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"A Study on Prevalence of Visual Impairment among School Going Children of Age 10 to 14 years in Urban Chennai"

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Abstract: ***Background: Visual impairment among school children is a raising concern because of increased screen exposure, poor dietand lack of early eye check-ups. It affects academic performance, physical activities and confidence in children.***
Objectives:

- ***To find the prevalence of visual impairment among school-going children aged 10 to 14 years.***
- ***To identify the underlying causes.***
- ***To assess the association between mobile usage and visual impairment.***

Methods: A cross-sectional study was conducted among 200 children aged 10–14 years in a Government School in urban Chennai. Stratified random sampling was used. The data was collected using a structured questionnaire containing 14 questions and Snellen's chart. Children already using glasses were excluded. Data were analyzed using SPSS version 24.
Results: The prevalence of visual impairment was found to be 41.5% among the participants. The most commonly reported symptoms were headache (17.5%), eyestrain (12.5%), and watering of the eyes (11%). A statistically significant association was observed between visual impairment and the duration of mobile phone usage (p = 0.001), class duration (p = 0.048), and inadequate intake of green leafy vegetables (p = 0.001). However, no significant association was found between visual impairment and factors such as parental use of spectacles or attendance in online classes
Keywords: Visual impairment, school children, screen time, myopia, mobile usage, refractive error, Chennai

I. INTRODUCTION

Visual Impairment and blindness are major public health problems in developing countries. Vision impairment both low vision and blindness compromises the quality of life. While the number of children with vision loss is relatively low in comparison with the number of older people, the impact as measured in Disability Adjusted Life Years DALY ranks childhood blindness second only to cataract on the global burden of eye diseases. It is one of the five priority areas of the World Health Organization "VISION 2020 – THE RIGHT TO SIGHT" programme.1 Studies have found that children who spend more time indoors and in front of screen are more likely to develop near sightedness or(myopia) . The exact process is still being studied, but researchers believe UV light plays an important role in healthy eye development. The rate of near-sightedness in children has increased dramatically in the past 30 years. 2 It is estimated that in almost half of the children blind today, the underlying cause could have been prevented. In children visual impairment can affect school performance and other functions such as ability to participate in sports, affecting the child's self-confidence. More time on electronic devices puts children at risk for digital eye strain, which is characterized by itchy, red, watery eyes that can feel irritated and uncomfortable. Staring at screens can also increase the likelihood of dry eye, uncorrected refractive errors and unstable binocular vision.3

II. METHODOLOGY

This study was conducted in a Government School located in urban Chennai. It followed a cross-sectional study design and was carried out over a period of two months, from August 2022 to September 2022. The study population consisted of school-going children aged 10 to 14 years.
A total of 200 students were selected using the stratified random sampling method to ensure balanced representation across different age groups.

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Data collection involved the use of a structured questionnaire to collect information on sociodemographic details, screen time, dietary habitsand visual symptoms. In addition to this, a visual acuity test was performed using Snellen's chart to identify any signs of visual impairment.

The inclusion criteria was children aged 10 to 14 years who were currently studying in the selected school. The exclusion criteria involved children who were already wearing spectacles, as the aim was to assess undiagnosed or uncorrected visual issues.

III. RESULT

A total of 200 school-going children aged between 10 to 14 years were included in the study. The observations related to the study objectives are presented below.

Out of the total 200 participants, the age-wise distribution was 11% were aged 10 years, another 11% were 11 years, 22.5% were 12 years, 20% were 13 years, and the highest proportion, 35.5%, were 14 years old. This indicates a relatively balanced age representation with a predominance of older children.

Gender distribution revealed that 130 (65%) of the students were female and 70 (35%) were male, showing a higher female participation in the study.

In terms of academic grade, students were from classes 5 to 10. The highest number of participants were from Class 9 (31%), followed by Class 7 (24.5%) and Class 8 (18.5%), while was Class 10 (4%).

IV. VISUAL IMPAIRMENT PREVALENCE

Among the 200 students surveyed, 83 (41.5%) reported that they experiencing difficulty in reading letters from the board, indicating mild visual impairment. The remaining 117 students (58.5%) did not report any such difficulty and so they were classified as having normal visual acuity. Overall this suggests that nearly two out of every five students in this age group may be affected by visual issues.

V. VISUAL SYMPTOMS REPORTED

When asked about visual symptoms, 35 students (17.5%) reported experiencing headaches, 25 students (12.5%) had eyestrain, and 22 (11%) had watering of the eyes. About 118 students (59%) reported no symptoms. These findings suggest that a significant proportion of students with mild visual impairment may present with subtle or no significant symptoms, underlining the importance of active screening.

