

# A Statistical Study of Spectacle Use and Eye Health of School Students: A Special Reference to Satara District, Maharashtra

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**Abstract:-** In recent years, the prevalence of eye health problems among school students has become a growing concern worldwide. School age is very important in every child's life starting from physical growth to educational and social life. Giving attention in this period may result in proper development. This survey can provide insights into potential issues students are facing and will help to identify risk factors that influence the eye problems in School students. The primary focus of this study was to determine the compliance of spectacle wear among school students. A cross-sectional, descriptive questionnaire-based study was conducted among the school students in the Satara District, Maharashtra. Data was collected from total 468 students aged 5-17 years, classes 1–10, from five schools in Satara District. 52.26% of students experience changes in their facial and neck structure due to spectacles. This paper provides empirical evidence examining significant association between practicing yoga or eye exercises and eye problems, how many years students are using spectacles and changes in facial and neck structure and also check whether there are any significant difference in current spectacle number and number when student first got spectacle using statistical tests. Additionally, it examines the awareness about computer vision syndrome among school students and also determines which eye problems they mostly face.

**Keywords:-** Spectacle and Associated Risk Factors, School Students, Eye Problems, etc.

## I. INTRODUCTION

A spectacle is a corrective lens typically worn in front of eyes to improve vision. The most common use is to correct refractive errors. Having good vision is important to everyone but in school students it can have a particularly damaging effect, if vision problems go undetected in this age, it can leave many students struggling to see on the board. Good vision of human being is essential for vital events in lifetime, it plays major role in studies, extra-curricular activities, sports, daily life, etc. It can have major impact on overall performance of a student. Eye disorders and vision issues have large impact on health cost; it can also cause disability, suffering and loss of productivity. WHO estimates that approximately 19 million children worldwide are visually impaired of which 1.6 million children in India are visually impaired due to uncorrected refractive error and the common

vision problem faced in children is myopia i.e. nearsightedness.

This study mainly aims, to investigate the eye health of school students and prevalence of spectacle use among them. The study majorly focuses on use of spectacles, reason behind not wearing Spectacles, yoga or eye exercises practicing, effect after checking number, eye problems faced due to spectacles, awareness about Computer vision syndrome, changes in facial and neck structure due to spectacles. Participants of the study were all students starting from age 5 to age 17 in Satara District. We hope to spread awareness among students, parents and teachers to help children for early interventions of the vision problems observations. Findings from studies indicate that lack of awareness and knowledge regarding the need and importance of using spectacles can be a major barrier to spectacle wear among students.

### ➤ Objectives:

- To check whether practicing yoga/eye exercises have any significant impact on the frequency of occurrence of eye problems among students
- To check awareness about computer vision syndrome among school students.
- To identify the effect of how many years using spectacle on changes in facial and neck structure of students.
- To find whether there are any significant difference in current spectacle number and number when student first got spectacle.
- To determine which eye problems are mostly faced by students.

## II. LITERATURE REVIEW

In this paper, a cross-sectional, non-interventional study aimed to evaluate the ocular, visual, and systemic manifestations of Computer Vision Syndrome among secondary school students, along with the related risk factors. The study highlights that excessive use of digital devices among secondary school students can result in Computer Vision Syndrome (CVS), characterized by ocular symptoms like eye rubbing and tearing, as well as visual problems such as blurry vision <sup>[1]</sup>. Spectacle compliance was poor among rural secondary school children in Pune district, India, which showed low adherence to wearing spectacles. Reasons for

non-wear included loss, damage, forgetfulness, teasing, and dislike of spectacles <sup>[2]</sup>. This paper comprehensively addresses the significant issue of refractive errors, particularly focusing on the growing prevalence among school-going children, worsened by increased digital device usage during the COVID-19 pandemic. Furthermore, the paper explores the potential role of yoga in mitigating refractive errors by promoting eye relaxation, mindfulness, and healthier habits. It suggests that integrating yoga practices, along with outdoor activities, could offer a holistic approach to reducing eye strain and promoting better eye health in children. Overall, the paper underscores the need for complementary practices alongside traditional eye care to safeguard children's visual health and enhance their quality of life <sup>[3]</sup>.

This research paper have reported a rising trend in myopia prevalence over the past few decades, attributed primarily to lifestyle changes, and limited outdoor exposure among children. Additionally Urbanization, educational pressures, and socioeconomic factors have been identified as significant risk factors in driving the myopia epidemic. However, limited research exists on myopia prevalence specifically in suburban areas, warranting further investigation to understand the risk factors <sup>[4]</sup>.

