/Category/Answers	
1.	Name		
2.	Age in years		
3.	Gender		
Education Related Factors			
4.	What type of school do you teach in?	1. Government	2. Private
5.	Highest Educational Qualification?		
6.	Years of teaching experience?		
7.	What subjects do you teach?		
8.	What grade(s) do you teach?		
Eye Condition related factors			
9.	Have you had an eye examination before?	1. Yes	2. No
10.	Do you have any eye related problems?	1. Yes	2. No
11.	Do you wear spectacles?	1. Yes	2. No
12.	Duration of spectacle use in years		
13.	Do any of your family members/close relatives wear spectacles?	1. Yes	2. No
Information related questions			
14.	Have you had training in eye health before?	1. Yes	2. No
14.1	If YES, what was the duration of the eye-health training?		
14.2	What was the main topic of the training?		
14.3	Do you think it was helpful in developing your knowledge about the topic?	1. Yes	2. No

II. Perception of the teacher regarding student's eye health -

Q.1. What do you believe are the main reasons for developing eye diseases in children? Please rank your choices with priority from 1 to 5, with 1 as least priority and 5 as the highest priority.

- a) Too much screen time
- b) Hereditary
- c) Environmental factors
- d) Unhealthy food habits
- e) Lack of exercise

Q. 2. Do you notice any differences in the eye problems across various classes?

- a) Yes
- b) No
- c) Can't say

Q. 2.1. If YES, what according to you are the reasons for it? _____

Q.3. Do you think it is important to know about eye hygiene?

- a) Yes
- b) No

Q.4. If YES, what are some safe and good hygienic practices that can be done in schools?

Ans: _____

Q.5. Please select the most appropriate responses which is true to your knowledge for the statements below -

i. Sitting close to the TV or increased screen time can hurt the eyes of the person

- a) Yes
- b) No
- c) Can't say

ii. Reading in dim-light leads to poor vision

- a) Yes
- b) No
- c) Can't say

iii. Vitamin A is an important nutrient to maintain eye health

- a) Yes
- b) No
- c) Can't say

iv. There is no harm in blowing off objects from other people's eyes

- a) Yes
- b) No
- c) Can't say

v. No blindness is preventable

- a) True
- b) False
- c) Can't say

vi. Which of the following eye diseases may occur in children?

(you may choose more than one)

- a) Cancer of the eye
- b) Cataract
- c) Retinopathy
- d) Glaucoma

III. Awareness about eye-health and practices -

Q.6. Have parents approached you regarding any eye problems of their children?

- a) Yes
- b) No

Q.7. What is the percentage of children in class with eye problems?

- a) None
- b) Very few (less than 25%)
- c) Some (more than 25% but less than 50%)
- d) Most (more than 50%)

Q.7.1. How many students in your class wear glasses?

- a) None
- b) Very few (less than 25%)
- c) Some (more than 25% but less than 50%)
- d) Most (more than 50%)

Q.8. What kind of eye-related issues have you observed in children in your classrooms? (You may choose more than one option)

- a) Watery eyes
- b) Redness in eyes
- c) Squinting
- d) Constant rubbing of eyes or blinking
- e) Frequent headaches
- f) Seeing double
- g) Itching, burning, heavy discharge in eyes
- h) Holding reading material close to the face
- i) Children finding it difficult to read from the black or white board
- j) Extreme light sensitivity
- k) Any other? _____

Q.9. If you have faced any of the above issues in your students, what kind of measures have you taken to address the problem? (You may choose more than one option)

- a) Rotation sitting
- b) Preference seating of students who may not be able to read the blackboard from the last row(s)
- c) Checked if your blackboard writing is visible clearly from the last row
- d) Discussed and practiced good reading postures
- e) Discussed and practiced safe book reading distance with students
- f) Discussed guidelines for healthy screen time
- g) Reach out to their parents/guardian about the student's eye health issue
- h) Any other? _____