VI. UNDERLYING CAUSES AND ASSOCIATED FACTORS REKATED TO VISUAL IMPAIRMENT

The association between visual impairment and various behavioral and environmental factors was explored through cross-tabulation and chi-square analysis.

1) Online Classes During COVID-19 Lockdown

A total of 192 students (96%) reported attending online classes during the COVID-19 lockdown. However, there was no statistically significant association between online class attendance and visual impairment ($p = 0.727$).

2) Duration of Each Online Class

Most students (78.5%) had classes lasting 30 to 45 minutes. A statistically significant association was observed between class duration and visual impairment ($p = 0.048$). Longer sessions were mostly associated with mild visual problems.

3) Mobile Usage (Time Spent Playing Games)

A highly significant association was observed between the duration of mobile phone usage and visual impairment ($p = 0.001$). Interestingly, while the majority of students with normal vision used mobile phones for 2 to 4 hours, a greater proportion of students with mild impairment reported using them for less than 2 hours. This discrepancy may reflect other influencing factors such as screen brightness, posture, or lighting conditions.

4) Frequency of Green Leafy Vegetable Consumption

A strong association was identified between vegetable intake and visual health ($p = 0.001$). Children who consumed green leafy vegetables daily or twice a week had lower no visual imapirment, while those who consumed them infrequently or not at all showed higher impairment rates.

5) Parental Use of Glasses

No significant association was found between parental spectacle use and child visual impairment (p = 0.320), suggesting that hereditary factors were not a major determinant in this particular population.

6) Difficulty Reading Letters from the Board and Class Duration

A highly significant association (p < 0.001) was found between difficulty reading the board and longer class duration, reinforcing the influence of prolonged screen exposure on visual strain.

Table1.0: Summary of Risk Factors and Their Association with Visual Impairment

VARAIBLE	MILD (n)	NORMAL (n)	p-value	INTERPRETATION
Online classes during COVID (Yes)	84	108	0.727	Not significant
Class duration (30 to 45 mins)	70	87	0.048	Significant (longer class → more impairment)
Mobile usage (2 to 4 hrs)	24	57	0.001	Highly significant
Green leafy veg (Daily)	4	32	0.001	Highly significant (protective effect)
Green leafy veg (Not at all)	15	3		Higher impairment among those who avoid veg
Parents wearing glasses (Yes)	37	55	0.320	Not significant
Difficulty reading board vs. class duration	—	—	0.000	Highly significant

This table shows the comparative distribution of children with mild and normal vision across various risk and protective factors, along with their respective p-values. Statistically significant variables include class duration, mobile usage, vegetable intake, and difficulty in reading the board, whereas online classes and parental spectacle use were not significant contributors to visual outcomes.