### III. METHODOLOGY

For this study, primary data was collected from school students aged 5-17 years, from classes 1-10, with different mediums of education, i.e., Marathi medium, Semi-English medium and English medium. The data was collected through in-person interview of students. Convenience sampling was employed for sample size which is 468 students from five different schools in Satara district. Permission was also obtained from the respective School In charge /authorities & class teacher in Schools to undertake the research at their facilities. The data was collected by standard format from students directly after informed written consent from school principal and class teacher for the involvement of students in this study. Ethical permission for conducting the study was also obtained from the ophthalmologist Dr. S. Kandalgaonkar during preparation of the questionnaire.

The preliminary aim of this study is to collect the data from school students regarding use of spectacles & eye health. So we prepared a questionnaire focusing on general eye health, any existing vision problems and few lifestyle habits. To ensure the reliability and validity of our survey, we carefully created a questionnaire and firstly we did a pilot study at Jijamata Practicing School, Satara. Then we distributed the same questionnaire for other schools also. The statistical analysis for this study was done using python, MS-Excel software with statistical techniques such as chi-square test and Wilcoxon's signed rank test. All results obtained were calculated at 5% level of significance.

### IV. STATISTICAL ANALYSIS

Table 1 Summary of Demographics for Participants Involved in this Study

Demographic factors	Class	Total (Percentage)
Gender	Female	253 (54.06%)
	Male	215 (45.94%)
Area of residence	Urban	326 (69.66%)
	Rural	142 (30.34%)
Current Age	5-7 years	21 (4.49%)
	8-10 years	85 (18.16%)
	11-14 years	239 (51.07%)
	15-17 years	123 (26.28%)
Family income	Below 50,000	78 (16.67%)
	50,000 - 1 lakh	155 (33.12%)
	1 lakh - 5 lakh	157 (33.55%)
	Above 5 lakh	78 (16.67%)

Table.1 shows that the percentage of female & male involved in this study was 54.06% & 45.94% respectively. Also, rural-urban proportion in this study 69.66% & 30.34%.