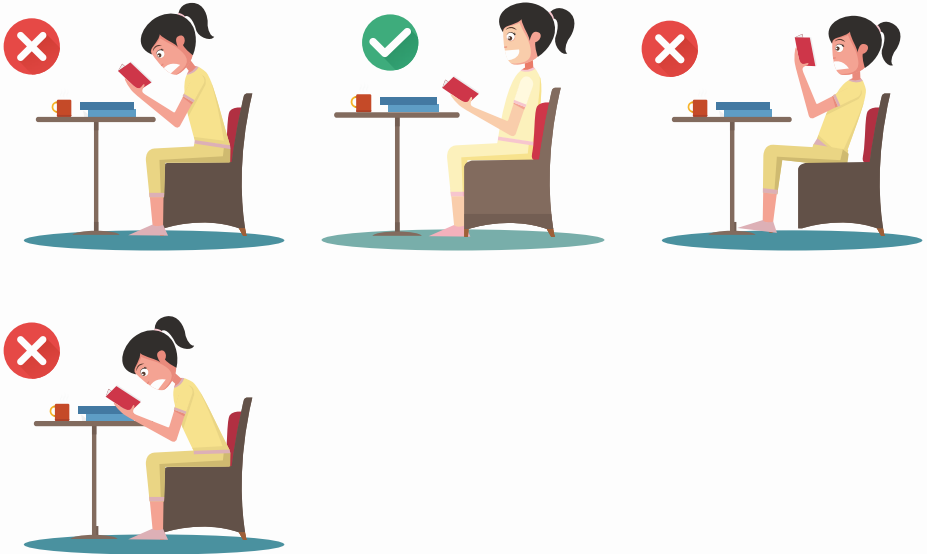
Q.10. What kind of daily issues do children face when suffering from eye-related diseases? (You may choose more than one option)

- a) Inactive/less participation in games or physical activities as compared to others
- b) Lead to poor academic performance
- c) Attending online classes for the day and increase in online activities during the pandemic
- d) Short attention span
- e) Inconsistent reading pace/Avoid reading
- f) Lack of participation in co-scholastic activities (dance, music, art, etc)
- g) Frequent confusion in directions (often confuses their left or right)
- h) Easily frustrated or angered
- l) Any other? _____

Q.11. Are you aware of the good reading posture related to eye health that should be followed by students?

Ans: _____

Q.11.1 From the pictures below, please choose the posture that to your knowledge is the correct reading posture –



Q.12. What do you think can be food items that can help maintain/and or improve eye health? (You may choose more than one option)

- a) Saturated fats
- b) Carrots
- c) Fatty meat
- d) Eggs
- e) White bread
- f) Green leafy vegetables
- g) Fish
- h) Nuts
- i) Legumes (dal, rajma)
- j) Any other? _____

Q.13. As per the PRAGYATA guidelines for digital learning, it has been suggested to maintain a balance between online and offline activities. Which of the following activities will be helpful in taking care of the eye health of students? (You may choose more than one option)

- a) Take notes during the online class and review them offline.
- b) Avoid using mobile/internet surfing 40 minutes prior to going to bed because engaging in passive communication just before sleeping makes the brain active and makes it difficult for the brain and body to relax.
- c) Restrict time for surfing and regulate screen time for scrolling/reading information on every issue.
- d) During online activities take small breaks to stand up and move away from the screen.
- e) Watch out for signs of anxiety, depression /anger during digital learning.
- f) Seek parents' permission before sharing any personal information on the Internet.

IV. Awareness and knowledge about common eye diseases:

Having heard of the highlighted common eye diseases amongst children will be defined as "awareness" and having some understanding of the eye disease will be defined as "knowledge". The demographic associations of awareness and knowledge of all the eye diseases will be analysed against age, gender, educational qualification, type of school the teachers come from and whether they have any disease themselves. Instructions: Respondents may choose more than one option wherever they deem fit. The respondents will remain anonymous.

Q.14. What are some common eye diseases that you think can affect children? (You may choose more than one option)

- a) Conjunctivitis
- b) Trachoma
- c) Refractive Error
- d) Night blindness
- e) Cataract
- f) Colour blindness
- g) Any other? _____
- h) Can't say

Q.15. What are some common eye diseases that you think can affect children? (You may choose more than one option)

- a) Conjunctivitis
- b) Trachoma
- c) Refractive Error
- d) Night blindness
- e) Cataract
- f) Colour blindness
- g) Any other? _____
- h) Can't say

Q.16. In what cases of eye diseases have you had to separate the children?

- a) Conjunctivitis
- b) Trachoma
- c) Refractive Error
- d) Night blindness
- e) Cataract
- f) Colour blindness
- g) Any other? _____
- h) Can't say

Q.17. With Conjunctivitis, what are the main symptoms that you see? (You may choose more than one option)

- a) Sensitivity to light
- b) Pink/or red colour in the white part of the eye
- c) Itching/irritation or burning
- d) Blurred vision for objects at a farther distance
- e) Constant rubbing of eye
- f) Watery/sticky discharge in the eye
- g) Any other? _____
- h) Can't say

Q.18. What kind of impact have you seen refractive error have on the eye health of children?