Fig 1.0 BAR DIAGRAM REPRESENTING RELATION BETWEEN VISUAL IMPAIRMENT AND ONLINE CLASSES DURING COVID

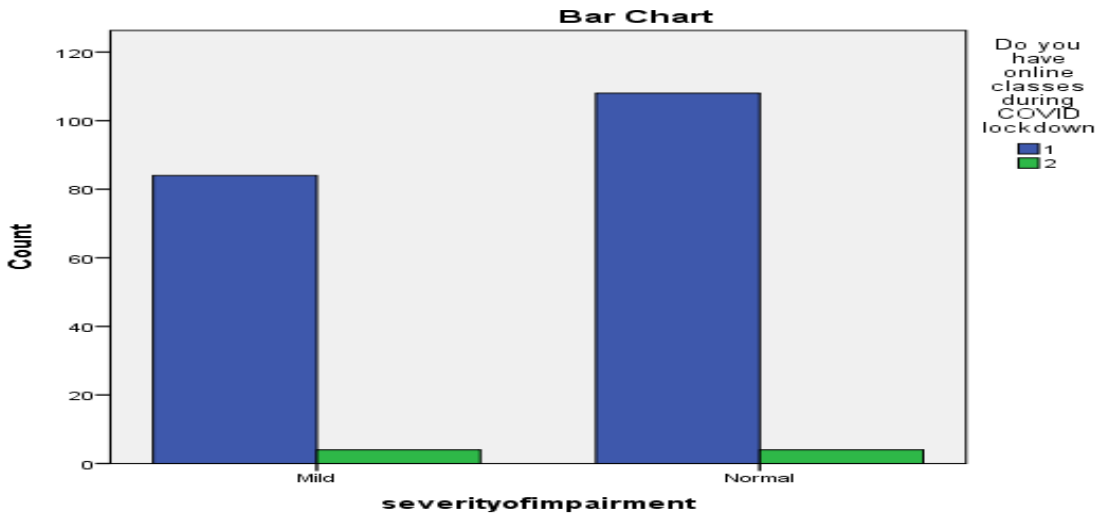
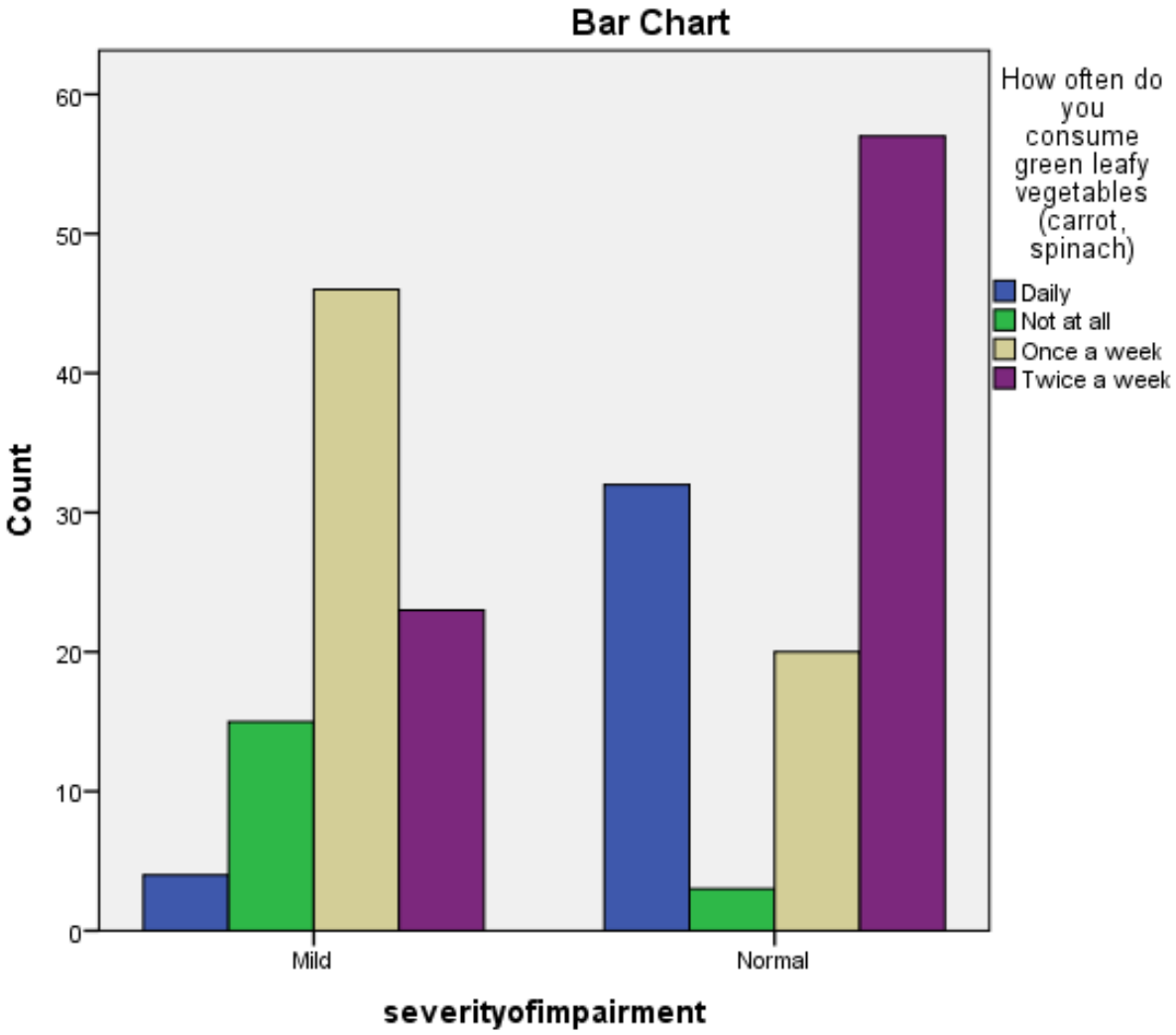


Fig 2.0 BAR DIAGRAM REPRESENTING THE ASSOCIATION BETWEEN VISUAL IMPAIRMENT AND CONSUMPTION OF GREEN LEAFY VEGETABLES



VII. DISCUSSION

The present study aimed in assessing the prevalence and associated factors of visual impairment among school-going children of age 10 to 14 years and of which the findings suggest that a significant portion of about 40% experienced mild visual impairment, primarily based on the reported difficulty in reading letters from the class board. This figure is considerably high and needs greater attention toward early screening and appropriate intervention in this age group.