➤ *Graphical Representation:*

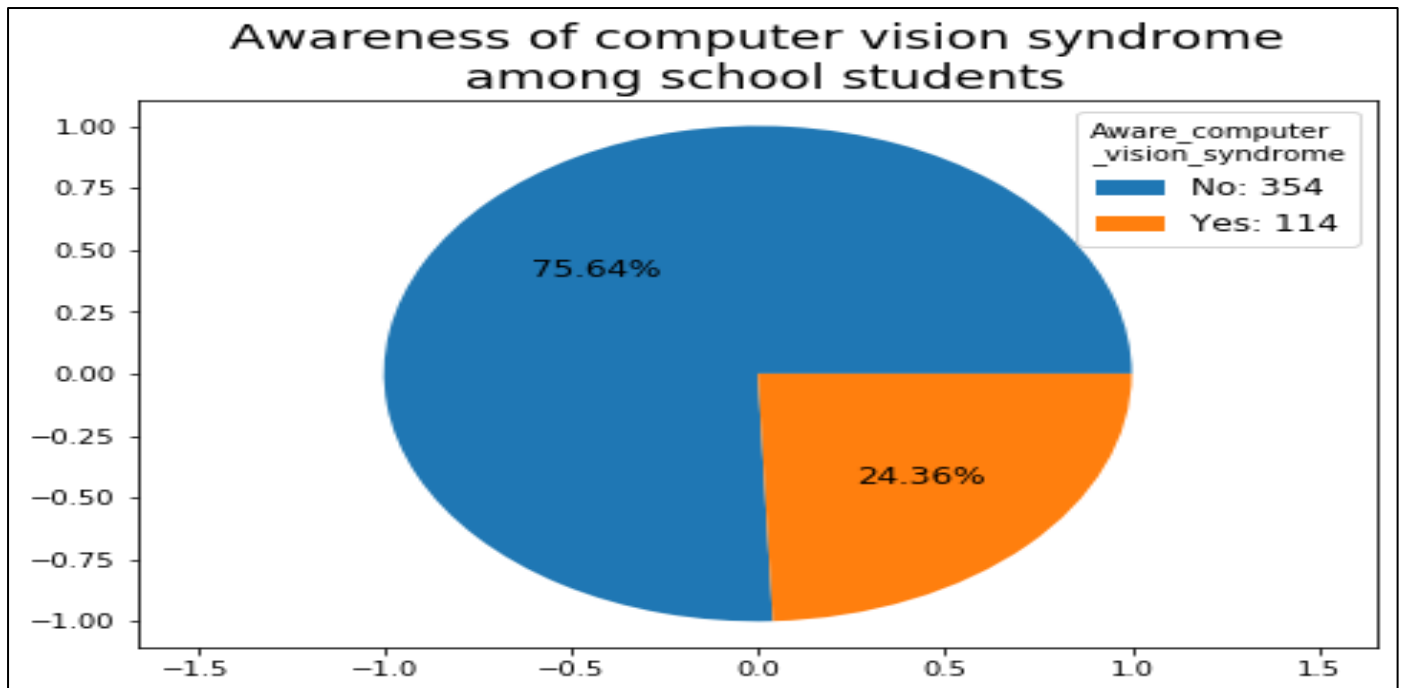


Fig Awareness of Computer Vision Syndrome among School Students

The conclusion drawn from the fig 1 is that a significant majority of students, approximately 75.64%, are not aware of Computer Vision Syndrome. Computer Vision Syndrome, which incorporates eye and vision-related problems associated with prolonged computer use, can have various adverse effects on individuals, especially students who might

spend considerable time on computers for study and leisure. In contrast, only small fractions, about 24.36%, have awareness of the condition. This discrepancy indicates a considerable gap in knowledge regarding Computer Vision Syndrome among the students.