- a) Affects only near vision
- b) Affects only distant vision
- c) Affects vision at different distances
- d) Cloudiness in vision
- e) Can't say

Q.19. What kind of symptoms do you think we should look out for children to see if they suffer from colour blindness? (You may choose more than one option)

- a) Unable to tell differences between certain shades of colour
- b) Are sensitive to light in the classroom
- c) Unable to differentiate between shapes and lines
- d) Unable to have a good sense of direction
- e) Any other? _____
- f) Can't say

Q.20. Which diseases have you seen develop due to poor sanitation and hygiene? (You may choose more than one option)

- a) Trachoma
- b) Night blindness
- c) Refractive error
- d) Conjunctivitis
- e) Chronic stye
- f) Colour blindness
- g) Any other? _____
- h) Can't say

Q.21. If given training on any of the following area(s) of eye health, what would you want to understand further and get training on?

Ans: _____

Q. 21.1. If you were provided with this training, will you be willing to play a role in identifying potential cases that require immediate medical attention?

- a) Yes
- b) No
- c) Not sure

Annexure 2 - Participant information sheet and consent form for the study

Tech Mahindra Foundation works in collaboration with East Delhi Municipal Corporation and North Delhi Municipal Corporation to improve the quality of education in the Primary Schools of Delhi with the goal to create happier classrooms and shape the future of our nation.

Tech Mahindra Foundation is the corporate social responsibility arm of Tech Mahindra Limited and has been working in the areas of education, employability, and disability by supporting initiatives that lead to employability and sustainable transformation. With a pan India presence running 120+ projects along with 90+ partners across India, the Foundation is one of the leading CSRs in the country.

The Foundation takes cognizance of the fact that any kind of intervention requires an in-depth understanding of the matter at hand as its first step. To be able to create happier and safer classrooms, it is important to identify all change agents that may contribute to the cause. Keeping this in mind, we wish to conduct this survey to understand how we can leverage the teaching community in creating safer classrooms for all our students.

Participant information sheet-

Teachers' Perspective, Awareness and Understanding of Students' Eye Health

Dear Participant,

We would like to invite you to take part in this research study. The purpose of this information sheet is to explain the research objective and what is expected from the participant so that you can take a judicious decision. Please take time to read the following information carefully. You may seek more clarity in case of any ambiguity or if you would like more information on anything. You may take time to decide whether or not to take part, either way we will respect your decision. After you are properly satisfied that you understand this study, and that you wish to participate, please do tick the box giving your consent to be a part of this study and proceed with the survey questionnaire.

Your participation in this study is voluntary. It is completely on your own discretion to make this decision. If you volunteer to be in this study, you may also withdraw from it at any time.

This study has been approved by Tech Mahindra Foundation's Research and Ethics Review Committee.

What is the purpose of this study?

The title of the study is Teachers' Perspective, Awareness and Understanding of Students' Eye Health. The research aims to investigate the current knowledge, awareness, and perception of primary school teachers of student's eye health and eye health related healthy practices. We are conducting this survey to understand your point of view and perception. Thus, there is no right or wrong answer.

What kind of involvement is expected from the participant?

If you agree to participate in this study, you will be asked to fill the online survey attached to this form. The objective of this survey is to understand the perception, knowledge, and awareness that teachers have regarding the eye health of students. It is important that you answer all the questions asked in the survey honestly and true to your knowledge. After the submission of the survey, the research group may reach out to you for a personal interview or focused group discussion. You will be notified about the same beforehand.

Are there possible disadvantages and/or risks in taking part?

To the best of our knowledge, there are no risks (either personal or to any other) or disadvantages in taking part in this research study.

What are the benefits of being in this study?

There may or may not be any direct benefits to you. You will not be reimbursed or paid for participation in this study. However, information obtained from this study will help to understand how effective we can make the teaching fraternity in identifying eye health issues in their students and do the early level intervention and avoid serious consequences later.

Will my taking part in this project be kept confidential?

We assure you that any private and confidential information or any personal notes will be only for our reference only. We will maintain full confidentiality at all points of times. We also ensure full anonymity as well. All data collected from participants will be stored in password protected files on a secured computer and the access will only remain with the immediate research group.

Who should I contact if I have any questions?

If you have any questions regarding the study, please contact **Archana Vishwakarma** at archana.v@techmahindrafoundation.org or **Rupsha Mitra** at rupsha.mitra@techmahindrafoundation.org

INFORMED CONSENT FORM

Title of Study: "Teachers' Perspective, Awareness and Understanding of Students' Eye Health." By signing below, I confirm the following:

- I have been given written information for the above study and have read and understood the information given.
- I have had sufficient time to consider participation in the study and have had the opportunity to ask questions and all my questions have been answered satisfactorily.
- I understand that my participation is voluntary, and I can at any time withdraw from the study.
- I understand the risks and benefits, and I freely give my informed consent to participate under the conditions stated.
- I understand that all personal data will remain STRICTLY CONFIDENTIAL and all research data collected will be securely stored.

I agree to be a part of this study

- a) YES
- b) No

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