The age and gender distribution of participants reflected a predominantly adolescent population, with a significantly higher proportion of females (65%). Class 9 and Class 7 students accounted for the largest group of participants. The peak prevalence among the 14 year old group probably suggest age-related progression of refractive errors, which is consistent with patterns observed in other school-based ophthalmic surveys (Murthy et al., 2002).

When evaluating visual symptoms, headache (17.5%) and eyestrain (12.5%) were the most commonly reported complaints, suggestive of undiagnosed refractive issues. However, a substantial proportion of children with reported impairment had no overt symptoms, indicating that reliance on symptom-based screening alone may lead to under-detection (Zhao et al., 2000).

Environmental and behavioral factors were analyzed for their association with visual impairment. While online class participation during the COVID-19 lockdown was widespread (96%), it did not show a statistically significant correlation with visual impairment outcomes.

This suggests that duration and nature of screen exposure, rather than participation alone, are more critical factors (Mohan et al., 2021).

In this regard, class duration was a statistically significant factor ($p = 0.048$). Longer exposure to digital screens during academic sessions, especially beyond 45 minutes, showed a notable association with visual difficulties. This correlates with the previous studies that highlighted the strain caused by prolonged near work and digital device use in children (Sheppard & Wolffsohn, 2018).

Mobile phone usage showed a highly significant association with visual impairment ($p = 0.001$). Interestingly, although more children with mild impairment reported using mobiles for less than 2 hours, this may indicate under-reporting or other screen time exposures not captured in the survey. Regardless, it signifies that increased screen exposure, particularly for entertainment, can contribute to digital eye strain (Lanca & Saw, 2020).

Dietary patterns, particularly the intake of green leafy vegetables, demonstrated a protective effect against visual impairment ($p = 0.001$). Students with daily or weekly twice intake of such vegetables had better visual outcomes, supporting the known role of vitamin A and other micronutrients in visual health (Sommer, 2008).

Parental history of spectacle use was not significantly associated with child visual status ($p = 0.320$). This finding suggests that while genetics may play a role in some populations, environmental factors had greater influence in this setting.

Finally, a strong correlation was found between difficulty reading the board and class duration ($p < 0.001$), again emphasizing the burden of prolonged visual tasks on young eyes.

Several Tamil Nadu–based epidemiological surveys offer correlation to our study findings. The comprehensive Kanchipuram district screening reported a 3.8% prevalence of vision impairment mainly due to refractive errors. Similarly, the STEM study among 5–16 year-olds in Tamil Nadu documented a 17.5% myopia prevalence, while the SN-SEES project reported 5.7% vision impairment and 3.6% myopia among 91,545 children. A Salem-based semi-urban study found 11.7% myopia and a clear association with gadget use and near work. While our study finds a much higher 41.5% self-reported visual difficulty, this discrepancy likely stems from the subjective reporting of symptoms rather than clinical diagnosis. However, the pattern is consistent that the refractive errors are the main driver, and associations with screen time, near work, and age are aligned with local data. This reinforces the urgent need for objective screenings and targeted visual health interventions in Tamil Nadu.

All together, the findings of this study highlight the importance of early screening, controlled screen exposure, health education on eye care, and nutrition-based prevention strategies in reducing childhood visual impairment. Interventions such as scheduled breaks during classes, limiting mobile screen time, and promoting regular vision check-up camps in schools are highly recommended.

Further studies using objective visual acuity testing and longitudinal follow-up may be beneficial to confirm these findings and to develop age-specific preventive strategies more apprehensive to the school environment

VIII. CONCLUSION

This study highlights a self-reported visual impairment (41.5%) among school-going children aged 10 to 14 years, indicating the need for early detection and appropriate intervention. Key factors such as longer class duration, increased mobile phone usage, and poor dietary habitsparticularly low intake of green leafy vegetableswere found to be significantly associated with visual impairment. While online class attendance itself was not directly associated, the duration of visual exposure had a significant role. Additionally, children with mild impairment did not always report overt symptoms, emphasizing the limitations of symptom-based screening and the importance of routine visual assessments in schools.

Considering the modifiable nature of many associated factors, school-based eye health programs should focus on educating children and parents about screen time, healthy diet and the importance of regular eye check-ups. Integration of vision screening into routine school health services, especially in high-risk age groups, could play a vital role in reducing preventable visual impairment and supporting better academic outcomes.