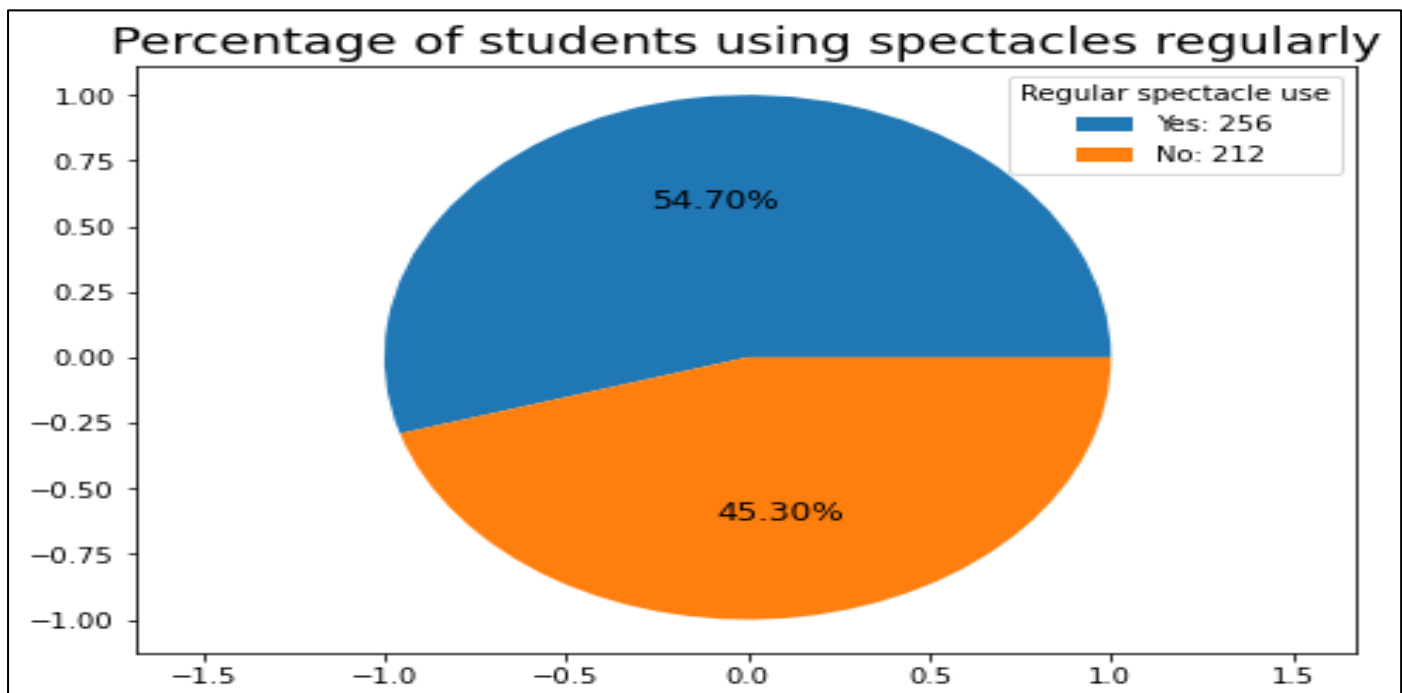


Fig 2 Percentage of Students using Spectacles Regularly

Fig. 3 shows that, out of total spectacles using students i.e. 468, 54.70% students use spectacle regularly, the remaining 45.3% students do not use their spectacles

regularly. It shows inconsistency in usage that might lead to fluctuating visual experiences or discomfort.

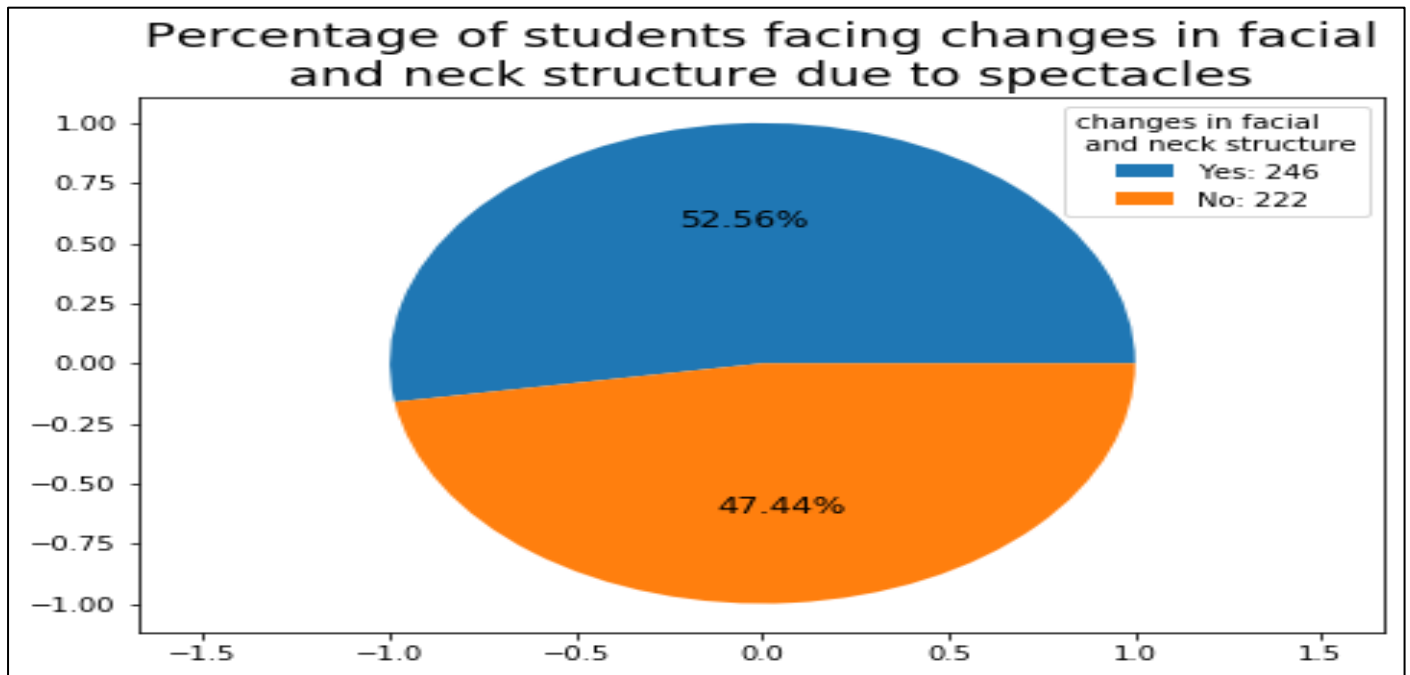


Fig 3 Percentage of students facing changes in facial and neck structure due to spectacles

Fig. 5, it reveals that 52.26% of students experience changes in their facial and neck structure due to spectacles. This data indicates that the long-term effects of wearing glasses are not limited to vision correction but also impact the physical structure. This helps us understand the importance

of recognizing and addressing the physical changes associated with the use of glasses. It provides a basis for thinking about improving the design and usage methods of glasses to minimize these effects.

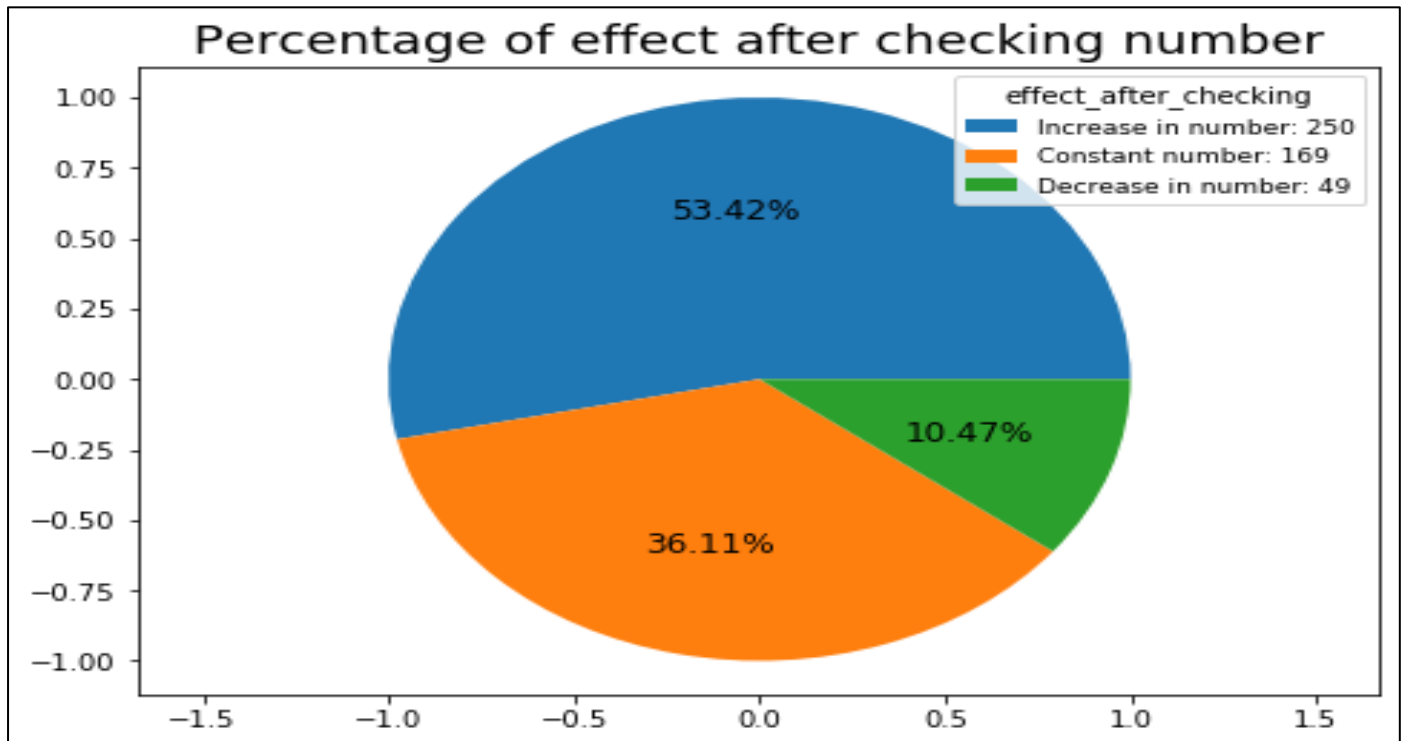


Fig 4 Percentage of effect after Checking Number

Fig. 6 shows 53.42% students face increase in number after checking their eyes indicating a progression in their vision issues that necessitated stronger corrective lenses. This substantial portion highlights a common trend of worsening

vision among school students and 36.11% students have constant spectacle number, 10.47% students number decreases after checking their number.