Implementing routine school vision screening programs at least once every academic year ,educating children, parents, and teachers about the risks of prolonged screen exposure and the need for periodic visual breaks and also promoting daily consumption of vitamin A-rich foods through school mid-day meals and awareness campaigns might play a significant role in reducing the prevalence of visual impairment among school going children.

IX. LIMITATIONS

This study has a small sample size, limiting statistical power, and lacks external validity beyond the study population. Information such as mobile usage, vegetable intake, and class duration based on child recall, which may be prone to inaccuracies or underestimation, especially regarding screen time and dietary habits contributing to recall bias.

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Several confounding factors such as genetic predisposition, outdoor activity, total screen time, sleep patterns, and prior eye conditions were not assessed

ETHICAL CONSENT

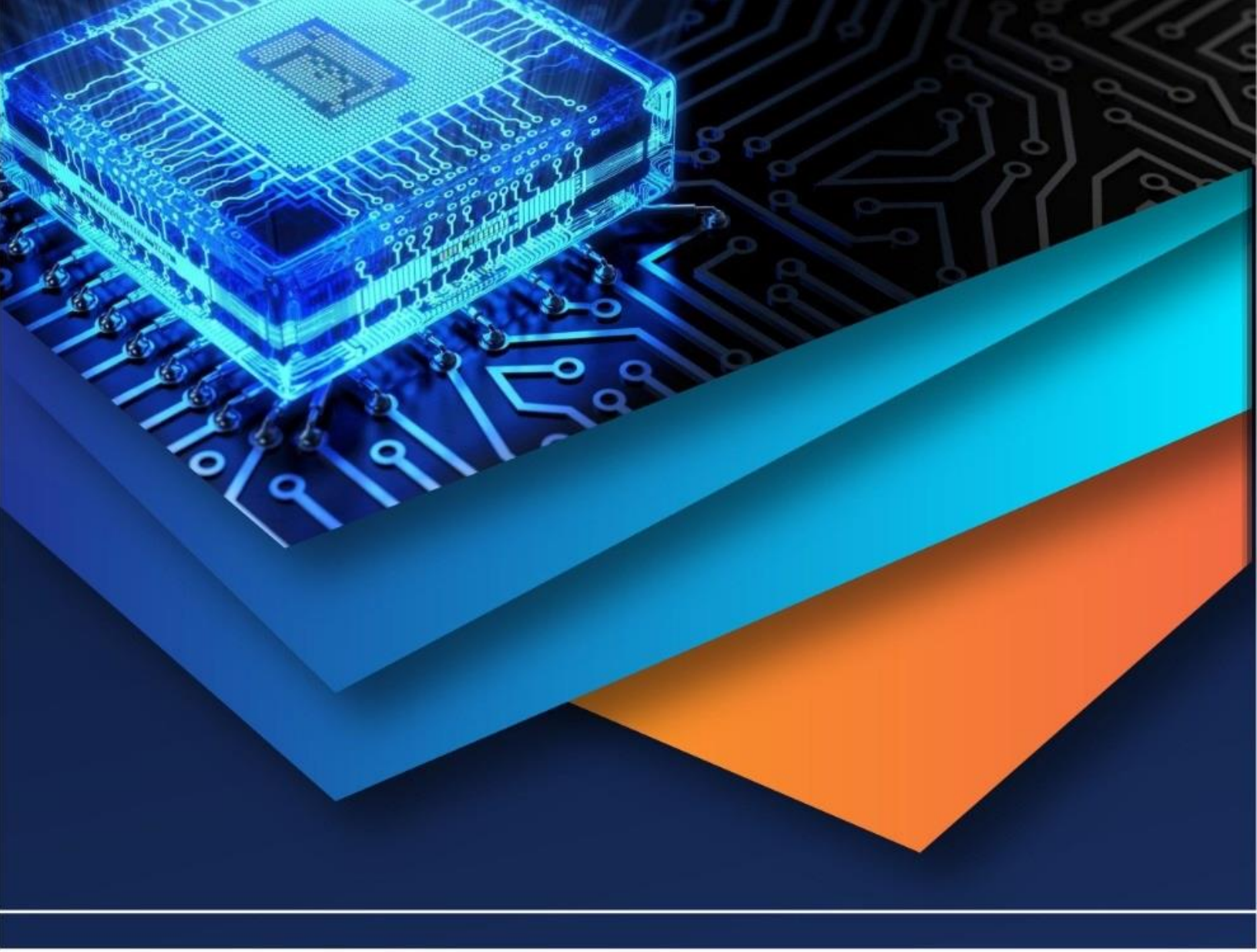
A written informed consent was obtained from the children' parents prior to the data collection.

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