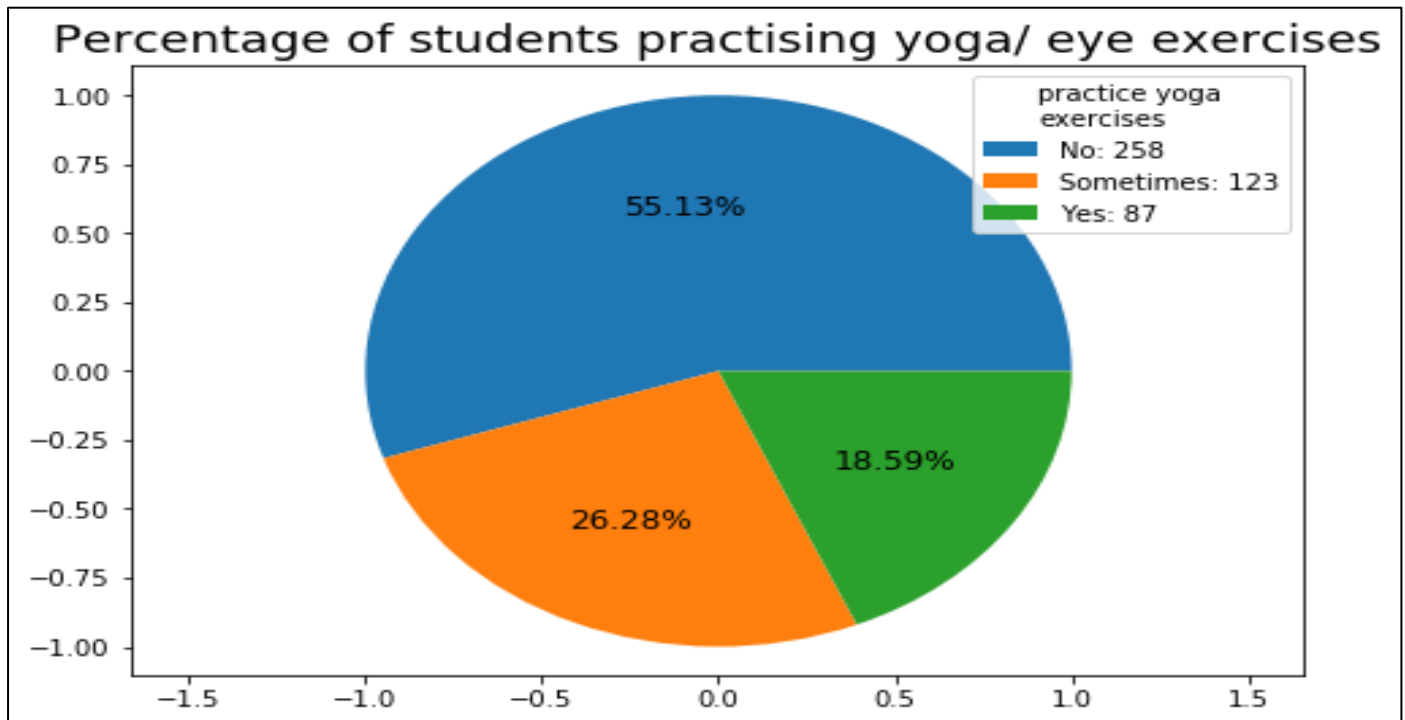


Fig 5 Percentage of Students Practising Yoga/ Eye Exercises

From fig. 7, we can see 55.13% students do not practice yoga or eye exercises regularly suggesting a lethargic approach to managing their eye health and overall well-being. On the other hand, 26.28% of the students engage in yoga or eye exercises occasionally, 18.59% of students practice yoga or eye exercises regularly. This is significant percentage

demonstrates a Positive trend towards adopting healthy lifestyle habits that can benefit vision health, such as reducing eye strain and improving eye muscle strength, especially important in the digital age where students are exposed to screens frequently.

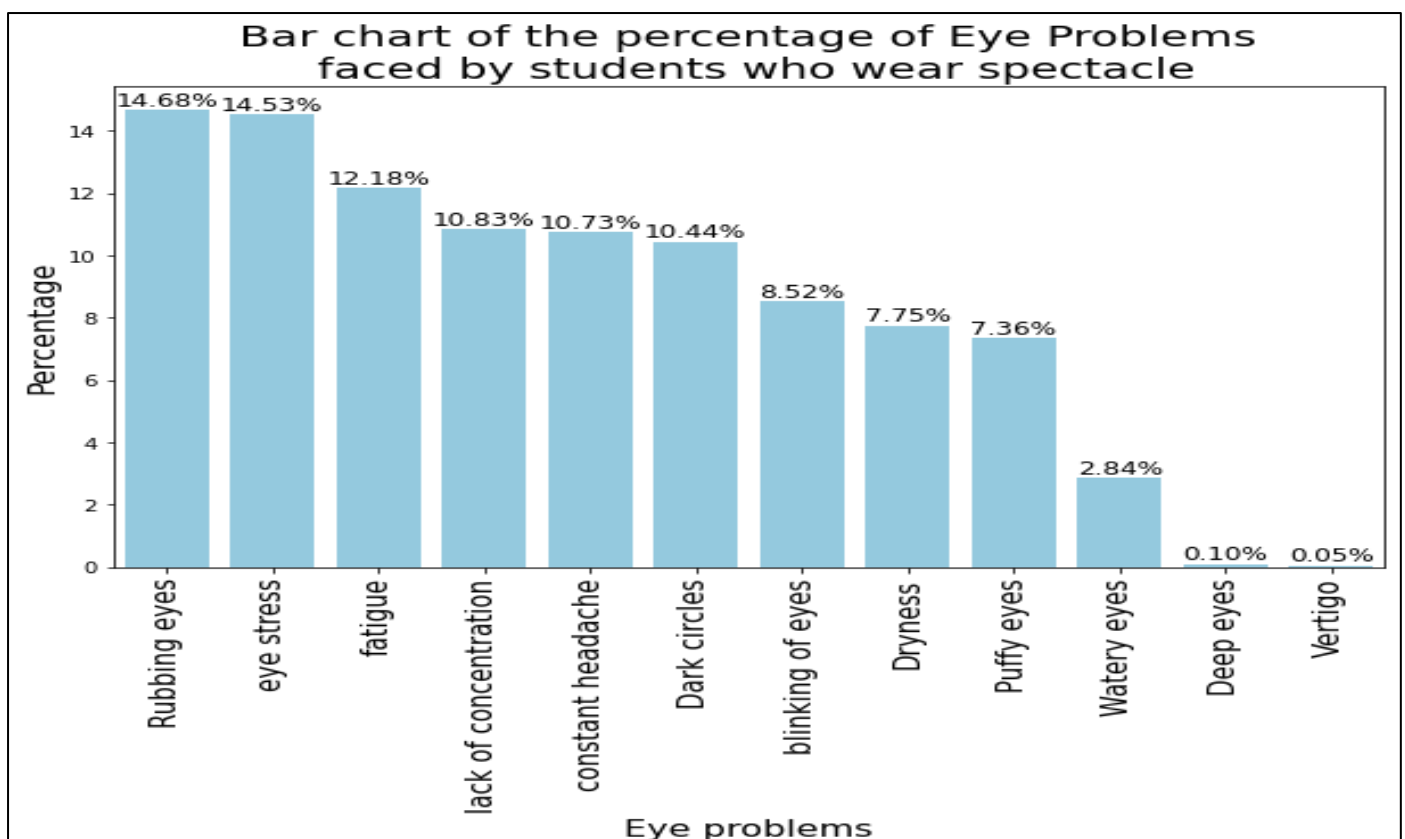


Fig 6 Bar chart of the percentage of Eye Problems faced by students who wear spectacle

Fig. 8 indicates that, rubbing eyes & eye stress was seen more frequently in students than other eye problem which was 14.68% & 14.53% respectively. Followed by other problems like fatigue, lack of concentration, constant headache, dark circles, blinking of eyes, dryness, puffy eyes, watery eyes, deep eyes & vertigo. These findings indicate a significant issue with eye discomfort and strain among students, likely influenced by factors such as prolonged screen time, inadequate breaks during study sessions, and possibly poor lighting conditions.

➤ *Chi-Square Test for Independence:*

In this study, we investigate the potential statistical association between practicing yoga or eye exercises and

number of eye problems occurring, as well as the relationship between the duration of spectacle usage among students and changes in their facial and neck structure.

➤ *Hypothesis:*

- **H<sub>0</sub>:** There is no statistical association between two categorical variables.
- **v/s**
- **H<sub>1</sub>:** There is statistical association between two categorical variables.

Table 2 Chi-Square Test for Independence

Variables	Chi-square statistic	p-value	Degrees of freedom
Practicing yoga/eye exercises and eye problems	18.0660	0.0207	8
How many years students are using spectacles and changes in facial and neck structure	13.9254	0.0075	4

If p-value is less than 0.05 significance level, reject the null hypothesis. Since,  $\alpha=0.05 > p\text{-value}$ . Therefore, we reject H<sub>0</sub>. Table 2, which shows a statistically significant association between practicing yoga/eye exercises and eye problems, suggests that engaging in yoga and eye exercises may have a beneficial effect on eye health. This association indicates that individuals who regularly practice yoga or specific eye exercises might experience fewer eye problems or a reduction in the severity of existing eye conditions, compared to those who do not engage in such practices. This study finds a statistically significant association between the duration of spectacle use and changes in facial and neck structure among students suggests that long-term use of spectacles can have an impact on physical attributes. This relationship points to the possibility that wearing spectacles over many years could lead to adaptations or modifications in the structure of the face and neck, potentially due to factors like the constant pressure exerted by the spectacles on the nose and ears.

➤ *Wilcoxon Signed Rank Test:*

To check the significant difference we also collected data of current number and number when student got his/her first spectacles from 165 students, as not all students were able to give information about their spectacle number. So, we conducted Wilcoxon signed-rank test to check whether there is significant difference in current spectacle number and the number when student got his/her first spectacle.

➤ *Hypothesis:*

- **H<sub>0</sub>:** There is no significant difference between current spectacle number and the number when student got first spectacle.
- **V/s**
- **H<sub>1</sub>:** There is significant difference between current spectacle number and the number when student got first spectacle.

Table 3 Wilcoxon Signed Rank Test

Variables	Test Statistic	P-value
For right eye	321	2.1287e-11
For left eye	280	9.2307e-13

From Table 3,  $\alpha=0.05 > p\text{-value}$ . Therefore, we reject H<sub>0</sub>. There is statistically significant evidence to suggest that the spectacle numbers for both the left and right eyes of school students have changed over time since they first received their spectacles. This conclusion implies that eye care professionals should be aware of the potential for student's vision to change over time and highlights the importance of regular eye examinations to adjust spectacle prescriptions as needed to accommodate these changes.

## V. CONCLUSION

The study reveals critical insights into student's eye health, particularly highlighting a substantial lack of awareness of Computer Vision Syndrome, which is prevalent among approximately 75.64 % of the students. This condition, resulting from prolonged computer use, underscores the need for increased educational and awareness initiatives. In this study it was observed that, some students expressed the view that their parent's showing no interest in checking their spectacle number or getting spectacle for them even after detecting refractive error (myopia). The study also indicates that a majority of students (55.13%) do not engage



in regular yoga or eye exercises, potentially contributing to the increasing prevalence of eye-related issues such as eye rubbing, eye stress, fatigue, lack of concentration, constant headache, dark circles respectively with prevalence rate more than 10% in overall eye issues which could significantly impact student's overall well-being and academic performance.

However, there are chances of reducing eye problems as the research identifies association between the practice of yoga/eye exercises and improved eye health. This suggests that regular engagement in these activities could mitigate the severity of eye problems and promote better vision health. The study further explores the long-term effects of spectacle use, revealing a notable association between prolonged use and changes in facial and neck structure, suggesting at the physical implications of consistent spectacle wear.

In conclusion, the findings underscore a critical need for enhanced educational efforts and awareness programs targeting students, their families, and educational institutions to bridge the knowledge gap on Computer vision syndrome and promote healthier eye care practices. Emphasizing the benefits of regular yoga/eye exercises and addressing the barriers to spectacle compliance are vital steps towards improving student's eye health. Collaborative efforts from schools, healthcare providers, and community organizations are imperative to cultivate an environment encouraging eye health education and proactive prevention measures, ensuring students can navigate the digital age with minimal risk to their visual and overall health.

## VI. LIMITATIONS

### ➤ *The Limitations of the Study were*

- The data was collected only from 468 school student in Satara district. The conclusions are obtained on the basis of data collected.
- The study is subject to human error.
- Some respondents did not answer well therefore the information on some units are not relevant.
- The major limitations of our study are that many of our results were obtained from participant's self-report.
- Another limitation of our study is that the survey choices were limited to only four possible reasons for why they were not wearing their spectacles. There might be any other reasons that can be considered for investigation.

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- **Financial support and sponsorship:** Nil
- **Conflicts of interest:**

The authors declare that there was no conflict of interest.

## FUTURE RESEARCH

Moreover, the significant association found in the study underscores the need for further research to explore the specific mechanisms through which yoga and eye exercises impact eye health, identify the most effective practices, and develop guidelines for their implementation. Overall, the study supports the potential of yoga and eye exercises as valuable tools in promoting eye health and preventing vision problems.

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